“COMPARATIVE CLINICAL STUDY OF ASTHIMAJJAPACHAK KASHAY (DHATRI, MUSTA, AMRUTA) GUGGULWATI ABHYANTERTAH AND SIDDHA TAIL AS KARNPURAN IN KARNBADHIRYA (NOISE INDUCED SUDDEN SENSORY NEURAL HEARING LOSS)”

A THESIS

SUBMITTED TO THE
TILAK MAHARASHTRA VIDYAPEETH PUNE

FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY
IN AYURVED – SHALAKYA TANTRA
UNDER THE BOARD OF AYURVED STUDIES

BY

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AUGUST 2022

CERTIFICATE OF THE SUPERVISOR

It is certified that work entitled **"Comparative Clinical Study of Asthimajjapachak Kashay (Dhatri, Musta, Amruta) Guggulwati Abhyantertah and Siddha Tail as Karnpuran in Karnbadhirya (Noise Induced Sudden Sensory Neural Hearing Loss)"** is an original research work done by Vd. Neelima Sanket Amrute under my supervision for the degree of Doctor of Philosophy in the subject of Shalakya Tantra in the Department of Ayurved to be awarded by Tilak Maharashtra Vidyapeeth, Pune.

To best of my knowledge this thesis

- embodies the work of candidate ~~himself~~ / herself
- has duly been completed
- fulfils the requirement of the ordinance related to Ph. D. degree of the TMV
- up to the standard in respect of both content and language for being referred to the examiner.

Signature of the Supervisor

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DECLARATION

I hereby declare that the work entitled **"Comparative Clinical Study of Asthimajjapachak Kashay (Dhatri, Musta, Amruta) Guggulwati Abhyantertah and Siddha Tail as Karnpuran in Karnbadhirya (Noise Induced Sudden Sensory Neural Hearing Loss)"** completed and written by me has not previously been formed as the basis for the award of any degree or other similar title upon me of this or any other Vidyapeeth or examining body.

Place: Pune

Date: 07-08-2022

Signature of the Research Scholar

(Vd. Neelima Sanket Amrute)

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Undertaking

I, Vd. Neelima Sanket Amrute is the Ph. D. Scholar of the Tilak Maharashtra Vidyapeeth in the Department of Ayurved – Shalakya Tantra subject.

Thesis entitled **"Comparative Clinical Study of Asthimajjapachak Kashay (Dhatri, Musta, Amruta) Guggulwati Abhyantertah and Siddha Tail as Karnpuran in Karnbadhirya (Noise Induced Sudden Sensory Neural Hearing Loss)"** under the supervision of Vd. Prashant Anant Suru, solemnly affirm that the thesis submitted by me is my own work. I have not copied it from any source. I have gone through extensive review of literature of the related published / unpublished research works and the use of such references made has been acknowledged in my thesis. The title and the content of research is original.

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Vd. Neelima Sanket Amrute

ABSTRACT

Title: Comparative Clinical Study of Asthimajjapachak Kashay (Dhatri, Musta, Amruta) Guggulwati Abhyantertah and Siddha Tail as Karnpuran in Karnbadhirya (Noise Induced Sudden Sensory Neural Hearing Loss)

The thesis work has been divided into five sections:

- Introduction
- Review of Literature
- Research Methodology
- Analysis and Interpretation
- Summary and Conclusion

Introduction:

Modern science does not have promising results to cure Deafness. Hence it only highlights as to reduce the ill effects of deafness rather than getting relief from it. Whereas, Ayurveda states that this disease is kasht sadhya i.e. curable if timely observed dinacharya, aahar, vihar and chikitsa. So the present clinical study has been taken to find a safe solution or management with the help of Ayurveda.

In this study importance of Shalakya in Ashtanga Ayurveda, importance of Sushruta Samhita in Shalakya Tantra, selection of the problem, selection of the drugs, aims and objectives, plan of study and review of the previous works have been mentioned.

Aim: To compare Asthimajjapachak Kashay (Dhatri, Musta, Amruta) Guggulwati Abhyantertah and Siddha Tail as Karnpuran in Karnbadhirya (Noise Induced Sudden Sensory Neural Hearing Loss)

Objectives:

- To study literature on Karnbadhirya and hearing loss from Ayurved Perspective and Modern Science.
- To estimate and compare Audiometry results.
- To evaluate role of anubhoot yog Asthimajjapachak Kashay Guggulwati in Karnbadhirya of Vd. Datarshastri.
- To compare role of anubhoot yog (Vd Datarshastri) Asthimajjapachak Kashay Guggulwati with Asthimajjapachak Kashay siddha Tail as Karnpuran in Karnbadhirya

Review of Literature:

This has been further divided into three sub sections:

- Ayurvedic Review
- Modern review
- Drug review

Ayurvedic Review: This section contains the historical background of Karna with detailed anatomical aspects of the structures of the ear. Physiology of the process of hearing is also dealt in this section. Importance of Vayu mainly Udanavayu in Karnaroga,detailed description of Karnbadhirya with details of Karnpuran procedure have been described.

Modern review: Anatomy and physiology of ear is included in this section, detailed description of Deafness starting with history, definition, causes, epidemiology, prevention& treatment.

Karnbadhirya and deafness in modern medical literature are similar conditions.

Being a very distressing invisible condition Ayurveda has coated it as a separate disease.

In Ayurveda, Karnbadhirya is Vataja- kasht Sadhya, whereas in modern Science Deafness i.e. hearing loss can be permanent conditions irreversible damage.

Drug Review: Detailed description of contents of Asthimajjapachak Kashay (Dhatri, Musta, Amruta) included in this section. Latin name and family, synonyms, Ayurvedic properties, Karma, uses, pharmacological actions etc. are written under this heading.

This section is further divided into sub-sections, such as – Pharmacognostical study on Drug preparation of Analytical study.

Asthimajjapachak Kashay Guggulwati and Asthimajjapachak Kashay siddha tail both have Vata Shamaka and Rasayana properties. Thus, this treatment protocol will be capable of modify the disease pathology; with this hypothesis these two drugs are selected for present clinical trial. This has been mentioned in the Ashtanga Hriday for astigat avastha of Jwar Chikitsa that is in Chaturthak Jwar chikitsa.

Deafness being disease of asthi majjavaha strotasa the below drug is selected for the trial.

कलिङ्गकाःपटोलस्यपत्रंकटुकरोहिणी।
पटोलंसारिवामुस्तापाठाकटुकरोहिणी॥
पटोलनिम्बत्रिफलामृद्वीकामुस्तवत्सकाः।
किराततिक्तममृताचन्दनांविश्वभेषजम्॥
धात्रीमुस्तामृताक्षौद्रमर्धश्लोकसमापनाः।
पञ्चैतेसन्ततादीनांपञ्चानांशमनामताः॥ अ.ह./चि./१–४८–४९

Control Medicine – used for Group A:

Asthimajjapachak Kashay Guggulwati – given Abhyantertah of Agasti Pharmaceuticals, Pune

Trial Medicine – used for Group B:

Asthimajjapachak Kashay siddha tail – self prepared for Karnpuran

RASAPANCHAK

	Name of the Drug	Ras	Virya	Vipak	Guna	Karma
1	Amruta (Tinospora Cordifolia)	Katu, Tikta, Kashay	Ushna	Madhur	Guru, shit	Tridoshaghna, Rasayan, Dipana Mutrajanan, Jwarghna
2	Amalaki (Phyllanthus emblica)	Amla Pradhan Pancharas, except lavana	Sheet	Madhur	Snigdha, Laghu	Kaphaghna, Rasayan, Pittashamak, antioxidant
3	Musta (Cyperus Rotundus)	Katu, Tikta Kashay	Sheet	Katu	Ruksh Laghu	Lekhana, Krimighna, Kaphaghna, Mutral
4	Guggul (Commiphora mukul)	Tikta, Katu	Ushna	Katu	Laghu, Ruksha, Tikshna, Vishada, Sukshma, Snigdha	Vrishya, Balya, Rasayana, Dipana, Medohara, Krimighna

Research Methodology:

Study Design: The clinical study deals with plan of study in detail, aims and objectives, materials and methods, criteria for selection, inclusion and exclusion of patients, sampling, consent, case record form, treatment schedule, symptom scoring and method of assessment. A total number of 242 patients who completed the treatment, recording of gradations of subjective and objective improvement in these patients with statistical analysis of results have been explained.

Inclusion criteria:

- Patients were selected on the basis of symptoms of Karnbadhirya which was diagnosed by audiometric test.
- Patients Age -21 to 60 years.
- Patients Gender - either

Exclusion criteria:

- Mentally retarded
- Diabetes Mallitus, Hypertension,
- Chronic supportive otitis media
- History of trauma
- Any specific medication using for other diseases
- Congenital anomaly. The clinical trial was assessed for its efficacy on the basis of following subjective and objective criteria.

Grouping and Posology:

All the selected patients fulfilling the criteria were randomly divided into two groups.

Group-A: Asthimajjapachak Kashay Guggulwati orally 250 gm two times a day at Vyanodan kal with water.

Group-B: Asthimajjapachak Kashay siddha tail sneh swed purvak Karnpuran once a day 4 - 6 drops in each ear = 100 matra (approx. 5 min) Karnpuran.
Aushadha sevana kal: Evening (Karnpuran) and wati twice a day Vyanodan kal.

Duration: 30 days.
Follow–up: 45 days for recurrence.

Total three months treatment, first two weeks for samprapti bhang with Aampachakvati (Agasti Pharmaceuticals, Pune) 250 mg twice a day, then one month for Asthimajjapachak Guggulwati Abhyantertah 250 mg twice a day Vyanodan kal with water, next 6 wks. observed for recurrence of the diseases, given to group A.

For group B Asthimajjapachak Kashay siddha tail is given for sneh swed purvak Karnpuran for one month 100 matra once a day after sunset.

Sample size: 142 individuals for group A and 100 for group B.

Sampling was done on randomised method.

Group A- Asthimajjapachak wati (Amruta, Musta Amalaki guggul siddha) with water 250 mg bid for one month

Group B – Asthimajjapachak Kashay siddha tail for Karnpuran 100 matra (5 min) after sunset time for one month.

Total duration of trials: 3months

Oil preparation was done in the ratio of 1:4:16 (Oil : Kwath : Water)

It was tested for all conformity tests of water in the oil. Each drug was tested in laboratory for microscopic and macroscopic analysis and pharmacognosy. The reports are attached in the annexure.

The prepared oil was sent to the laboratory (about 50 ml) for physical, chemical, and microscopic analysis and microbial study.

After satisfactory reports from the laboratory, the oil was filled in 10 ml of dropper bottles with all aseptic precautions and dispensed to the patients as per dose. The reports are included in the annexure.

Treatment Protocol:

Screening of patient was done.

Informed written consent was taken (Annexure)

Assessment is done by otoscopy and Audiometry.

Subjective Criteria:

Relief in signs and symptoms in terms of intensity, frequency and duration obtained in the patients were considered for the assessment.

Karnbadhirya: Yes (1) or No (0)

Objective Criteria:

Materials and Methods:

Audiometric tests were performed on each patient before and after the treatment.

Before Treatment (BT)	After Treatment (AT)	Recurrence
0^{th} day	45^{th} day	90^{th} day

Measuring scale for pure tone Audiometry

Objective parameter:

Grade	Degree of Hearing in dB	Type of Hearing Loss
0	0 to 20	Normal hearing
1	20 to 45	Mild hearing loss
2	45 to 65	Moderate hearing loss
3	65 to 85	Severe Hearing loss
4	Above 85	Profound Hearing loss

Standard Operating Procedure (SOP):

The improvement if any in the objective test was recorded.

Observations recorded in case record form.

Analysis and Interpretation:

Observations:

Majority of the patients 58.26 % were reported in the age group of 31 – 40 years followed by 29.75 % in the age group of 21 – 30 years, 94.21 % patients were males, 91.75 % patients were Hindu, 73.55 % were married, 79.75 % patients were labour, 54.13 % patients were having pulse rate in between 71 to 80 beats per minute, 38.43 % patients were having systolic blood pressure in between 111 to 120 mm of Hg, 78.10 % patients were having diastolic blood pressure in between 71 to 80 mm of Hg, Maximum i.e. 56.61 % patients were belonging to Poor class, 40.91 % patients were studied up to H.S.C., all 100 % patients were having sensory neural type of hearing loss, all 100 % patients were having moderate degree of hearing loss in right and left ear.

Majority 51.24 % patients were of having duration to exposure in between 1 to 10 years, 60.33 % patients were using Protective Aid, all 100 % patients were having Exposure to noise as an etiological factor, 38.43 % patients were having normal sleep, 35.12 % patients were having normal emotional make-up, 23.55 % patients were having vata-pitta prakruti, 28.10 % patients were having addiction of Alcohol, and 77.27 % patients were having mixed type of diet.

Interpretation:

In this, the logical interpretation of the literary review, observations and effects of therapy obtained, probable mode of action of the trial drugs have been discussed.

Asthimajjapachak Kashay Guggulwati (orally) and Asthimajjapachak Kashay siddha tail Karnpuran both have Vata – Kapha Shamaka and Rasayana properties. Thus both thesedrugs do the shaman of Vata Dosha, which is main vitiated dosha for the disease Karnbadhirya.

Present clinical study shows that group B (Asthimajjapachak Kashay siddha tail Karnpuran) is more effective than Asthimajjapachak Kashay Guggulwati (Group A) for Karnbadhirya (Deafness) on Audiometry.

In the present clinical study both the drugs showed significant ($p<0.05$) relief in Karnbadhirya, this indicates towards the Vata-Kapha Shamaka and Rasayana properties of the selected drugs. Hence it disintegrates the pathology of the disease Karnbadhirya.

Group A - Conclusion:

The effect of Asthimajjapachak Kashay Guggulwati (Group A) is significant at $p<0.05$ for Karnbadhirya (Deafness) Right Ear and Left Ear.

Asthimajjapachak Kashay Guggulwati (Group A) is found to be statistically significant for objective criteria such as Audiometry over different frequency for Right and Left Ear.

Group B - Conclusion:

The effect of Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant at $p<0.05$ for Karnbadhirya (Deafness) Right Ear and Left Ear.

Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is found to be statistically significant for objective criteria such as Audiometry over different frequency for Right and Left Ear.

Final Conclusion:

There is no significant difference between effect of Asthimajjapachak Kashay Guggulwati (Group A) and Asthimajjapachak Kashay siddha tail Karnpuran (Group B) for Karnbadhirya (Deafness) Right Ear and Left Ear, where $p>0.05$.

The effect of Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant than Asthimajjapachak Kashay Guggulwati (Group A) for Audiometry – Right Ear and Left Ear at Frequencies 500, 1000 and 2000, where $p<0.05$.

Discussion:

The aim of discussion should not be victory for a research scholar, but it term as a progress of research study. Thereby moving forward, the discussion of this work has been catalogued under specific subtitles.

Ayurveda promotes various treatments for the diseased by giving proper remedy for it and also helps for preserving person's health through regimes which can be followed in daily routine life. Theplan of study is to carry out a systematic standardized clinical work, which itself justifies the aim and objectives of any research work. Present work is based on diseases, Karnbadhirya 'where the attempt has been made to compile every aspect of the diseases maintained scientifically and systematically.

The entire discussion has been divided mainly into six parts:

- Discussion on the selection of problem.
- Discussion on conceptual study
- Discussion on drug review.
- Discussion on clinical study.
- Discussion on effect of therapy.
- Probable mode of action of Asthimajjapachak Pancha Kashaya Guggulwati and Asthimajjapachak Pancha Kashaya Siddha Tail Karnpuran.

Effect of Therapy:

Asthimajjapachak Kashay Guggulwati, (Group A)

Statistically significant ($p<0.05$) relief was observed in the Groups of 142 patients treated with Asthimajjapachak Kashay Guggulwati (GROUP A) by applying Chi square test i.e., non parametric test to all subjective criteria and paired t test to objective parameters.

Chi square value and t value is significant at $p<0.05$ i.e., at 95 % level of significance.

Asthimajjapachak Kashay siddha tail Karnpuran, (Group B)

Statistically significant ($p<0.05$) relief was observed in the Groups of 100 patients treated with Asthimajjapachak Kashay siddha tail Karnpuran (GROUP B) by applying Wilcoxon sign rank test and Chi square test i.e. non parametric test to all subjective criteria and paired t test to objective parameters.

Chi square value and t value is significant at $p<0.05$ i.e. at 95 % level of significance.

Comparative analysis: Asthimajjapachak Kashay Guggulwati, (Group A) and Asthimajjapachak Kashay siddha tail Karnpuran, (Group B)

For comparative analysis of Asthimajjapachak Kashay Guggulwati (Group A) and Asthimajjapachak Kashay siddha tail Karnpuran (Group B), Chi square test i.e. non parametric test was used to all subjective criteria and unpaired t test to objective criteria.

Karnbadhirya (Deafness) Right Ear – 116 patients were having mild Karnbadhirya and 26 patients were having no Karnbadhirya in right ear after treatment in Asthimajjapachak Kashay Guggulwati (Group A). 70 patients were having mild Karnbadhirya and 30 patients were having no Karnbadhirya in right ear after treatment in right ear after treatment. Asthimajjapachak Kashay siddha tail Karnpuran (Group B). Chi square value is 4.50 so Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant than Asthimajjapachak Kashay Guggulwati (Group A) at $p<0.05$ i.e. at 95 % level of significance.

Karnbadhirya (Deafness) Left Ear – 114 patients were having mild Karnbadhirya and 24 patients were having no Karnbadhirya in right ear after treatment in Asthimajjapachak Kashay Guggulwati (Group A). 51 patients were having mild

Karnbadhirya and 49 patients were having no Karnbadhirya in right ear after treatment in right ear after treatment Asthimajjapachak Kashay siddha tail Karnpuran (Group B). Chi square value is 23.19 so Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant than Asthimajjapachak Kashay Guggulwati (Group A) at $p<0.05$ i.e. at 95 % level of significance.

Audiometry – Right Ear – 500 Frequency – Mean score of difference of Asthimajjapachak Kashay Guggulwati (Group A) was 18.09 and that of Asthimajjapachak Kashay siddha tail Karnpuran (Group B) was 21.20 and t value is 3.39, so Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant than Asthimajjapachak Kashay Guggulwati (Group A) at $p<0.05$ i.e. at 95 % level of significance.

Audiometry – Right Ear – 1000 Frequency – Mean score of difference of Asthimajjapachak Kashay Guggulwati (Group A) was 16.37 and that of Asthimajjapachak Kashay siddha tail Karnpuran (Group B) was 18.70 and t value is 2.64, so Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant than Asthimajjapachak Kashay Guggulwati (Group A) at $p<0.05$ i.e. at 95 % level of significance.

Audiometry – Right Ear – 2000 Frequency – Mean score of difference of Asthimajjapachak Kashay Guggulwati (Group A) was 17.32 and that of Asthimajjapachak Kashay siddha tail Karnpuran (Group B) was 22.05 and t value is 6.61, so Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant than Asthimajjapachak Kashay Guggulwati (Group A) at $p<0.05$ i.e. at 95 % level of significance.

Audiometry – Left Ear – 500 Frequency – Mean score of difference of Asthimajjapachak Kashay Guggulwati (Group A) was 15.91 and that of Asthimajjapachak Kashay siddha tail Karnpuran (Group B) was 22.10 and t value is 9.60, so Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant than Asthimajjapachak Kashay Guggulwati (Group A) at $p<0.05$ i.e. at 95 % level of significance.

Audiometry – Right Ear – 1000 Frequency – Mean score of difference of Asthimajjapachak Kashay Guggulwati (Group A) was 15.35 and that of

Asthimajjapachak Kashay siddha tail Karnpuran (Group B) was 22.05 and t value is 11.25, so Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant thanAsthimajjapachak Kashay Guggulwati (Group A) at $p<0.05$ i.e. at 95 % level of significance.

Audiometry – Right Ear – 2000 Frequency – Mean score of difference of Asthimajjapachak Kashay Guggulwati (Group A) was 14.19 and that of Asthimajjapachak Kashay siddha tail Karnpuran (Group B) was 19.85 and t value is 8.36, so Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant than Asthimajjapachak Kashay Guggulwati (Group A) at $p<0.05$ i.e. at 95 % level of significance.

Summary and Conclusion:

A conclusion is drawn after logical interpretation of the work which has been summarized.

CONCLUSION:

- Detailed and practical description of Karnbadhirya is mentioned in classics of Ayurveda.
- The effect of Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant ($p<0.05$) than Asthimajjapachak Kashay Guggulwati (Group A) for Karnbadhirya (Deafness) Right Ear and Left Ear of Karnbadhirya (noise induced sudden sensory neural hearing loss).
- The effect of Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant ($p<0.05$) than Asthimajjapachak Kashay Guggulwati (Group A) for Audiometry – Right Ear and Left Ear at Frequencies 500, 1000 and 2000 of Karnbadhirya (noise induced sudden sensory neural hearing loss).
- Deafness, in modern medical literature is a similar condition of Karnbadhirya.
- Deafness is more common worldwide disorder affecting any age group of both sexes. More often in middle age with sensory-neural deafness in people who are working in an noisy industry.
- Vat kaph prakruti people are more prone to this disease.
- Deafness was observed more in the age group 31 – 40 years.
- Deafness was observed more in the Labour than the office staff of the industry.
- Controlling noise level and using protective aid while doing work are very much

helpful in coping and delaying Karnbadhirya i.e., deafness.

- Karnpuran is an effective local treatment / procedure in Karnagata Roga.
- Asthimajjapachak Kashay siddha tail Karnpuran and Asthimajjapachak Kashay Guggulwati have not shown any side effect so it should be used.
- Karnpuran can be observed as dinacharya as preventive treatment for people exposed to noise when there is no ear drum perforation.

RECOMMENDATIONS:

- Longer duration of treatment may enhance the results.
- One can try this medicine for post covid sudden sensory neural hearing loss (Karnbadhirya) because it is asthimajjagata awastha of Jwar.
- Sarvanga Snehana with Basti Karma procedures may be added in treatment protocol which may produce better result.

REFERENCES, BIBLIOGRAPHY AND ANNEXURE:

The references and bibliography have been given at the end of the thesis. Master charts have been attached.

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ABBREVIATIONS

A. H.	Ashtanga Hriday
A. H. Utt.	Ashtanga Hriday Uttarsthana
A. S.	Ashtanga Sangraha Sutrasthana
A. S. Utt.	Ashtanga Sangraha Uttarsthana
Bha. P.	Bhavaprakasha
Bh. Sha.	Bhela Sharirasthana
Ch. Chi.	Charaka Chikitsasthana
Ch. Ni.	Charaka Nidanasthana
Ch. Sha.	Charaka Sharirasthana
Ch. Si.	Charaka Siddhisthana
Ch. Su.	Charaka Sutrasthana
Ch. Vi.	Charaka Vimanasthana
Sha. Pu.	Sharangadhara Purvakhanda
Sha. Utt.	Sharangadhara Uttarkhanda
Su. Su.	Sushruta Sutrasthana
Su. Utt.	Sushruta Uttartantra
Y.R.	Yoga Ratnakara
SD	Standard deviation
t	t-test value
P	Significance values
S	Significant
IS	Insignificant
Vol.	Volume
%	Percentage
Audiometry – Fq	Frequency in Hz
dB	Sound in decibel
B.T.	Before treatment
A.T.	After treatment
Comm.	Commentary
GABAergic	Gama Amino Butyric Acid

INTRODUCTION

Ayurveda is the integral and the most ancient oldest form of medical stream related to the wholesome cure of the disease by the natural remedies in the form of both herbal formulations and purificatory procedures. Equal importance is given to preventive and curative aspects of diseases. Ayurveda provide total health in the aspect of physical, mental, social, and spiritual wellbeing. Its holistic approach towards healthy good lifestyle creates its inevitable importance in the world scenario in recent times. The whole of Ayurveda has divided into aastha different branches, the branch which deals with the diseases above clavicle region is called Shalakya Tantra[1] (Urdhvajatrugat) where shalaka is used for examination and application of drug. Nimi is the pioneer in the specialty of Shalakya[2] and his quote is reproduced in the foremost chapter of Uttartantra, part of Sushruta Samhita.

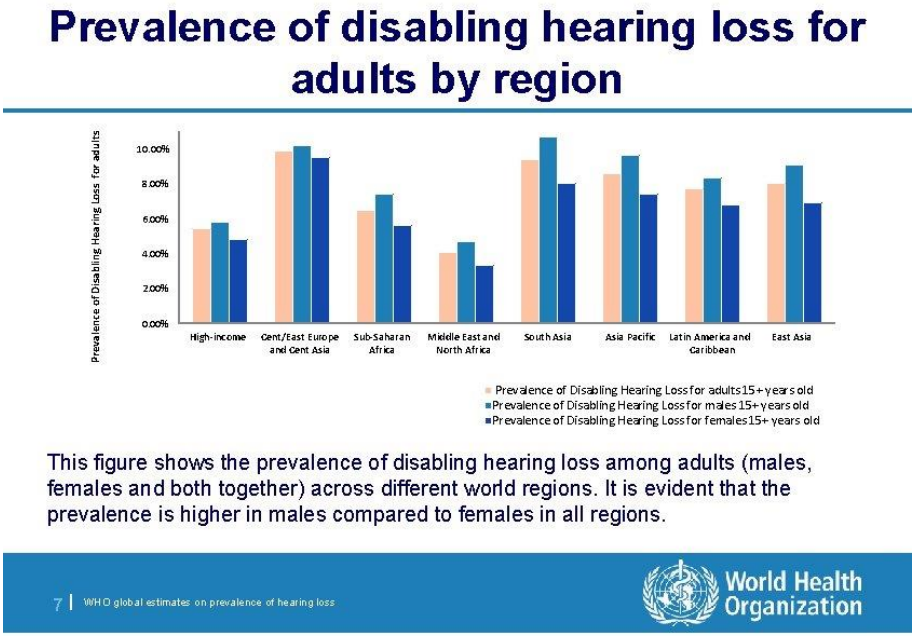
Thus, Sushruta Samhita is the foremost available granth of Ayurveda which explains the ophthalmology, ENT, shirorog and dentistry in a systemic manner. According to Ayurveda Shravanendriya originates from Akasha Mahabhoota[3], which is responsible for perception of noise or sound. Acharya Madhava has clearly explained the situation of Shrotrendriyas the hidden part which is covered from outside by auricle[4]. For the proper functioning of Shravanendriya, Akasha and Vayu Mahabhutas are very essential. So, Vata Dosha is conducting apparatus for normal hearing procedure. Acharya Sushruta explained twenty-eight types of Karna Rogas[5] and Acharya Vagbhata described twenty-five types[6], whereas Acharya Charaka described only four, in Trimarmiya Chikitsa[7]. While describing Karna Rogas, Acharya Sushruta has explained about Karnanad and Karnbadhirya and Karnakshweda[8]. Vitiated Vata Dosha entering into other channels by stotorodh or Vimarga Gamana or encircled by Kaphadi Doshas (Sangam) in Sabdavaha Strotas (Auditory canal), produces different types of sounds in the ear like that of Bheri (cuttle drum sound), Mrudanga (roaring sensation), Shankha (ringing sensation) etc. is known as Karnanad and Venugosha (flute like sound) as Karnakshweda which if Karnanad is not cured, it leads to Karnbadhirya deafness[9].

Acharya Yogaratnakara[10] and Vagbhata[11] have described common hetu / factors of Karna Rogas like swimming, picking, or probing, injury of external auditory canal,

improper instrumentation during the examination and treatment, hearing (high frequency/ dB) loud sounds, injury to head.

Deafness is one of the common and prevalent ailments which we come across our daily medical practice. It affects people right from child to old age. Commonly, prevalence of Deafness has been observed in approximately one out of every ten people[12]. A blind person can easily be visualized or noticed as a handicap and thus gets sympathy but person suffering from ear problem as his handicap remains unnoticeable.

Graph 1.1: WHO - Prevalence of disabling hearing loss for adults



Tinnitus is derived from the Latin word “Tinnire” which means to ringing or tinkle like a bell. It is the perception or continues hearing of sound within the human ear in the absence of same external sound[13].

Deafness mild to profound loss of hearing while tinnitus is a ringing, buzzing, whistling, hissing or other noise, heard in the ear during absence of environmental noise. Tinnitus is characterized by annoying ear noises which can be soft as a whistle or loud enough to be completely debilitating while Deafness is depressing feeling of handicap. It is not a condition itself; it is a symptom of an underlying condition such as age-related hearing loss, ear injury or a circulatory system disorder. Deafness can seem to be continuous or intermittent with normal hearing in between the episodes[14].

This condition is caused by malfunction in the method where auditory signals are processed. The causes of deafness include aging or exposure to loud sound/ noise. Most often it affects people over the age of 40[15,16] but it is now being seen more frequently in young people who are exposed to loud, factory workers, Musicians. Noise that can cause deafness with long term exposure occur in the home and at workplace, environment include noise from forging equipment, power saws, vacuum cleaners, Hammers, power movers, and some kitchen appliances.

Deafness is also due to allergies, diabetes, hypertension, high cholesterol, ear wax. In old age, it is due to the natural degenerative changes in the body, where the hearing impaired is termed as Presbyacusis.

A rare form of Deafness is caused by abnormalities in blood vessels around the ear which causes abnormal clicking noise when muscles contract in the ear.

The clinical features of Karnanad and, Karnbadhirya are very similar.

Pimpri Chinchwad in Pune, Maharashatra is a well-known industrial region and has prevalence of this disease. So large number of patients complaining of Karnanad and Karnbadhirya has been reported in our ENT (Shalakya) OPD.

Noise induced deafness associated with tinnitus is day by day increasing problem in present population due to overuse of and close exposure of sound needs urgent medical and social intervention.

Ayurveda since always mentioned about Dinacharya, Rutucharya and Aharcharya also mentioned about Janpadopdhwan Vyadhi in ayurveda. In Corona everyone is using mobile for communication (headphone) which will cause atiyog of karnendriya.

In present health sciences there is no perfect or complete curative treatment for Deafness which is almost killing all type of population from child to geriatric, all genders of all over the world.

This is my small effort to reach or search for solution on noise induced Deafness.

As per modern science is difficult to diagnose and treat deafness or tinnitus. Tinnitus "maskers" are helpful to some. This device fits like a hearing aid and is turned on to play sounds at some frequency thus producing a dampening effect on the unwanted noise i.e., Tinnitus. A hearing aid and masker both in combination can also be tried. Low dose of tranquilizers or labyrinthine sedative jatamansi can reduce tinnitus. But all this gives a temporary relief, and the recurrence rate is high.

In contrast, Ayurveda has a systematic line of treatment for Karnanad and Karnbadhirya. Vat dominant Tridosha along with Rakta presents as forth dosh the chief pathological factors in the disease. The treatment in Ayurveda for four diseases viz. Karnashoola, Pranada, Karnakshweda, and Badhirya are similar[17]. The treatment regimen as per Dosha vitiation to be adopted can be grouped as Ghritapana, Rasayana, Avyayama, Ashirasnana, Brahmacharya, apunarbhav chikitsa, Akatthana[18]. Ghrita having "Samskarasya Anuvartanatva[19] when processed with Vatashamaka drugs and having Rasayana Guna becomes the best line of treatment for Karnanad and Karnbadhirya. Similarly, when processed with Til tail drug is carried to specific organ it acts like carrier, also Til tail is vatshamak Hence, Asthimajjapachakkashay siddha til tail was selected.

Karna being one of the Adhisthana of Vata Dosha[20], Snehana becomes important to control the localized increased Vata Dosha. Hence, Karnpuran also gains importance in the management of the disease. Karnpuran is a method of pouring or dropping the medication into the external ear. The use of Sneha especially Tail helps to control Vata Dosha and clears the Strotas of the Karna. Asthimajjapachak Kashay siddha tail is possessing Vata Kapha Shamaka properties due to its Madhura Kashaya Rasa and Ushna Virya is taken as the drug of choice to be processed with Vata Shamaka Tail to control Karnbadhirya.

There was no work done on this disease till now. Therefore, to study the disease thoroughly and to know the effect of Karnpuran with Rasayana clinical study has been planned to find out the efficacy of Asthimajjapachakwati and Dhatryadisidha Tail Karnpuran[22] in the management of Karnbadhirya.

Selection of topic:

In my thirty years of clinical experience, I came across many such patients having sudden deafness who were exposed to sound may be as job profile (working in industries or call centres) and new generation, which is more prone to use headphone, Bluetooth leading in this type of condition needs more attention of healthcare professionals, so the topic was selected.

Need to do this research:

As overuse or techno-savvy era (Bluetooth, headphones) is making people use more advanced aids for hearing normal conversation on phone like headphones, Bluetooth. This leads to hearing disabilities which needs research on this burning problem to save the health of society.

Importance of the topic:

Karna is one of the five basic senses of human being, hearing loss or reduction in quality and quantity will definitely hamper the normal life of individual. Ayurveda is based on panchmahabhut which says the first and foremost (panchtatwa) is Akash, where karnendriya adhisthan is there, so to restore the health of aakash and vayu it becomes the primary aim of my topic by using drugs (Amruta, Dhatri, Musta) Rasayan in nature which are individually as well as in combination useful for Karnbadhirya (Charaka/Chi/3/203). Research is needed to study their effects on health of Ear / Hearing loss for the benefit of society.

Aim and Objectives

Aim: To compare Asthimajjapachak Kashay (Dhatri, Musta, Amruta) Guggulwati Abhyantertah with Asthimajjapachak Kashay siddha tail as Karnpuran in Karnbadhirya (Noise induced sudden Sensory Neural hearing loss) (Panchabhautik anubhoot chikitsa of Brihattrayi Ratna Vaidyaraj Atmaram Waman Datarshastri).

Objectives

- To study literature on Karnbadhirya and hearing loss from Ayurved perspective and Modern Science.
- To estimate and compare Audiometry results.
- To evaluate role of anubhoot yog (Vd Datarshastri) Asthimajjapachak Kashay Guggulwati in Karnbadhirya.

- To compare role of anubhoot yog (Vd Datarshastri) Asthimajjapachak Kashay Guggulwati with Asthimajjapachak Kashay siddha Tail as Karnpuran in Karnbadhirya.

Hypothesis

- H_a- Alternative Hypothesis
- Asthimajjapachak Kashay siddha tail as Karnpuran is more effective than Asthimajjapachak Kashay Guggulwati Abhyantertah in Karnbadhirya (sudden sensory neural hearing loss)
- H_0- Null Hypothesis
- Asthimajjapachak Kashay siddha tail as Karnpuran is not more effective than Asthimajjapachak Kashay Guggulwati Abhyantertah in Karnbadhirya (sudden sensory neural hearing loss)

Review of previous work

Maharashtra

- 2020 - Dr Jaywant Kharat, Dr Priyanka Mane - Clinical study of efficacy of Karnpuran in the management of Karnbadhirya

Bangalore

- 1998 - Maheshwar – A clinical study on Karnanad & its management with Apamarga Kshara.
- 1999 - Guggari Maheswar S - A clinical study on Karnanad and its management with Apamarga Kshara Taila.
- 2010 - Apeksha D Rao – A comparative study of Karnpuran with Nasyakarma using Bala Tail in the management of Karnanad.
- 2019 - Rakesh Bishnoi and Shamsa Fiaz - Critical analysis of Badhirya with special reference to hearing loss

Hyderabad

- 2009 - Shankar Mahadev P - The management of Karnanad (Tinnitus Aura) with Bilwadi Tail Karnapooranam and Ashwagandhadi Ghritam as Rasayana- A Clinical Evaluation.

Plan of Study:

The entire study has been divided into:

- **Review of Literature:**

  Conceptual Study: The available description on Karnbadhirya has been studied from various sources of Ayurveda and modern medical sciences.

  - Ayurvedic Review
  - Modern review
  - Drug review

  Drug Review: It includes detailed description of drugs (Dhatri, Musta, Amruta, Guggul) used in the two groups.

  - Pharmacognostic study
  - Pharmaceutical study
  - Analytical study

- **Research Methodology:**

  Clinical study: For clinical study, patients from industries were collected. and screening camp conducted in Chinchwad MIDC, patients having Karnbadhirya selected by random sampling method and an attempt has been made to assess the efficacy of the trial medicine "Asthimajjapachak Kashay siddha tail and wati" with the help of clinical trial. Assessment of clinical study has been done on the basis of special proforma through scoring pattern and analysed statistically with the help of students' "t" value, chai square test.

- **Analysis and Interpretation:**

  Facts of conceptual study, results, and observations of Pharmacognostical, pharmaceutical and clinical studies have been discussed and interpreted as per scientific background.

- **Summary and Conclusion:** Summary of the work represents in nutshell, information about over all study carried out. According to the aims and objectives, honest efforts have been made to clarify the subject based on scientific evidence and a suitable conclusion has been drawn.

At the end, all the referred texts in the form of Bibliography have been enumerated.

REVIEW OF LITERATURE

AYURVEDIC REVIEW

Historical background of Karna Rogas.

Vedic Period: Vedas are the oldest documented source of infinite knowledge on this earth and Ayurveda is the branch or "Upaveda" of Atharvaveda[23]. Description pertaining to the Urdhvajatrugata (Supraclavicular) area of body and diseases are there in Vedas along with Mantras (rhymes having empirical effect) to be recited for their treatment[24,25].

Ayurveda fundamentals are given in nutshell in Vedas[26]. Karnendriya (word used is "Shruti") has been referred in Rugveda and Yajurveda along with many other organs[27]. In Atharva veda, the description of Indriyas like two Netra, two Karna, two Nasika vivar and Jihwa is found[28]. Karnakshweda, Karnshool and Badhirya (Otalgia and Deafness) used to be treated by Mantras in Vedic period[29]. Further references regarding the treatment of Narad Rishi for Badhirya by surgical procedure done by Ashwinikumaras is also available in Vedas[30].

Samhita period: Samhita period is known as the golden period in Ayurveda. During this period, Ayurveda was at its peak and rose to great heights. There is difference of opinion among the Acharyas about the total number of Karnarogas.

Charaka Samhita: Acharya Charaka belongs to Kayachikitsa School of thoughts that is medicinal branch, so he did not give detailed description of Karnarogas separately. Acharya Charkhas described four types of Karnarogas in Trimarmiya Chikitsa Adhyaya on the basis of Dosha involved[31].

Sushruta Samhita: Acharya Sushruta has mentioned twenty-eight types of Karnarog[32]. In Karna vyadhi bandhavidhi, he has given description of Karnapaaligata roga which occur due to complication of Karnapaali Sandhana (auroplasty)[33].

Ashtanga Hridaya and **Ashtanga Sangraha:** Twenty-five types of Karnarogas have been explained by Acharya Vagbhata[34,35]. Among twenty-five types, fifteen disorders belong of (External and Internal Auditory canal) Karnashrotas, seven disorders belong to Karnapaali, and three disorders belong to (pinna) Karnashashkuli.

Sharangadhara Samhita: Thirty Karnarogas are mentioned in Sharangadhara Samhita[36], among them, eighteen are Karna Marg / Shrotasagata Rogas, seven are Karnapaliroga/pinna and remaining five Rogas belong to Karnamula. Acharya Sharangandhara has explained the disorders of Karnamula, but he has not explained the treatment aspect of same.

Madhava Nidana: Acharya Madhava[37] described the Karna Rogas according to Acharya Sushruta. He followed the view of Acharya Charaka.

Bhavaprakasha: In Bhavaprakasha Madhayam Khanda, the Karna Rogas are described under the chapter of Karna Rogaadhikara, and these are classified according to Acharya Sushruta[38].

Yogartnakara: Acharya Yogaratnakara has also described Karna Rogas according to Acharya Sushruta[39].

Gadanigraha[40]and **Vangasena**[41] had followed the view of Acharya Sushruta and Charaka.

Bhela Samhita: Bhela Samhita has described the Karna Rogas in very short Viz. Vataja, Kaphaja, Raktaja, and Krimija[42].

Harita Samhita: Harita has also described Karna Rogas in very short; He has classified Karna Rogas in Vataja, Pittaja, Kaphaja, Sannipataja, and Krimija specially[43].

Etymology of Karna:

The word / shabd "Karna" is derived from the root "Krina Viksyapa" (कृण् विक्षेपे) by the principle of "Na" (नन्) and with the addition of suffix **"Unadirna"** which means hear[44].

Definition: Karna is defined as that which helps in hearing/listening or that which helps in the perception of sound[45].

Synonyms: Karna, Shabdagrahyam, Shrotra, Shruti, Shravana, Vakraguhaa, Dhwani Grahyam, Shravanopayaha, Shravanendriya[46].

Karna Sharira: Karna Sharira (Anatomy and Physiology) has been mentioned in Sharirasthana of Sushruta Samhita and Ashtanga Hridaya, although description is

very premature. Acharya Sushruta has given second most importance to Karnendriya after Chkshu(Netra). Karna is the end organ of Shravanendriya (organ of corti), the function of which is hearing (also center of hearing in the brain).

Garbha Karna Sharira: According to Acharya Sushruta, Garbha means combination of Atma, Prakruti, Vikara along with Shukra and Aartava. In the Garbha, the process of division is brought about by Vayu mahabhut. All catabolic and anabolic process by Teja mahabhut. Hardness and structure are formed about by Prithvi Mahabhut. Fluid in the cochlea by Jala Mahabhut and all the hollow structures by Akash Mahabhoota[47]. During third month of intra uterine life, various Pratyanga body parts like Karna, Nasa, Netra etc. develops and are found in primitive (Avyakta) form and gradually become evident (Vyakta) after few months. In fourth month of intrauterine life, Garbha Hridaya or fetal heart is formed, and sensory perception starts Fetal heart beats. In the so formed Hriday, the Chetana Dhatu gets lodged facilitating the existence thus various Indriyartha like Shabda, Sparsha, Rupa, Rasa and Gandha are perceived. During seventh month of intra uterine life. All Indriyas are Anumanagamya. They are made up of Panchamahabhoota and each Indriyahas got predominance adhikya of one Mahabhut.

The hearing sense organ which perceives Shabda is called as Shrotrendriya[48] Shravanendriya is one among five Gyanendriya, is predominant with "Aakasha Mahabhoota"[49] and its Indriya Karma is Shabda Grahana. Karna is Adhishtana of shravanendriya.

Strotas: According to Acharya Sushruta and Vagbhata, Indriyas are formed of Atmaja Bhavas[50]. In Sharirasthana, various factors related to Matruja, Pitruja, Satmyaja, Satvaja, Rasaja and Atmaja are present. Most of the Strotas are formed of Matruja Bhavas. The concept of Strotas / marg is special and unique feature of Ayurveda. Even though there are no direct references of Shabdavaha Strotas in the particular topic of Strotas, we get the reference of the disorders related with ShabdavahaStrotas (Deafmutism). Acharya Sushruta has mentioned in Uttartantra that disorders of Karna are related with Shabdavaha Strotas, Sira[51], Nadi[52] and Patha[53].

According to Acharya Sushruta the Strotas are of two types: Bahirmukha Strotas and Antarmukha Strotas. Among them Karna has been mentioned under (external Auditory canal orifice)

Bahirmukha Strotas[54,55] Acharya Charaka has also described Karna as Bahirmukha type of Strotas. According to Acharya Charaka, all the Strotas have two essential functions that is carrying Malakhya and Prasadakhya[56] While commenting on this, Chakrapani says that the opening of these Strotas are called Ayana or Mukha of the Strotas, through which both Malakhya(excreta) and Prasadakhya Dhatus are carried. As we know that Karnamala /karnguthak is formed by Mamsa Dhatu during its metabolism and this Karnamala is carried out of the body through this Bahirmukha Strotas.

Karna Sharira Rachana: Karna (ears) are placed on head on lateral side two-supraclavicular organs, which are the seat of specialized sense of hearing[57,58,59].

Pramana: Pramana (measurement) of Karna is four Angula[60].

Situation: Karna is located at equidistance of five Angula from the Apaanga i.e. (lateral canthii) of either side. Dalhana commented that distance is counted from lateral end of the eyebrow to opening of external auditory canal[61]. In Ayurvedic Literature, the available description regarding Karna Sharira i.e., anatomy of ear from modern viewpoint is presented:

Karna Shashkuli: Shashkuli (karanji) is in fact a foodstuff. It is prepared by rice and jiggery added in it. There after fried in Tila Taila (Sesamum indicum). It is best in Shleshmaja- PittajaVikara. Indigenously, it is called as Shashkuli, Pharaka or Gujiya[62,63]. The part of the external ear i.e., pinna is almost similar structure and is called Shashkuli. According to Chakrapani, Shashkuli is Karnagata vartakar (whirlpool shaped part of ear cochlea), which means that in this some circular or spiral structures are found and seem to terminate in a hollow space.

Paali: Acharya Vagbhata (I) has created controversy by saying "Paali Karna Shashkuli" which should mean that Karna Paali is a part of Shashkuli, and they are not synonymous[64].

Acharya Vagbhata (II) clarified it by saying "Paali Bahya Karnasyaadhobhagah"[65] which means Paali, is the lower portion of Bahya Karna, which reflects that, it is the

ear lobule and not a Shashkuli. In Charaka Samhita, the structure of Karna Paali is not described. Chakrapani while commenting on Karna Putaka (Pratyanga) says that "Putrakah Karnapalya AdhahBhagah". If Karnapaali is similar to ear lobule, then there is no structure below it. Shashkuli and the portion below it means Paali i.e., Putraka indicates the ear lobule. Karnalatika is a synonym of Karnapaali and is named by Acharya Dalhana[66].

पलितः कर्णलतिका । (सु.सू.१६/१ डल्हणाचार्य)

Here above explanation, it is clear that Shashkuli is similar to pinna and the word Paali is used as synonym of Shashkuli but frequently it is used as ear lobule.

Karna Putraka: Acharya Charaka described two Urdhvajatrugata Pratyanga (Suporaclavicular organs) under Karna Putraka. The discussion, which has been made above Karnapaali, also give indications to resemble the two, structures i.e., Karna Putraka and ear lobule. Acharya Dalhana while commenting on Karna Peetha written as "Putriko Paridesh"[67]. Karna Peetha is back portion of the Karna (pinna) from which Twacha (skin) and Mamsa (Muscles and fascia) is grafted for tympanoplsty. In short, the word "Putraka" appears to be mentioned for ear lobule. Therefore, Karnapaali and Karnaputraka, both are synonyms.

Karna Peetha: According to Acharya Vagbhata **(**I) Karn-adhah Bhaga is back and lower portion of Karna (pinna). It is the lowermost, cartilaginous part of pinna from which lobule is attached. If the Karnapaali gets destroyed, cut, elongated (or perished), loose skin flap of this portion is used for lobuloplasty.

Karna Chidra, Karna Strotas or Karna Vivar[68]**:** It is that portion of Karna, where Karna Kleda/mal is found and in which insects can get entangled. Shabdavaha Strotas has been referred in context to Badhirya and Karna Pranada[69]. Shabdavaha Nadi Vestibulocochealar nerve also accounted in the disorders of Karna in Nidanasthana by Acharya Sushruta[70].Shabdavaha Strotas and Nadi seem to be the external and internal auditory meatii and cochlear nerves in present context. Except these structures, Acharya Sushruta has mentioned some other anatomical entity related to Karna in Sharirasthana[71].

Karnasthi: Acharya Sushruta has mentioned that there is a single bone (mastoid) in ear while counting bones of Shira and Greeva[72]. Acharya Sushruta in Sharirasthana

while explaining type of Asthi, says that Tarunasthi(cartilage) presented in Karna[73,74]. Ghanekar in Sharirasthana Teeka has considered Karnasthi as Mastoid process.

Karna Avatu: Distance between two Karna is fourteen Angula[75].

कर्णावट्वन्तरं चतुर्दशाङ्गु.ळं । (सु.सू. ३५/१२)

Karnaprushtha: Karnaprustha is located above the Vidhura Marma[76].

Sandhi: Acharya Sushruta says that in Karna Shringataka, Shankhavarta Sandhi[77]. While describing the Sandhi, Acharya Sushruta has counted one Sandhi in each ear. Shri Gananath Sen Saraswati also agreed about one Sandhi in each ear.

Peshi: While describing the Peshi of Greeva and Shira, Acharya Sushruta has counted two Peshi in each ear (Total 4)[78].

Marma: Acharya Sushruta says that Vidhura Marma is found behind the Karna, which is a Snayu Marma[79]. As Acharya Sushruta belonged to Shalya Sampradaya, he had instructed to protect the Marmas and Avedhya Siras during the surgery[80].Acharya Vagbhatt is also of the same view[81,82].Both of them agree that any injury/trauma (mechanical or sound) to this Marma will cause Badhirya or Deafness[83,84].

"कर्णपृष्टतोऽधः संश्रिते विधुरे तत्र बाधिर्यं॥" (सु.सू. ६/२७)

Vagbhatacharya says that it is a Dhamani Marma[85] and considered it under Vaikalyakara Marma[86,87]. This is the nature of Vaikalyakara Marma to cause vikalata (Disability) the other type of defect, after an injury over them[88]. Ghanekar has correlated posterior auricular vein, artery as Vidhura Marma, because there is every possibility of rupture of these structures.

Siras: According to Acharya Sushruta total 10 Siras in both ears are found; out of which 4Vatavahini, 2 Pittavahini, 2 Raktavahini, 2 Kaphavahini[89]. Siras are linked with Karna.

"कर्णयोर्दश, तासां शब्दवाहिनीमेकैकां परिहरेत्;" ॥ (सु.सू. ८/१७)

In Sharirasthana[90], regarding Avedhya Siras (should not prick). There are ten Siras in Karna, among them 2 Shabdavaha Siras should be protected (while performing

surgical procedures). According to Acharya Vagbhata there are16 Siras in Karna[91] out of which 2 Shabdavahini Siras are contraindicated for Rakta Mokshana[92].

Dhamani: In Karna there are two Dhamani, which help in perception of sound[93].

Prashasta Karna Lakshana (Features of ideal ear):

Acharya Charaka while describing the features of parts of body has also described the ideal features of Karna such as both the ears should be thick (Bahala), large (Vipula), smooth (Sama Peetha), equally and evenly formed (Nichai Vridhdho), posteriorly depressed (Pruthato Avanata) with well developed (Sushlista) Karnaputrika, and large orifice (Maha chidrau)[94,95].

बहलौ विपुलसमपीठौ समौ नीचवृद्धा पृष्ठतोडवनतौ सुश्लिष्टकर्णपुत्रकौ महच्छिद्रौ कर्णा। (च.शा. ८/५१)
कर्णौ निचौन्नतौ पश्चान्महान्तौ श्लिष्टमांसलौ । (अ.ह. शा.३/१०८)

From the above discussion, after reviewing the Ayurvedic literature and comparing it on the grounds of modern science, Karna and its related parts refer to the following structures.

Karna: The word Karna refers to the whole external ear including pinna, lobule, and external auditory meatus.

Karna Shashkuli: The word Shashkuli is used for pinna of ear.

Karna Putraka and Karna Paali: Both of these are synonyms and used for ear lobule.

Karna Peetha: Karna Peetha refers to the posterior and lower surface of pinna.

Karna Chidra, Karna Strotas and one of Bahirmkukha Strotas:

All these terms refer to the external auditory meatus.

Shabdavahi Strotas: - this refers to the external and internal auditory meatii.

Shabdavaha Nadi / Dhamani: - This most probably refers to the Vestibulocochlear nerve

Physiology (Kriyasharira): Hearing (Shravana Kriya) is the chief function of Karna. Maharshi Charaka has narrated that the knowledge perceived through the

confluence (Sannikarsha) of four factors viz. Atma, Mana, Indriya and its Vishaya (Artha)[96].

आत्मेन्द्रियमनोर्थानां सन्निकर्षात् प्रवर्तते
व्यक्ता तदात्वे या बुध्दिः प्रत्यक्षं सा निरुच्यते ॥ (च.सु.११/२०)

Shabdendriya Kriya Sharia (Concept of sound perception in Ayurveda):

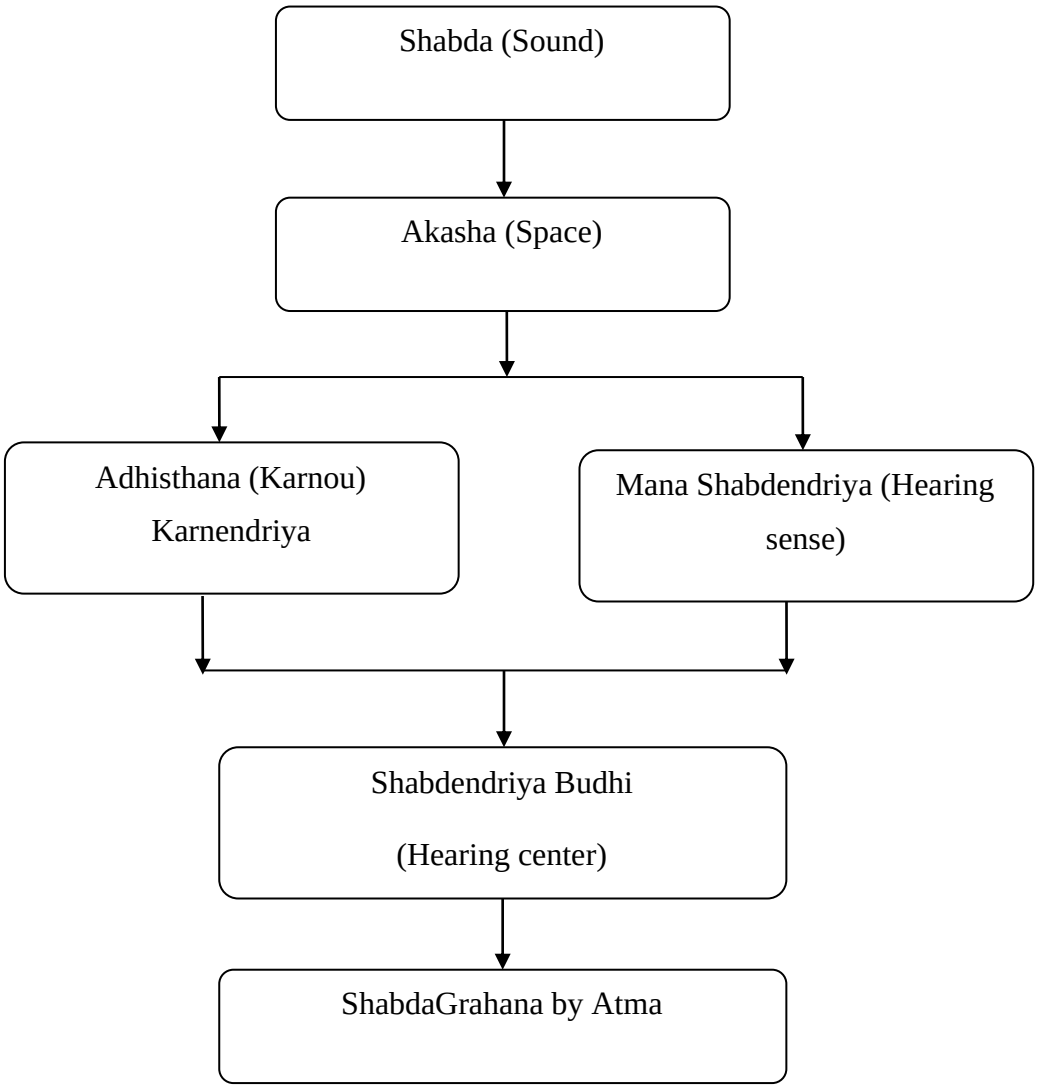
This process needs, five elements of each Indriya (specialized sense organs), then this process of perception is achieved. Indriya Vishaya (object), Indriya Dravya (media), Indriya Adhisthana (organ of reception), Indriya(sense), Indriya Budhi (specialized sense center for hearing), act in co-ordination with subtle and amphibious sense i.e. Mana to finish or round off the process of perception by senses[97]. So, in the process of hearing, combination of Shabda (sound), Akasha (Space), Karna (ear), Shravanendriya (sensory part of internal ear or cochlea) Shravana Buddhi (hearing centre) and Mana (psyche) is essential. Here, sound is Vishaya, space is Dravya, ear is Adhishthaana, cochlea is Indriya, and hearing centre is Shravana Buddhi. Sound travelling through space when comes in contact with external ear and transmitted to internal ear (cochlea) is perceived and further transmitted to the hearing center where after its interpretation it is heard by an individual. Psyche (mana); by its uniqueness and its sense of quality work, it acts as a co-ordinator.

The sense organ which perceives Shabda is called as Shrotendriya.

"श्रोत्रे शब्दज्नानसाधने इन्द्रियभेदे तदाधारे ॥" (Vachaspathyam, pg 5157)

Shabdendriya Kriya or perception of sound this phenomenon presented as under.

Fig 2.1: Shabdendriya Kriya



Shabdaendriya Kriya Sharir

The explanation regarding Shabda Grahana as elucidated in Shabda Stoma Mahanidhi. The sound waves come in contact with the ear, stimulates Karnendriya, it perceives sound with the help of Dika/disha or direction. Vaisheshika Darshana defines Shrotra as, a space in Shravana Vivara intended for Prapaana or transmission of Shabdas, Nimitta Upabhoga is experience caused by the sound waves.

Badhirya or deafness is results from its Upanibhandaka's Vaikalya. (Pathology in transmitting media)

“श्रोत्रं पुनः श्रवन, विवर संज्नक नासो देशः शब्द निमित्तोपभोगप्रपान धर्मोपनिबद्ध तस्य च नित्यत्वे सति उपनिबन्धक वैकल्यात् बाधिर्यमिति” ॥ (तर्कसग्रह)

Each ear is a receptor concerned with:

- Sangraha (Collection)
- Samvahana (Conduction)
- Parivartana (Modification)
- Vistarana (Amplification)
- ParimanugamanaVivechana (Analysis)

Nature of Shabda: Shabda or sound is the quality of Aakasha, it is perceived by Shrotra, and it is transient or shanika. Shabda is not present in Karna (source) i.e. at the site of hearing (Shrotra) but it is to be created, conducted, and perceived.

Kinds of Shabda:

“शब्दस्त्रिविधः संयोगज विभागजः शब्दश्चेति” ॥ (तर्कसग्रह)

Three types of Shabda[98] are:

Samyogaja: Sound caused by the contact between one or more substances as seen in sound by Bheri (trumpet), Mridanga etc.

Vibhagaja: Sound caused by separation of article such as venu Vidarana (separation of bamboo stick into two pieces).

Shabdaja: Alphabets and other broken words and sentences.

“श्रोत्रग्राह्यो गुणः शब्दः । आकाशमात्रवृत्तिः, स द्विविधः ध्वन्यात्मकः वर्णात्मकश्च ।
ध्वन्यात्मकः भेर्यादौ । वर्णात्मकः संस्कृतभाषादिरूपः ॥” (तर्कसग्रह)
“शब्दो ध्वनिश्च वर्णश्च मृदंगादिभवो ध्वनिः । कंठसंयोगादिजन्यो वर्णास्ते कादयो मताः।
सर्वः शब्दो नभोवृत्तिः श्रोत्रोत्पन्नस्तु गृह्यते॥” (तर्कसग्रह)

Production of Varnatmaka Shabda is dealt within the chapter of Vagindriya Varnanam. As per above Shloka quoted by Acharya Panini – Dwanyatmaka Shabda is produced by Aakasha Samyoga in case of Dhwani. This means disturbance caused in space resulting in mutual contact (Samyoga) or separation (Vibhaga) of the medium producing sound. These vibrations travel just like water or wind. Shabda according to its nature is of two types:
Varna Lakshanas – Alphabetical sounds consisting of language.
Dhwani Lakshanas – (Created sounds) just as screaming, humming etc[99].

Shabda is both Samana Jaatiya Karana and Asamana Jaatiya Karana. Sound is produced in solid; liquid or air is invariably essential for the conduction of vibration of sound waves, space between the first and the next atom of medium through which the sound waves pass on, is also consistently essential. In other words, the sound can be defined as, an effect of the disturbance in the particles or a medium either by Samyoga or by Vibhaga.

Shabdotpatti:

"वीचितरंगन्यायेन क्रदम्बमुकुलन्यायेन वा शब्दात्
शब्दान्तरोत्पत्तिक्रमेण श्रोत्रदेशे जातस्य श्रोत्रसंबंधात् प्रत्यक्षत्वसंभवात् ॥" (तर्कसग्रह)
"आत्म बुद्धया समेत्यर्थान् मनो युक्ते विवक्षया । मनः कायाग्निमाहन्ति स प्रेरयति मारुतम् ॥
मारुतस्तूरसि चरन् मंदंजनयति स्वरम् । सोदीर्णो मूर्ध्न्यभिहतो वक्त्रमापाध्य मारुतः॥
वर्णाञ्जनयते;" (पाणिनीय शीक्षा ६–३)

Shabda Grahana takes place through "Veechee Taranga Nyaya"[100]. According to this process when we throw a stone/object on the still waters of the lake a circle of waves starts first from the center. It expands to the periphery. Followed by another circular wave, like this, many such waves being generated, expanded, and disappeared subsequently. The Grahana of these waves is completed by Dhamani which carries out the function of Shabdavahana and is processed by the Manasa.

Similarly, the sound waves disturb the molecules of the medium through which they travel and propagate to unimaginable long distances from the place of their origin. These waves are collected, conducted, magnified, amplified, and finally analyzed isometrically by the organ of hearing.

Like Veechee Taranga they reach the Shrotra. Further, the sound waves after reaching the external ear will vibrate, and then sound waves are analyzed, interpreted, and perceived by the preview of Atma and Manasa Samyoga as explained above.

Disease review:

Introduction: In Sanhitas it is elaborated the importance of Roga Pariksha initially for the determination of the treatment protocol with the usage of best suited drug in the regime[101].Acharya Charaka has told to do proper diagnosis of the disease. It is necessary to become a good clinician. For this, detail textual knowledge is

essential[102]. Hence in present aspect, it is necessary to have good information of Karnarogas which are described in various texts as follows

Types of Karnarogas: There is difference of opinions among the Acharyas about the total number of Karnarogas.

Table 2.1: Numeral list of no. of ear disorders according to different classics:

Samhitaas	Karnaroga	Karnapaaliroga	Karnamoolagata
Charaka Samhita	04	-	-
Sushruta Samhita	28	09	-
Astanga Samgraha	25	-	-
Ashtaanga Hridaya	25	-	-
Madhava Nidana	32	05	-
Bhaavaprakasha	28	05	-
SharangadharaSamhita	18	07	05

Table 2.2: Classification of Karna Rogas according to different Acharyas:

Karnarogas	Charaka Samhita	Sushruta Samhita	A.H. and A.S.	Madhava Nidana	Bhav. P.	Sha.
Vatika Karnaroga	+	-	-	+	+	+
Paittika Karnaroga	+	-	-	+	+	+
Shlaishmika						
Karnaroga	+	-	-	+	+	+
Raktaja Karnaroga	-	-	-	+	+	+
Sannipatika						
Karnaroga	+	-	-	+	+	+
Karnashoola	-	+	-	+	+	-
Vatika Karnashoola	-	-	+	-	-	-
Pattika Karnashoola	-	-	+	-	-	-
Kaphaja Karnashoola	-	-	+	-	-	-
Raktaja Karnashoola	-	-	+	-	-	-
Pranada/Karnanad	-	+	+	+	+	+
Badhirya	-	+	+	+	+	+
Karnakshweda	-	+	+	+	+	+
Karnapratinaaha	-	+	+	+	+	+
Karnasraava	-	+		+	+	
Karnakandu	-	+	+	+	+	+
Karnavarcha	-	+	-	+	+	
Krimikarna	-	+	+	+	+	+
Putikarna	-	+	+	+	+	+
Karnapaaka	-	+	-	+	+	
Vidradhi	-	+	+	+	+	+
Karnashotha	-	+	+	+	+	+
Karnaarsha	-	+	+	+	+	+

Karnarogas	Charaka Samhita	Sushruta Samhita	A.H. and A.S.	Madhava Nidana	Bhav. P.	Sha.
Karnaarbuda	-	+	+	+	+	+
Utpotaka	-	+	+	+	+	+
Utputaka	-	+	-	-	-	-
Shyava	-	+	-	-	-	-
Unmanthaka	-	+	+	+	+	+
Granthika	-	+	-	-	-	-
Jambual	-	+	-	-	-	-
Sraavi	-	+	-	-	-	-
Daha	-	+	-	-	-	-
Paalishosha	-	-	+	-	-	+
Karnapippali	-	-	+	-	-	+
Vidaarika	-	-	+	-	-	+
Tantrika	-	-	+	-	-	+
Paripota	-	-	+	+	+	+
Dukhavardhanaka	-	-	+	+	+	+
Lehya	-	-	+	+	+	+
Vataja Karnamularoga	-	-	-	-	-	+
Pittaja Karnamularoga	-	-	-	-	-	+
Kaphaja Karnamulroga	-	-	-	-	-	+
Raktaja Karnamulroga	-	-	-	-	-	+
Snnipataja Karnamulroga	-	-	-	-	-	+
Karnahallikaa	-	-	-	-	-	+
Karnashashkuli	-	-	-	-	-	+

Manifestation of Arishta Lakshanas in Karna Rogas:

Man who hears a variety of divine sounds even in the absence of any of the celestial beings (such as the Siddhas, the Gndharvas etc.) the moaning of the sea, or the rumbling of the rain clouds, without their actual presence or proximity, or who is incapable of catching their sounds even when they are actually present and assigns to them cause other than the actual ones, should be regarded as a doomed being. The person who interprets the uproar of a city or the rustling forest as sounds emanating from other sources or rejoices at the voice of his enemies and is annoyed at that of his own devoted friends or who suddenly loses the faculty of hearing without any manifested or tangible reason, should be deemed as already on the threshold of death[103].

Importance of Vayu in Karnarogas:

Vayu is the strength; it is the controller of the body of the living beings, is all pervasive and is reputed as the controller of everything in the universe. It is of five types, viz. Prana, Udana, Vyana, Samana and Apana. It controls the Mana and directs the Manasa towards the union of physique, senses, mind, and soul. It is the Prakriti of Shabda and Moola of Shrotra, in its normal state plays an important role in bringing all these together for perception or cognition. Therefore, Vayu is described above as "Ayuhu"[104].

If Vayu is in its normal status, i.e., not vitiated, then the person lives a long life without any disease. Vayu is GOD (prabhu).

"वायुरायुर्बलं वायुर्वायुर्धाता शरीरिणाम् ।
वायुर्विश्वमिदं सर्वं प्रभुर्वायुश्च कीर्तितः ॥" [१०५] (च.चि. २८/३)

Udanavayu: In present relation, the most important of all Vayus, which sends its vibrations upwards, hence termed as Udana. It produces speech/swar /shabd and it said to be the controller for efforts, strength, vitality, appearance, remembrance, movements[106]. In its deranged state it causes diseases which are specifically confined to regions lying above the clavicle[107]. The diseases occur only when deranged Vayu individually or in combination with Kapha obstructs the Shabda Vaha Strotas as (strotorodjanya).

As per **Bhela Samhitha**: There are two types of diseases in the body caused due to vitiated Vata:

- Sarvanga Roga: Having disease in whole of the body.
- Ekanga Roga: Having disease in localized part of body[108].

"श्रोत्रादिष्विन्द्रियवधं कुर्यादुष्टसमीरणः ॥" (च.चि. २८/२९)

Vata Dosha when aggravated in the ear and other sense organs causes impairment of the functions of that sense organs[109].

"वायुर्धातुक्षयात् कोपो मार्गस्यावरेण च ॥" (च.चि. २८/५९)

The causes of aggravation of Vayu are[110]:

- Due to degeneration (Dhatu Kshaya)
- Due to obstruction of its movement (Margaavarodha)

Karnbadhirya and Karnakshweda:

Karnbadhirya and Karnakshweda are two Karnarogas explained by Acharya Sushruta[111,112] and Yoga Ratnakara[113], presenting with various sensation of the sounds in the ear as important features, a comparable clinical entity with that of deafness The main Dosha involved here is **Vata**.

Acharya Charaka has mentioned Karnbadhirya under the Vataja Karnaroga. He has also explained it as Vataja Nanatmaja Vyadhi[114], Samanya Lakshana Vataja Grahani[115] and Lakshana of Vataja Shiroroga[116].

Acharya Vagbhata has explained Karnbadhiryaas Karnaroga out of 25 types of Karnarogas and also explained as Lakshana of other diseases like Vataja Adhimantha[117] and Krimija Shiroroga[118,119], While Karnakshweda as Poorvaroopa of (Deafness)Karn badhirya[120].

Definition:

Karnanad: The term Karnanad is basically derived from two root words Karna and Nada.

Karna: The organ of hearing.

Nada: Sound or ringing in the ear[121,122].

The term Karna refers to organs which are responsible for the perception of the sound (includes external, middle, and internal ear).

The term Nada or Ninada refers to that which produces rhythmic sounds in the ear.

Karnshweda Sound or ringing in the ear.

Derivation:

Karnanad: The term Karna is derived from

"कीर्यते अत्र शब्द इति कर्णः ॥"
"करोति शब्द ग्रहणम् ॥" (अमरकोश)
The term Nada refers to vibrations.
"नादति इति नादः ॥" (अमरकोश)

Synonyms:

Nada= Pranada =Ninada **Karnakshweada:**

क्ष्वेड = क्ष्विड् + घच्च[१२३] = ध्वनि (शब्दकल्पद्रुम)

There are five means for understanding a disease explained in Ayurvedic texts[124] i.e.

1. Nidaana (Causes, etiology).
2. Purvarupa (Premonitory symptoms, prodromal).
3. Rupa (Signs and symptoms, clinical features).
4. Upashaya (Diagnostic tests).
5. Sampraapti (Process of manifestation pathogenesis).

Nidanas:

1. Karnbadhirya**:** The following are the etiological factors responsible for the causation of the clinical condition of Karnbadhirya .
2. Pratishyaya (Chronic recurrent rhinitis)
3. Avashyaya (Exposure to cold wind, currents)
4. Jalakreeda (Swimming)
5. Karna Kanduyana (Constant rubbing or irritating the ear with finger or any other instruments)
6. Mithya Yoga of the Shastra (Improper usage of instruments for diagnosis and treatment on the ear)
7. Atiyoga, Ayoga, Mithya Yoga of the Shabda Incompatible correlations of sensation of sound (Exposure to High, Low, Medium pitched sound) of the organ of hearing.

Vata Prakopa is attributed as the prime etiological factor for the causation of Karnanad. The following the factors are responsible for the pathogenesis of the VataVyadhis.

Hetu:

1. Excessive intake of Ruksha, Sheeta, Laghu -Aahara.
2. Consumption of AlpamatraAahara
3. Ativyavaya (Excessive sexual indulgence)
4. RaatriJagarana (Awakening in nights)
5. Dhatu Kshaya
6. Ati Shoka (Excessive grief)
7. Excessive usage of Lekhana drugs.
8. Vega Dharana (Suppression of physiological urges)
9. Abhighata (Trauma)

Poorvarupa:

No specific prodromal symptoms are found for diseases Karnbadhirya and Karnakshweda in the classical literature. While explaining the general Poorvarupa of VataRogas, Acharya Madhavakara describes Poorvarupa as expression of Roopa Lakshanas with less intensity i.e., less intensity of sound in the ear (patient starts complaining of blocking in ear), may be considered as the Poorvarupa of Lakshanas or when experienced for shorter duration and once in a while which remits by itself can be considered as Poorvarupa of Karnbadhirya and Kshweda.

Acharya Charaka has explained that,

अव्यक्त लक्षणं तेषां पूर्वरूपं इति स्मृतम् । (च.चि. ११/१२)

Means unknown symptoms are Poorvarupa of Vata Vyadhi[125].

लिङ्गमव्यक्तमल्पत्वाव्याधिनां तघथायथम् । (अ.ह.नि १/४)

Symptoms with either less frequency or intensity in appearance are considered as the prodromal symptoms of the very disease.

नाबाधिर्ययोःकुर्याद्वातशूलोक्तमौषधम्।

श्लेष्मानुबन्धेश्लेष्माणंप्राग्जयवमनादिभिः॥२२॥[AH/U18/22]

Karnbadhirya Chikitsa

सशोफक्लेदयोर्मन्दश्रुतेर्वमनमाचरेत्। [AH/U18/31]

Vaman karm is advised in treatment of discharge(strav) and edema(shoph) in the ear.

बाधिर्यवर्जयेद्बालवृद्धयोश्चिरजंचयत्॥३१॥[AH/U18/31]

Deafness of congenital and geriatric type is difficult to treat.

श्लेष्मणानुगतोवायुदोवासमुपेक्षितः।
उच्चैःकृच्छ्राच्छतिकुर्यादधिरत्वंक्रमेणच॥१०॥[AH U/17/10]

Deafness occurs if tinnitus is not treated in time or properly.

वातेनशोषितःश्लेष्मास्रोतोलिम्पेत्ततोभवेत्।
गौरवंपिधानंचसप्रतीनाहसंज्ञितः॥११॥ [AH U17/11]

One should treat tinnitus and deafness like otalgia (vataj karnshool) if kaph is associated then treat with Vaman karm.

एरण्डशिगुवरुणमूलकात्पत्रजेरसे।
चतुर्गुणेपचेत्तैलंक्षीरेचाष्टगुणोन्मिते॥२३॥
यष्ट्याह्वाक्षीरकाकोलीकल्कयुक्तंनिहन्तितत्।
नाबाधिर्यशूलानिनावनाभ्यङ्गपूरणैः॥२४॥ [AH/U18/23-24]

One should use Shigru,Erand sidha tail for nasya for karnnad and karnbadhirya.

पक्वंप्रतिविषाहिङ्गुमिशित्वकस्वर्जिकोषणैः।
ससूक्तैःपुरणातैलंरुस्रावस्रतिनादनत॥२५॥ [AH/U18/25]
कलिङ्गकाःपटोलस्यपत्रंकटुकरोहिणी।
उपळसरी,नागरमोथे,आवळकापटोलंसारिवामुस्तापाठाकटुकरोहिणी॥४८॥
किराततिक्तममृताचन्दनंविश्वभेषजम्॥४९॥[AH/CHI/1/48-49]
पटोलनिम्बत्रिफलामृद्वीकामुस्तवत्सकाः।
धात्रीमुस्तामृताक्षौद्रमर्धश्लोकसमापनाः।
पञ्चैतेसन्ततादीनांपञ्चानांशमनामताः॥५०॥[AH/CHI/1/50]

Amruta, Musta, Amalaki kashaya is advised in 'Chaturthak jwar Chikitsa' - asthimajjagatawastha.

मज्जास्थएवेत्यपरेप्रभावसतुदर्शयेत्॥७२॥
चतुर्थकोमलेमेदोमज्जास्थ्यन्यतमस्थिते।द्विधाकफेनजवनभ्यांसपूर्वशिरसोऽनिलात्।
[AH NI2/72-73]

Chaturthakjwar comes when doshas are dhatugat in Asthi, Majja. Since karnbadhirya comes only when there is dhatu kshay of asthi and majja. Due to

asthimajjagatavastha of jwar which leads to deafness or tinnitus ,vertigo like symptoms.

अथातोरक्तपित्तकासनिदानगजायते।

संततवपर्ययात्॥६८॥[AH/NI/3/68]

अस्थिमज्जोभयगतेचतुर्थकविपर्ययः॥७३॥[AH/NI/3/73]

त्रिधाद्यहंज्वरयतिदिनमेकंतुमुञ्चति।

Fever if remains more and becomes chronic called asthimajjagat when alternate day fever comes and goes .

रक्त अनुक्रमें कुपित पायहोरात्र प्रभृतीनांबलाज्ज्वरः॥७४॥

Roopa:

Karnbadhirya:

Vitiated vayu due to negligence of Karnanad accompanied by vitiated kaph blocks various sound carrying channels.

If the condition is neglected in initial stage, hearing deteriorates gradually ultimately leading to Karnbadhirya i.e. total Deafness .

Uchchshruti i.e., hearing loud sound only.

Kruchrashruti i.e., hearing even loud sound with difficulty.

If neglected causes Karnbadhirya i.e., total Deafness [AH/U/17/10] [SH/U/20/8]

Karnanad:

वेणुघोषवत स्वनम् । (यो.र)

Nanavidha Shabdan: Different type of sounds are being heard in

Shabdavah Shrotas[126]

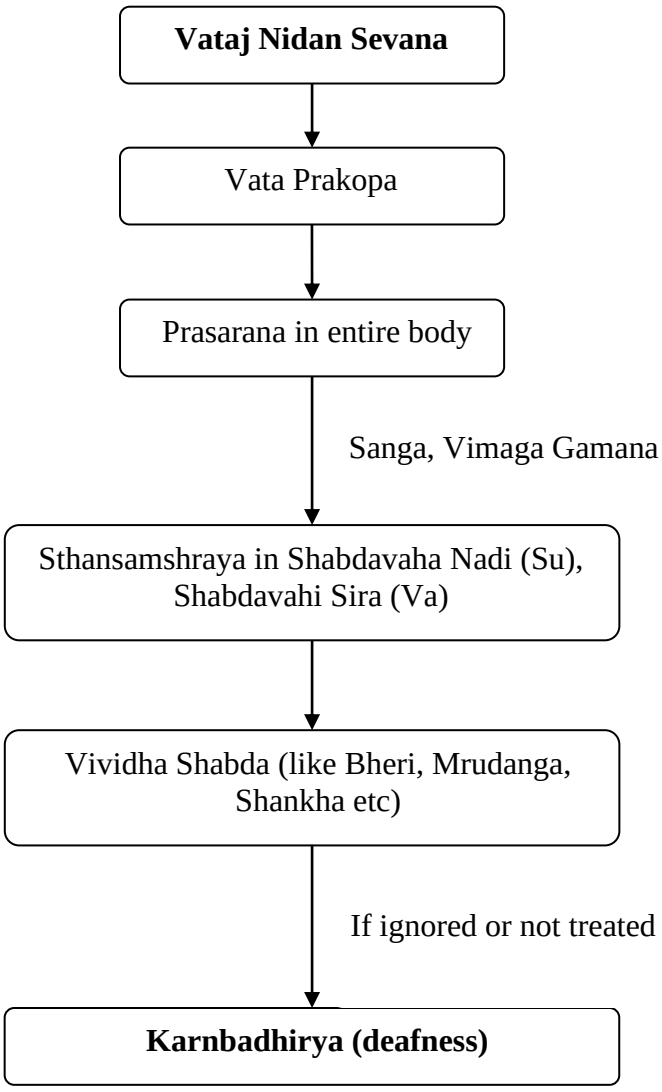
Vividha Shabda like Bheri, Mrudanga, Shankha, Bhrungaara, Kauncha, Mandoora, Tantri, Saamturya svanamare being heard in Shabdavaha Strotas[127].

Samprapti:

Disease process is manifestation of the diseases by the Dosha which are circulating all over the body. Jaati and Aagati are synonyms of Sampraapti. Maharshi Sushrutahas explained Sampraapti of Karnasraava in very consisted way. Due to the various etiologies as cited above, ear afflicted by Vaata Dosha causes discharge from ear.

Samprapti of Karnbadhirya **and** Karnshweda**:** The vitiated Vayu gets lodged in the Shabdavaha Shrotas, thereby causing different types of sounds in the ear called as Karnanad[129]. Karnakshweda if neglected and complicated will further lead to karnbadhirya (deafness).

Samprapti of Karnbadhirya and Karnanad (Fig 2.2)



Samprapti Ghatakas:

Karnbadhirya:

Dosha – Vata

Dushya – Rasa, Rakta

Shrotas – Shabdavaha

Shroto Dushti – Atipravruti, Sanga, Vimargagamanaof Vata

Adhishtana – Karna {ShabdavahaNadi (Su), Shabdavaha Sira (Va)}

Rogamarga – Madhyama

SancharaSthana – SarvaSharira (VatavahaNadi)

VyaktaSthana – Karna

Udhbavasthana – Koshta

Prabheda – Karnanad is only one type.

Karnanad:

Dosha - Vata, Pitta, Kapha, Rakta.

Dushya - Rasa, Rakta.

Shrotas - Shabdavaha, Rasavaha, Raktavaha.

Shroto Dusti - Sanga, Vimargagamana

Adhisthana - Shabda Patha

Agni - Vishamagni

Udabhavasthana - Ama-Pakwashaya

Vyaktisthana – Karna

Table 2.3: Difference between Karnanad and Karnbadhirya:

Sr. No	Karnnada	Karnbadhirya
1	Mainly vitiation of Vata Dosha	It is Tridoshaja in nature
2	Different types of sound heard like Bheri, Mrudanga, Shankha etc	Intensity of hearing is reduced, blocking, or buzzing of ear.
3	Treatment based on Vata Shamana	Treatment based on Tridosha Shodhan, vat shaman and rasayana.

Updrava: If Karnnad is ignored then it results in Karnbadhirya[132].

Sadhya – Asadhyata of Karna Rogas:

पिप्पलि सर्वजं शूलं विदारि कूचिकर्णकः ।

एषामसाध्या, याप्यैका तन्त्रिकाऽन्यांस्तु साधयेत् ॥ (अ.ह.उ.१७/२५)

Acharya Vagbhata coats that Asadhya KarnaRogas are four, viz:

1 Karnapippali
2 Sannipataja Karnaroga
3 Vidradhi
4 Kuchikarnaka

All others are said to be Sadhya Karnarogas and Tantrika is considered as Yapya[133]

Chikitsa:-

It is the curative aspect, and this has to be done simultaneously giving due importance to **Nidanaparivarjana** i.e., preventive measures So **Nidanaparivarjana** i.e., avoidance of causative factors is the first step in combating the disease and forms the part of line of treatment also to reduce exposure to the noise (time wise).

RASAYANA Chikitsa-

Acharya Charak described Rasayana Chikitsa in brief as life promoter, maintains positive health, preserves life youth & help in balancing Tridosha.

दीर्घमायुःस्मृतिंमेधामारोग्यमंतरुणंवयः। प्रभावर्णस्वरौदार्यंदेहेन्द्रियबलंपरम्।

वाक्सिध्दिंप्रणतिंकान्तिंलभतेनारसयनात्। च.सं. च.सं.चि.१/७

Rasayan therapy simultaneously affects the body and mind and bring out physical and psychic improvement & with this prevents the effect of aging(Rejuvenation).

Samanya Chikitsa: The management of Karbadhirya aims at the alleviation of Vata. Sushruta advocated the common management for Karnashoola, Karnanad, Badhirya and Karnakshweda[134]. He advised Ghrutpan vishesh.

सामान्य कर्णरोगेष ु घृतपानं रसायनम् ।
अव्यायामोड शिरःस्नानं ब्रह्मचर्यमकत्थनम ॥ (सु. उ. २०/३)

According to **Acharya Sushruta** treatment includes:

Administration of Vatahara treatment., Snigdha Auashada, Snigdha Virechana, Naadi Sweda, Pinda Sweda, Dhoopana with Kshouma, Guggulu and Agaru, Grithpana as Rasayana, Basti karma chikitsa

Administration of Bala taila in the form of Murdha Basti, Nasya, Mastishka Parishechana and Ghrt for Bhojana, Avoidance of Shira Snana, excessive exercise, excessive talks, excessive sexual indulgence

According to **Acharya Charaka[135]**, treatment principles adopted for Vataja Karnashoola holds good for Karnbadhirya also like Peenasahara Chikitsa, Karnapoorana, Nasyakarma, Snehapoorana.

As per **Vagbhataacharya[136]** Karnashoolahara Chikitsa, Pratishyaya Chikitsa. Naavana, Abhyanga is given

If Kapha Dosha is associated, first Vamana Karma is advised, Vatahara chikitsa is given, Karnapoorana with Katu Tail is advised,

Many classical preparations have been mentioned for Karnapoorana, in Karnbadhirya and karnnad as per below table

Table 2.4: Classical preparations for Karnapoorana in Karnbadhirya and karnnad

Sr No	Yogas	Acharya Sushruta	Acharya Charaka	A.H. and A.S.	Sha.	Yo.Ra.	Chakradatta
1	Sarsapa Tail	+	-	+	-	+	+
2	Swarjikakshara Tail	-	-	-	+	-	+
3	Eranadpatra Swarasa	-	-	+	-	-	-
4	Apamargakshara Tail	-	-	-	+	+	-
5	Bilva Tail	+	-	-	+	-	+
6	Kshara Tail	-	+	-	+	-	+
7	Hingavadi Tail	-	-	-	-	+	-
8	Nirgundiaadi Tail	-	-	-	-	+	-
9	Yasti-Vasa	-	-	-	+	-	-

Internal Yogas[137],

Sarivadivati, Rasnadiguggulu, Indu Vati

Vishesha Chikitsa:

Sarsapa Tail Karnapoorana[138]

Vatashuloktam Auashadham[139.]

Viz, Snehana, Swedana, Varunipana, Ghritapura (Ghritapupa)[140]

Yogas Used in Vatajashoola[141]:

Sauvarchalaadi Gutika, Hingvadi Choorana, Baladi Kwatha, Vishvadi Kwatha

Kulattha Yusha, Tumburvadi Choorana, Shyamadi Kalka, Yamaanyaadi Choorana

Vishva Earandmooladi Kwatha, Hingvastaka Choorana, Hingvadi Vati

Bijapoorakamoola Yoga, Bilvamooldi GutikaTila, GutikaTil tail, Sidh tail

Importance of Snehana in the Karnarogas:

Snehana: The administration of Snehana is of two types:

Bahya (External)

Abhyantara (Internal)

Karnapoorana comes under the division of Bahya Snehana (External oil application).

AbhyantaraSnehana: Administration of Ghritapana comes under heading of Abhyantara Snehana. Snehana is mainly of four verities viz. Ghrita, Tail, Vasa and Majja.

Ghrita has been considered as the superior among all the varieties of Snehana and it has been indicated in Ayurvedic texts, that **Ghritapana** should be used in all types of Karna Rogas.

BahyaSnehana:

Karnapoorana:

सजलं च सदुग्धं च बाधिर्ये कर्णपूरणम् ।
सितामधुकबिम्बीभिः सिद्धं वाऽऽजे पयस्यपि ॥३६॥
बिम्बीक्काथे विमथ्योष्णं शीतीभूतं तदुद्भुतम्। पुनः पचेद्दशक्षीरं सितामधुकचन्दनैः ।।३७ ।।
बिल्वाम्बुगाढं तत्तैलं बाधिर्ये कर्णपूरणम् || सु. उ. २१/३४ ते ३७

The literal meaning of Karnapoorana is filling of ear with luke warm Tail, Swarasa, Sneha dravya or Gomutra etc[142]. According to Acharya Charaka is one type of Sneha Pravichaaranaa[143]. Karnapoorana comes under the external type of Snehana[144]. Acharya Charaka and Acharya Sushruta have not described the procedure. Acharya Vagbhatta[145] and Sharangadhara[146] have described the procedure of Karnapoorana.

While describing Dincharya, Acharya Charaka and Vagbhata has described importance of regular practice of Karnapoorana, avoiding occurrence of diseases of ear. Acharya Charaka[147] has mentioned that daily practice of **Karna Tarpana** may prevent Vata Rogas of Karna, Manyahanugraha, Ucchai Shruti, and Badhirya. Again, Acharya Vagbhata has mentioned that one should daily take up the Snehana of Shira-

Pada Shravana[148]. Acharya Sushruta has also mentioned that Snehana should be done in Manya, Shira, and Karna daily, which may prevent Vata Rogas of Karna[149].

It indicates that our Acharya have ideas regarding maintenance of health of the ear.

The entire procedure of Karnapoorana broadly can be divided into 3 steps.

Purva Karma[150]:

Patient should be made to lie down on right or left lateral depending on the affected side.

Gentle massage with lukewarm oil around the ear for a short period should be done.

Mild hot fomentation around the ear should be done.

Pradhana Karma[151,152]:

The medicated liquid (oil) should be gently warmed by keeping in lukewarm water.

The external auditory canal should be straightened by pulling the pinna backward and upwards.

The liquid (oil) should be poured in drops till the ear canal is filled up.

Dharana Samaya[153]:

Rasadi Dravya– Before meal Tailadi Dravya– After sunset

The root of ear (Karnamula) should be gently massaged in order to potentiate the action of the drug.

The medicated oil should be retained in same position for 100 Matras (5 minutes).

Indication of Dharana according to disease[154]:

In Karnaroga 100 Matra
In Kantharoga 500 Matra
In Shiroroga 1000 Matra

Dhaaranakala[155]:

In painful diseased condition - Till pain relives.

In Swastha Hundred Matra (approx. 5 minutes)[156,157].

Pashchat Karma:

The excess oil should be taken out of the external auditory canal by dry cotton.

After retaining the medicated oil for the prescribed time, the ear should be cleaned with dry cotton mopping.

In bilateral case, the same procedure should be repeated in the fellow ear also.

With the administration of Snehana Dravyas, the Vayu is eliminated and Mridutva in the body is produced. This finally results in the removal of strotorodh. The vitiated Dosha, which obstructs the Shrotas, are eliminated with the help of Snehana[158]

Pathya-Apathya:

There is no specific Pathya or Apathya for Karnbadhirya and Karnakshweda.

Pathya[159]**:** Principal modalities in systemic treatment of disease comprise Sweda, Virechana, Vamana, Nasya, Dhoopana, Siravyadha.

Intake of food grains like Godhuma, Mudga, Shaali, Yava, Purana Ghritha are beneficial.

Consumption of Mamsa of Lava Pakshi, Mayura, Harina, Tittira, Vanakukkuta etc. are conducive.

Vegetables like Patola, Shigru, Vartaka, Karavellaka etc. are advised.

Rasayanas are beneficial.

Following Brahmacharya and less talk are helpful.

These are used according to the involvement of Doshas in Karnarogas.

Apathya[160]**:**

Usage of medicated sticks for brushing teeth, Head bath, over exercise, Scratching the skin of external auditory canal, Oral intake of bulky food items, Drinking cold water or cold drinks.

कर्णनादे हितं तैलं सर्षपोत्थं च पूरणे॥ वा.उ. १८२९

नादबाधिर्ययोः कुर्याद्वातशूलोक्तमौषधम् ।

श्लेष्मानुबन्धे श्लेष्माणं प्राग्जयेद्वमनादिभिः।। वा.उ.११२२

नादबाधिर्ययोः र्वातशूलोक्त: सर्वो विधिः श्लेष्मानुबन्धे तु प्राक् श्लेष्माणमाहरेद्वमननावनाभ्यां तीक्ष्णधूमैश्च ।।

बाधियं च बालवृद्धक्षीणकासशोषिणां चिरोत्थितं च वर्जयेत् ।।

इतरं तु स्नेहस्वेदनस्यशिरोबस्तिबस्तिकर्मप्रभृतिभिर्दोषानुबन्धमवेक्ष्य साधयेत् ।। तत्र प्रागेव पुराणसर्पिषा वा वातहरतैलेन वा स्निग्धं स्नेहेनैव विरेचयेत् ॥

कृतसंसर्जनस्य पुनः स्निग्धस्य शोणितमपहरेत् कर्णासन्नं जलौकोभिस्ततो बस्तिकर्ममूर्धतैल नस्यधूमान् कर्णपूरणं च शीलयेत् ।। अ.सं.उ.२२५१ ते ५६

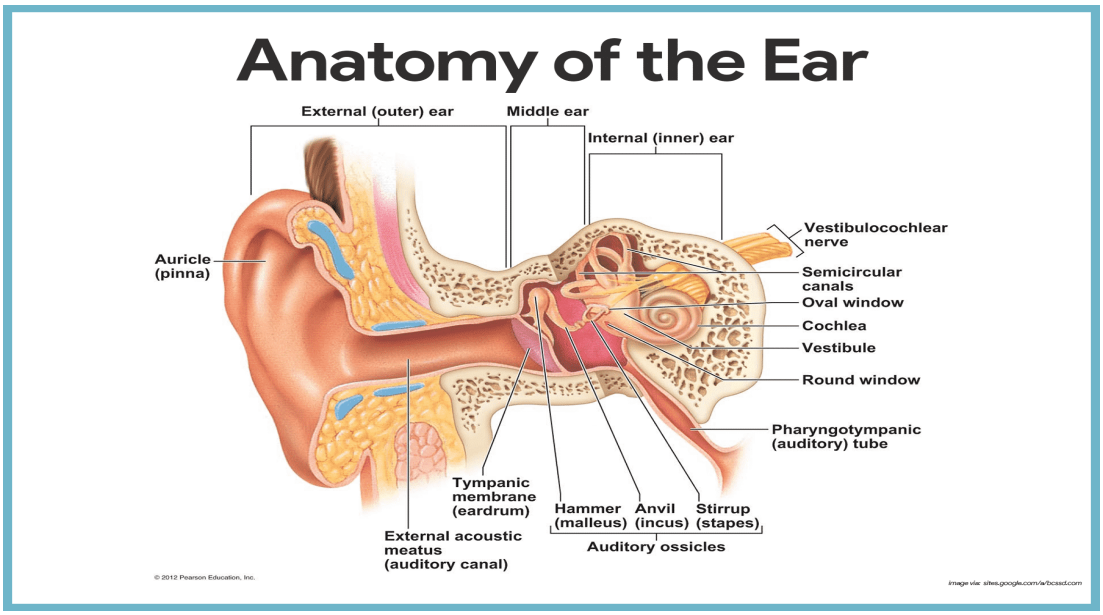
MODERN REVIEW

Anatomy of the ear[161]:

Development of Ear: embryonic stage

Auricle: First branchial cleft is the precursor of external auditory canal. Around the sixth week of embryonic life, a series of six tubercles appear around the first branchial cleft. They progressively coalesce to form the auricle. Tragus develops from the tubercle of the first arch while the rest of the pinna develops from the remaining five tubercles of the second arch by the twentieth week, pinna achieves adult shape. Initially, the pinna is located low on the side of the neck and then moves on to a more lateral and cranial position.

Fig 2.3: Anatomy of the Ear



External auditory meatus: It develops from the first branchial cleft. By about the sixteenth embryonic week, cells proliferate from the bottom of ectodermal cleft and form a meatal plug. Re-canalization of this plug forms the epithelial lining of the bony meatus. Re-canalization begins from the deeper part near the tympanic membrane and progresses outwards. External ear canal is fully formed by the twenty eighth week of gestation.

Tympanic membrane: It develops from all the three germinal layers. Outer epithelial layer is formed by the ectoderm, inner mucosal layer by the endoderm and the middle fibrous layer by the mesoderm.

Middle ear cleft: The eustachian tube, tympanic cavity, attic, antrum, and mastoid air cells develop from the endoderm of tubo- tympanic recess which arises from the first and partly from the second pharyngeal pouches.

Malleus and Incus are derived from the mesoderm of the first arch while the stapes develop from the second arch except its foot plate and annular ligament which are derived from the otic capsule.

Membranous inner ear: Development of the inner ear starts in the third week of fetal life and is completed by the sixteenth week. Ectoderm in the region of the hind brain thickens to form an auditory placode which is invaginated to form auditory vesicle or the otocyst. The latter then differentiates into the endo lymphatic duct and the sac; the utricle, the semicircular ducts; and saccule and the cochlea.

Development of phylogenetically older part of labyrinth – pars superior (semicircular canals and utricle) takes place earlier than pars inferior (saccule and cochlea). The cochlea is developed sufficiently by 20 weeks of gestation and the fetus can hear in the womb of mother. This probably explains how Abhimanyu, while still unborn, could have heard the conversation between his mother and father (Arjuna) in the legend given in the Great Indian epic of Mahabharata written thousands of years ago.

The ear is divided into 3 parts:

1 External ear
2 Middle ear
3 Internal ear or the labyrinth

External ear:

The external ear consists of:

1 The auricle or pinna.
2 The external auditory canal.
3 The tympanic membrane.

Auricle or Pinna: The entire pinna, except its lobule and the outer part of external acoustic canal are made up of a framework of a single piece of yellow elastic cartilage covered with skin. There is no cartilage between the tragus and crus of the helix, and this area is called as the incisura terminalis. Pinna is also the source of several graft materials for the surgeon.

The various elevations and depressions seen on lateral surface of pinna.

External Features of the Auricle: The auricle is formed by the combination of the following parts: Tragus, Antitragus, Helix, Antihelix, Crura, incisura terminalis, Symba concha

External auditory canal:

It extends from the bottom of the concha to the tympanic membrane and measures about 24mm along its posterior wall. It is not a straight tube; its outer part is directed upwards, backwards, and medially while its inner part is directed downwards, forwards, and medially.

The canal is divided into two parts (a) cartilaginous and (b) bony.

Cartilaginous part:

It forms outer one third (8mm) of the canal. Cartilage is a continuation of the cartilage which forms the framework of the pinna. It has two deficiencies - the "fissures of Santorini" in this part of the cartilage. The skin, covering the cartilaginous canal is thick and contains ceruminous and pilosebaceous glands which secrete wax.

Hair is only confined to the outer canal.

Bony part:

It forms inner two third (16mm). Skin lining the bony canal is thin and continuous over the tympanic membrane. It is devoid of hair and ceruminous glands. About 6mm lateral to tympanic membrane, the bony meatus presents a narrowing called the isthmus. Antero – inferior part of the deep meatus, beyond the isthmus, presents a recess called the anterior recess.

Tympanic membrane:

It forms the partition between the external acoustic ear and the middle ear. It is obliquely set and as a result its posterior superior part is more lateral than its anterior inferior part. It is 9 – 10mm tall, 8 – 9mm wide and 0.1 mm thick. Tympanic membrane can be divided into two parts:

Pars Tensa:

It forms most of the tympanic membrane. Its periphery is thickened to form a fibrocartilaginous ring called the "annulus tympanicum" which fits in the tympanic sulcus. The central part of the pars tensa is tented inwards at the level of the tip of malleus and is called the umbo. A bright cone of light can be seen radiating from the tip of malleus to the periphery in the anterior inferior quadrant.

Pars Flaccida:

This is situated above the lateral process of malleus between the notch of Rivinus and the anterior and posterior malleolar folds. It is not so taut and may appear pinkish.

It is also called as Sharpnel's membrane.

Layers of the tympanic membrane:

It consists of three layers

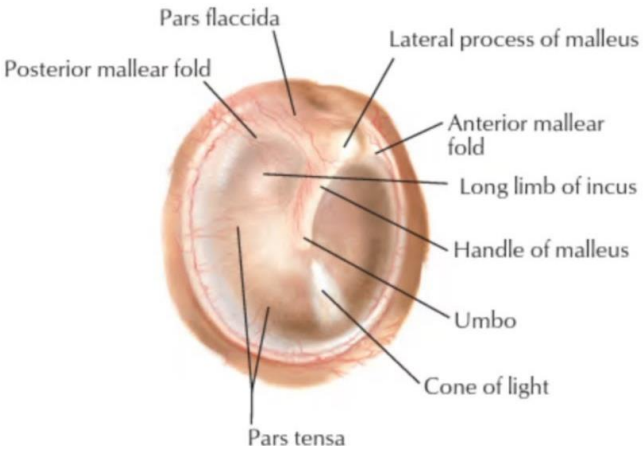
Outer epithelial layer, which is continuous with the skin lining the meatus.

Inner mucosal layer, which is continuous with the mucosa of the middle ear.

Middle fibrous layer, which encloses the handle of malleus and has three types of fibers – the radial, circular and the parabolic.

Fibrous layer in the pars flaccida is thin and not organized into various fibers as in pars tensa.

Fig 2.4: Tympanic Membrane



Relations of external acoustic meatus:

Superiorly - Middle cranial fossa

Posteriorly – Mastoid air cells and the facial nerve

Inferiorly – Parotid gland

Anteriorly – Temporomandibular joint

Posterior superior part of deeper canal near the tympanic membrane is related to the mastoid antrum. **Nerve supply of the ear:** Greater auricular nerve, Lesser occipital, Auriculo temporal, Auricular branch of Vegas (Arnold's nerve), Facial nerve, Tympanic branch of cranial nerve IX (Jacobson's nerve)

The Middle Ear:

The middle ear along with the Eustachian tube, aditus, antrum and mastoid air cells is called the middle ear cleft. It is lined by mucous membrane and filled with air. The middle ear extends much beyond the limits of tympanic membrane which forms its lateral boundary and is sometimes divided into Mesotympanum – lying opposite pars tensa

Epitympanum – also called as attic, lying above pars tensa but medial to shrapnel's membrane and the bony lateral attic wall.

Hypotympanum – lying below the level of pars tensa. The portion of middle ear around the tympanic orifice of the Eustachian tube is sometimes called the pro-tympanum.

Middle ear can be likened to a six-sided box with a roof, a floor, and medial, lateral, anterior, and posterior walls.

The roof is formed by a thin plate of bone called tegmen tympani. It also extends posteriorly to form the roof of the aditus and antrum. It separates tympanic cavity from the middle cranial fossa.

The floor is also a thin plate of bone which separates tympanic cavity from the jugular bulb.

The anterior wall has a thin plate of bone which separates the cavity from the internal carotid artery. It also has two openings, the lower one for the Eustachian tube and the upper one for the canal of tensor tympani muscles.

The posterior wall lies close to the mastoid air cells. It presents a bony projection called the pyramid through the summit of which appears the tendon of the stapedius muscle to get attachment to the neck of stapes. Aditus, an opening through which attic communicates with the antrum, lies above the pyramid. Facial nerve runs in the posterior wall just behind the pyramid. Facial recess or posterior sinus is a depression in the posterior wall lateral to the pyramid. It is bounded medially by the vertical part of VIIth nerve, laterally by the chorda tympani and above by the fossa Incudis.

The medial wall is formed by the labyrinth. It presents a bulge called promontory which is due to the basal coil of cochlea; oval window into which is fixed the footplate of stapes, round window or fenestra cochlea which is covered by the secondary tympanic membrane. Above the oval window is the canal for facial nerve. Above the canal for facial nerve is the prominence of lateral semicircular canal. Just anterior to the oval window, the medial wall presents a hook like projection called the processus cochleariformis. The tendon to tensor tympani takes a turn here to get attachment to the neck of malleus. Medial to the pyramid is a deep recess called sinus tympani which is bounded by the subiculum below and the ponticulus above.

The lateral wall is formed largely by the tympanic membrane and to a lesser extent by the bony outer attic wall called the scutum. The tympanic membrane is semitransparent and forms a window to the middle ear.

Mastoid antrum is a large, air containing space in the upper part of mastoid and communicates with the attic through the aditus. Its roof is formed by the tegmen antri which is continuation of the tegmen tympani and separates it from middle cranial fossa.

The lateral wall of antrum is formed by a plate of bone, which is marked externally on the surface of mastoid by suprameatal (Mac Ewen's) triangle.

Aditus and Antrum:

Aditus is an opening through which the attic communicates with antrum. The bony prominence of the horizontal canal lies on its medial side while the fossa incudis, to which is attached the short process of incus, lies laterally. Facial nerve lies just below the aditus.

The Mastoid and its Air Cell System:

The mastoid consists of bone cortex with a "honeycomb" of air cells underneath. Depending on development of air cell, three types of mastoids have been described as

- Well pneumatized or cellular
- Diploetic
- Sclerotic, or acellular.

Mastoid develops from the squamous and petrous bone. The Petro squamosal suture may persist as a bony plate the Korner's septum, separating the superficial squamosal cell from the deep petrosal cells.

Depending on the location, mastoid air cells are divided into:

- Zygomatic cells (in the root of zygoma).
- Tegmen cells (extending into the tegmen tympany).
- Peri sinus cells (overlying the sinus plate).
- Retro facial cells (round the facial nerve).
- Peri labyrinthine cells (located above, below and behind the labyrinth, some of them pass through the arch of superior semicircular canal. These cells communicate with the petrous apex).
- Peri tubal (around the Eustachian tube. Along with hypotympanic cells they also communicate with the petrous apex).
- Tip cells which are quite large and lie medial and lateral to the digastric ridge in the tip of mastoid.
- Marginal cells (lying behind the sinus plate and may extend into the occipital bone).
- Squamosal cells (lying in the squamous part of temporal bones).

Ossicles of the Middle ear:

There are three ossicles in the middle ear – the malleus, incus, and stapes. The malleus has head, neck, handle (manubrium), a lateral and an anterior process. Head and neck of malleus lie in the attic. Manubrium is embedded in the fibrous layer of the tympanic membrane. The lateral process forms a knob like projection on the

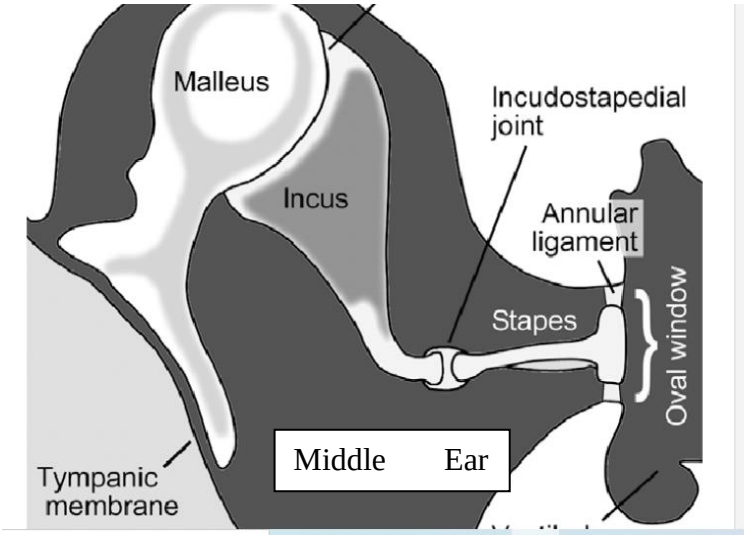
outer surface of the tympanic membrane and gives attachment to the anterior and posterior malleolar folds.

The incus has a body and a short process, both of which lie in the attic, and a long process which hangs vertically and attaches to the head of stapes.

The stapes has a head, neck, anterior and posterior crura and a footplate. The footplate is held in the oval window by annular ligament.

The ossicles conduct sound energy from the tympanic membrane to the oval window and then to the inner ear fluid.

Fig 2.5: Middle Ear



Intratympanic Muscles:

There are two muscles – Tensor tympani and the Stapedius; the former attaches to the neck of malleus and tenses the tympanic membrane while the latter attaches to the neck of stapes and helps to dampen very loud sounds thus preventing noise trauma to the inner ear. Stapedius is a 2nd arch muscle and is supplied by a branch of CN VII while tensor tympani develop from the 1st arch and is supplied by a branch of mandibular nerve.

Blood supply of Middle Ear:

Middle ear is supplied by six arteries, out of which two major arteries are,

(i) Anterior tympanic branch of maxillary artery. Stylomastoid branch of posterior auricular artery, four minor vessels are, Petrosal branch of middle meningeal artery,

Superior tympanic branch of middle meningeal artery, Branch of artery of pterygoid canal (iv) Tympanic branch of internal carotid

Lymphatic drainage:

Lymphatic from the middle ear drain into retropharyngeal and parotid nodes while those of the Eustachian tube drain into retropharyngeal group.

Internal Ear:

It is an important organ of hearing and balance. It consists of a bony and a membranous labyrinth. The membranous labyrinth is filled with a clear fluid called endolymph while the space between the membranous and bony labyrinth is filled with perilymph.

Bony Labyrinth:

It consists of three parts: the vestibule, the semicircular canals, and the cochlea.

1) The **vestibule** is the central chamber of the labyrinth. In its lateral wall lies the oval window. The inside of its medial wall presents two recesses, a spherical recess, which lodges the saccule and an elliptical recess which lodges the utricle. Below the elliptical recess is the opening of aqueduct of vestibule through which passes the endolymphatic duct. In the posterio superior part of vestibule are the five openings of semicircular canals.

Semicircular canals are three in number, the lateral posterior and superior, and lie in planes at right angles to one another. Each canal has an ampullated end which opens independently into the vestibule and a non-ampullated end. The non-ampullated ends of the posterior and superior canals unite to form a common channel called the crus commune. Thus, the three canals open into the vestibule by five openings.

The **bony cochlea** is a coiled tube making 2.5 to 2.75 turns round a central pyramid of bone called modiolus. The base of modiolus is directed towards internal acoustic meatus and transmits vessels and nerves to the cochlea. Around the modiolus and winding spirally like the thread of a screw is a thin plate of bone called osseous spiral lamina. It divides the bony cochlea incompletely and gives attachment to the basilar membrane.

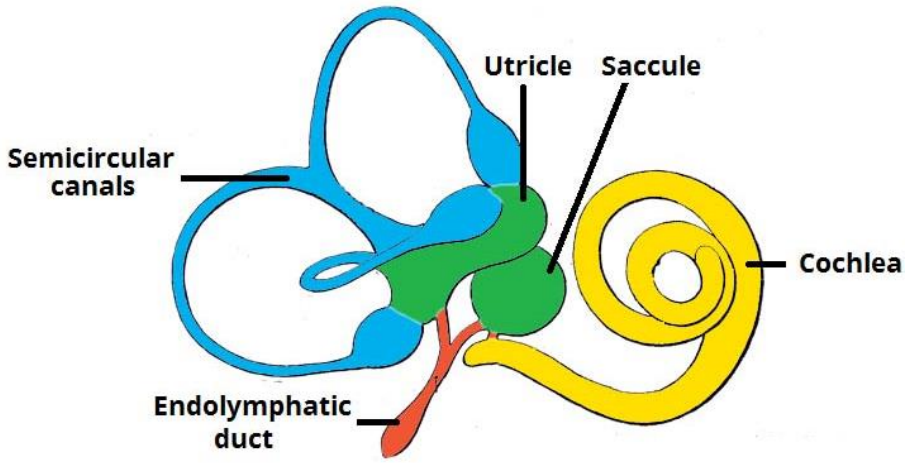
The bony cochlea contains three compartments

- Scala vestibule
- Scala tympani
- Scala media

The Scala vestibule and tympani are filled with perilymph and communicate with each other at the apex of cochlea through an opening called helicotrema. Scala vestibule is closed by the footplate of stapes which separates it from the air-filled middle ear. The Scala tympani are closed by secondary tympanic membrane; it is also connected with the subarachnoid space through the aqueduct of cochlea.

Membranous labyrinth consists of the cochlear duct, the utricle and saccule, the three semicircular ducts, and the endolymphatic duct and sac.

Fig 2.6: Membranous labyrinth



Cochlear duct – Also called membranous cochlea or the scala media. It is a blind coiled tube. It appears triangular on cross section and its three walls are formed by

The basilar membrane, which supports the organ of corti.

The Reisner's membrane which separates it from the Scala vestibule

The striae vascularis, which contains vascular epithelium and is concerned with secretion of endolymph.

Cochlear duct is connected to the saccule by ductus reuniens. The length of basilar membrane increases as we proceed from the basal coil to the apical coil. It is for this reason that higher frequencies of sound are heard at the basal coil while lower ones are heard at the apical coil.

Utricle and saccule – The utricle lie in the posterior part of the bony vestibule. It receives the five openings of the three semicircular ducts. It is also connected to the saccule through utriculo saccular duct. The sensory epithelium of the utricle is called the macula and is concerned with linear acceleration and deceleration. The saccule lies in the bony vestibule, anterior to the utricle and opposite the stapes footplate. Its sensory epithelium is also called macula, and its exact function is not known.

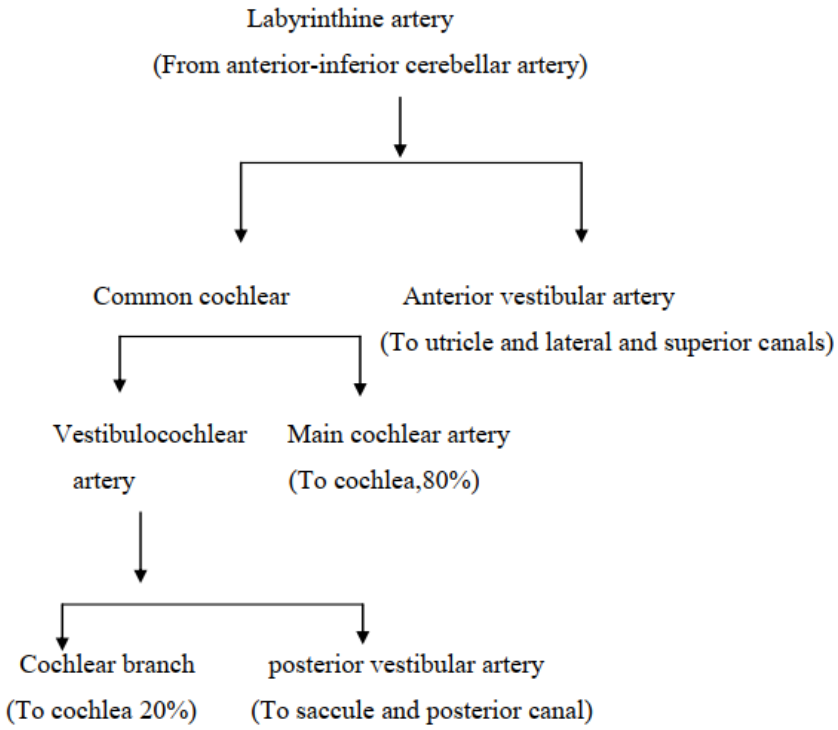
Semicircular ducts – They are three in number and correspond exactly to the three bony canals. They open in the utricle. The ampullated end of each duct contains a thickened ridge of neuroepithelium called crista ampullaris.

Endolymphatic duct and sac – Endolymphatic duct formed by the union of two ducts, one each from the utricle and saccule. It passes through the vestibular aqueduct. Its terminal part is dilated to form endolymphatic sac which lies between the two layers of dura on the posterior surface of the petrous bone.

There are two main fluids in the inner ear, perilymph, and endolymph.

Perilymph resembles extracellular fluid rich in sodium ions. Endolymph resembles intra cellular fluid rich in potassium ions.

Blood supply of labyrinth (Fig 2.7)



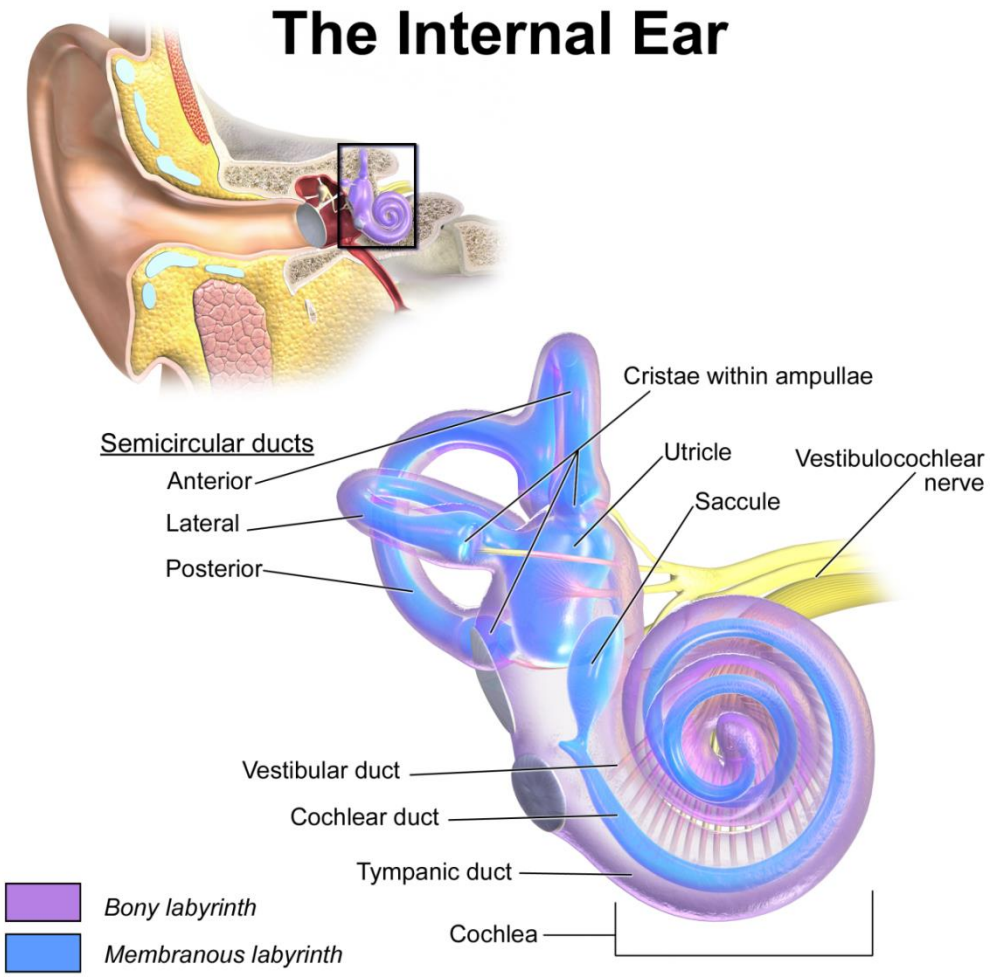


Fig 2.8: The Internal Ear

Auditory system:

Organ of Corti: It is the sense organ of hearing and is situated on the basilar membrane.

Tunnel of Corti: formed by the inner and outer rods. It contains a fluid called endolymph.

Hair cells: They are important receptor cells of hearing and transducer sound energy into electrical energy. Inner hair cells form single row whereas outer hair cells form three or four rows.

Table 2.5: Differences between inner and outer hair cells

		Inner hair cells	Outer hair cells
1.	Total no.	3500	12000
2.	Rows	One row	Three or four rows
3.	Shape	Flask shaped	Cylindrical
4.	Nerve supply	Primarily afferent fibers and very few efferent.	Mainly efferent fibers and very few afferents.
5.	Function	Transmit auditory stimuli.	Modulate function of inner hair cells.
6.	vulnerability	More resistant	Easily damaged by ototoxic drugs and high intensity noise.

Supporting cells: Dieter's cells are situated between the outer hair cells and provide support to the latter. Cells of Hensen lie outside the Dieter's cell.

Tectorial membrane: It consists of gelatinous matrix with delicate fibers. It overlies the organ corti. The shearing force between the hair cells and tectorial membrane produces the stimulus to hair cells.

Auditory neural pathways and their nuclei:

The auditory fibers travel via the ipsilateral and contra lateral routes and have multiple decussation points. Thus, each ear is represented in both cerebral hemispheres. The area of cortex, concerned with hearing is situated in the superior temporal gyrus (Brodmann's area 41)

Eighth nerve ⟶ Cochlear nuclei ⟶ Superior Olivary complex ⟶ Nucleus of Lateral lemniscus ⟶ Inferior colliculus ⟶ Medial geniculate body ⟶ Auditory cortex.

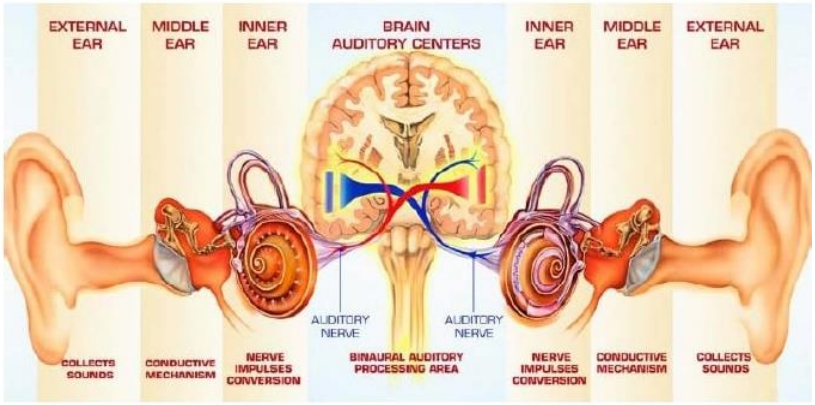
PHYSIOLOGY OF HEARING

Any vibrating object causes waves of compression and rarefaction and is capable of producing sound.

Mechanism of hearing:

A sound signal in the environment is collected by the pinna, passes through external auditory canal, and strikes the tympanic membrane. Vibrations of the tympanic membrane are transmitted to stapes footplate through a chain of ossicles coupled to the tympanic membrane. Movements of the stapes footplate causes pressure changes in the labyrinthine fluid which move the basilar membrane. This stimulates the hair cells of the organ of corti. It is these hair cells which act as transducers and convert the mechanical energy into electrical impulses which travel along the auditory nerve.

Fig 2.9: Mechanism of Hearing



The mechanism of hearing can be broadly divided into:

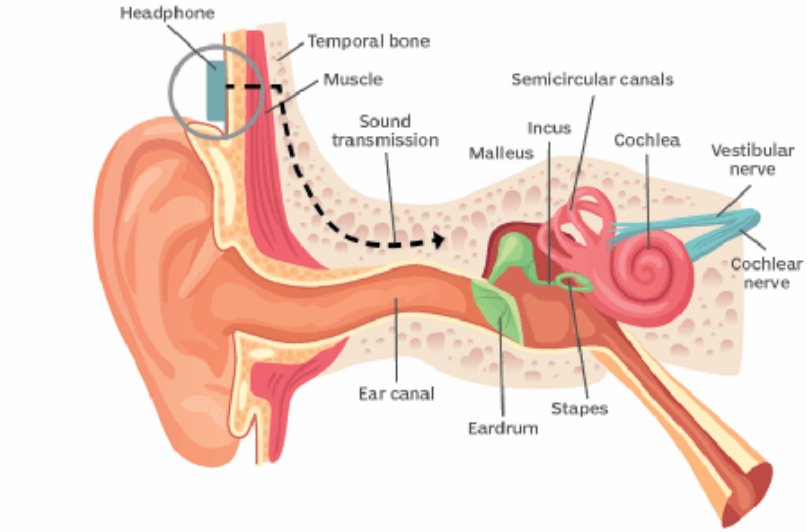
Mechanical conduction of sound (conductive apparatus)

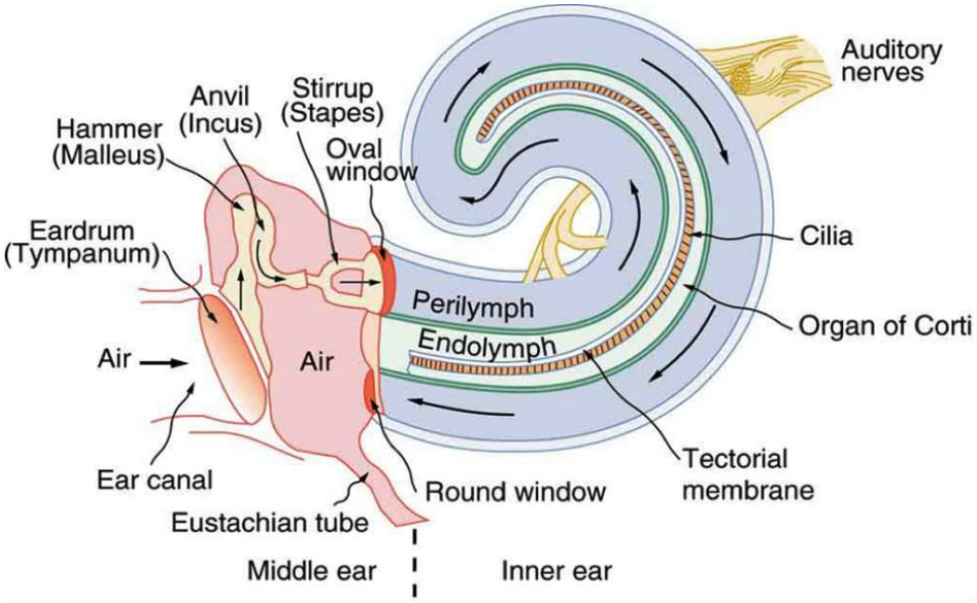
Transduction of mechanical energy into electrical impulses (sensory system of cochlea)

Conduction of the electrical impulses to the brain (neural pathways)

Conduction of sound: A person under water cannot hear any sound made in the air because 99.9% of the sound energy is reflected away from the surface of water because of the impedance offered by it. A similar situation exists in the ear when the air – conducted sound has to travel to cochlear fluids.

Mechanism of Sound Conduction (Fig 2.10)





Nature has compensated for this loss of sound energy by interposing the middle ear which converts sound of greater amplitude, but lesser force, to that of lesser amplitude and greater force. This function of middle ear is called impedance matching mechanism or the transformer action. It is accomplished by:

Lever action of ossicles.

Hydraulic action of tympanic membrane.

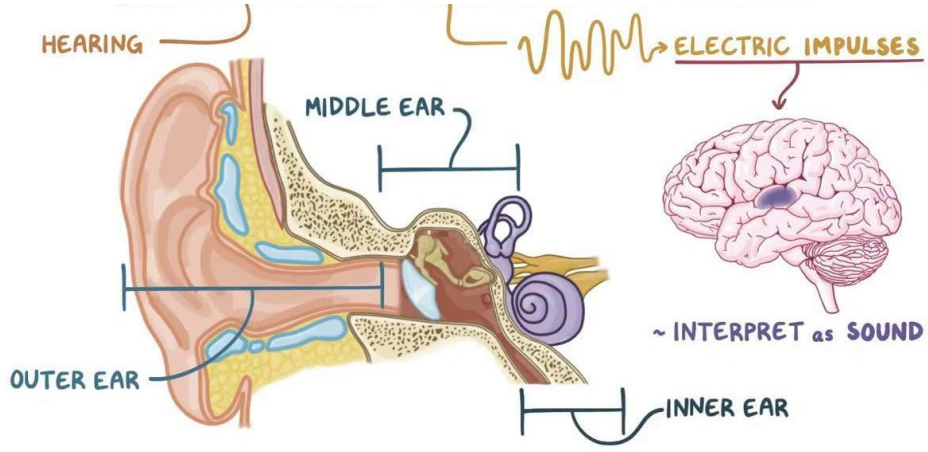
Curved membrane effect.

When oval window is receiving waves of compression, the round window is at the phase of rarefaction. If sound waves where to strike both the windows simultaneously, they will cancel each other's effect with no movement of the perilymph and no hearing. This acoustic separation of the windows is achieved by the presence of intact tympanic membrane and a cushion of air in the middle ear around the round window.

Phase differential between the windows contributes 4dB when tympanic membrane is intact.

Transduction of mechanical energy into electrical impulses: Movements of the stapes footplate, transmitted to the cochlear fluids, move the basilar membrane, setting up shearing force between the tectorial membrane and the hair cells. The distortion of hair cells gives rise to cochlear micro phonics which triggers the nerve impulse.

Auditory Transduction (Fig 2.11)



A sound wave, depending on its frequency, reaches maximum amplitude on a particular place on the basilar membrane and stimulates that segment (traveling wave theory of Von Bekesy). Higher frequencies are represented in the basal turn of the cochlea and the progressively lower ones towards the apex.

Neural pathways: Hair cells get innervations from the bipolar cells of spiral ganglion. Central axons of these cells collect to form cochlear nerve which goes to ventral and dorsal cochlear nuclei. From there, both crossed and uncrossed fibers travel to the superior olivary nucleus, lateral lemniscus, inferior colliculus, and medial geniculate body and finally reach the auditory cortex of the temporal lobe.

Four types of potentials have been recorded: three from the cochlea and one from CNVIII fibers. They are:

1. Endocochlear potential
2. Cochlear micro phonics — from cochlea
3. Summating potentials
4. Compound action potential — from nerve fibers.

Hearing Screening

A hearing screening is a quick test to see how well a person hear different sounds. He will either pass or fail the screening. If he passes, there is no further tests required. On failure, additional tests are required to check if there is a hearing loss.

Deafness-Hearing Loss

- Types of hearing loss
- Degree of hearing loss
- Configuration, or the shape, of hearing loss

Types of Hearing Loss

There are three basic types of hearing loss:

- Conductive hearing loss
- Sensorineural hearing loss
- Mixed hearing loss

Conductive Hearing Loss

This type of hearing loss can be caused by the following:

Fluid in the middle ear from colds or allergies.

Ear infection, wax, or otitis media. Otitis is a term used to mean ear infection, and media means middle.

Poor Eustachian tube function. The Eustachian tube connects your middle ear and your nose. Fluid in the middle ear can drain out through this tube. Fluid can stay in the middle ear if the eustachian tube does not work correctly.

A hole in the tympanic mem, Benign tumors. These tumors are not cancer but can block the outer or middle ear.

Earwax, or cerumen, stuck in the ear canal.

Infection in the ear canal, called external otitis. This is called swimmer's ear.

An object stuck in your outer ear. An example might be if your child put a pebble in his ear when playing outside.

A problem with how the outer or middle ear is formed. Some people are born without an outer ear. Some may have a deformed ear canal or have a problem with the bones in their middle ear.

Sensorineural Hearing Loss

Ear is made up of three parts the outer, the middle, and the inner ear. Sensorineural hearing loss, or SNHL, happens after inner ear damage. Problems with the nerve pathways from your inner ear to your brain can also cause SNHL. Soft sounds may be hard to hear. Even louder sounds may be unclear or may sound muffled.

This is the most common type of permanent hearing loss. Most of the time, medicine or surgery cannot fix Sensorineural Hearing Loss. Hearing aids may be the only remedy.

Causes of Sensorineural Hearing Loss.

Illnesses ,Medicines that are toxic to hearing , Congenital Hearing loss that runs in the family, Presbyacusis – Hearing loss due to ageing, Trauma-A blow to the head, Atresia-A problem in the way the inner ear is formed, Barotrauma-Listening to loud noises or explosions.

Mixed Hearing Loss

Sometimes, a conductive hearing loss happens at the same time as a sensorineural hearing loss, or SNHL. This means that there may be damage in the outer or middle ear and in the inner ear or nerve pathway to the brain. This is a mixed hearing loss.

Causes of Mixed Hearing Loss

Anything that causes a conductive hearing loss and sensory neural hearing loss can lead to a mixed hearing loss. An example would be if you have a hearing loss

because you work around loud noises and you have fluid in your middle ear. The two together might make your hearing worse than it would be with only one problem.

Degree of Hearing Loss

Degree of hearing loss may be mild, moderate, or severe. This description is referred to as "the degree of hearing loss." It is based on how loud sounds need to be for you to hear them. Decibels, or dB, describe loudness. The term dB HL describes your hearing loss in decibels.

The table below shows a common way to classify hearing loss. (Table 2.6)

Degree of hearing loss	Hearing loss range (dB HL)
Normal	–10 to 15
Slight	16 to 25
Mild	26 to 40
Moderate	41 to 55
Moderately severe	56 to 70
Severe	71 to 90
Profound	91+
Source: Clark, J. G. (1981). Uses and abuses of hearing loss classification. Asha, 23, 493–500.	

Configuration of Hearing Loss

The hearing loss is represented by the audiologist as an audiogram to record hearing. The audiogram will show how loud the sounds need to be at different frequencies for the patient to hear them. Frequency is the pitch or tone of the sound.

The graph of hearing on the audiogram will form a shape. This shape is the configuration of hearing loss.

Some examples of how hearing loss might look include the following:

Hearing at low-pitched sounds at a normal level, requiring high-pitched sounds to be louder is a high-frequency hearing loss, and the graph will indicate this.

Hearing both low and high frequencies the same way, the graph will be flat.

The configuration describes the hearing loss. Some of the ways to describe hearing are as follows.

High-frequency versus low-frequency. This is like the example above, where patient either hear high-pitched or low-pitched sounds better.

Bilateral versus unilateral. Bilateral means hearing loss in both ears. Unilateral means hearing loss in one ear.

Symmetrical versus Asymmetrical. Symmetrical means the severity and shape of hearing loss are the same in each ear. Asymmetrical means each ear has a different severity and shape.

Progressive versus sudden hearing loss. Progressive means that hearing loss becomes worse over time. Sudden means hearing loss that happens quickly.

Fluctuating versus stable hearing loss. Fluctuating means hearing loss that changes over time. It sometimes gets better, sometimes gets worse. Stable means that the hearing loss has stayed the same.

Karnbadhirya (Deafness)

The definition - hearing impairment, deafness, or hearing loss refers to the total or partial inability to hear sounds.

Symptoms may be mild, moderate, severe, or profound. A patient with a mild hearing impairment may have problems understanding speech, especially if there is a lot of noise around, while those with moderate deafness may need a hearing aid.

Some people are severely deaf and rely on lip-reading to communicate with others. People who are profoundly deaf can hear nothing at all and can find themselves totally reliant on lip-reading or sign language.

Causes of Deafness

Some diseases or circumstances that can cause deafness include:

Chicken pox, Cytomegalovirus, Mumps, Meningitis, Sickle cell disease, Syphilis, lyme disease, Diabetes mellitus - as studies have shown that people with diabetes are more likely to have some kind of hearing loss, a treatment for tuberculosis (TB)- Streptomycin, that is believed to be a key risk factor ,Hypothyroidism, Arthritis, some cancers treatments, teenagers exposed to passive or second-hand smoke.

The middle ear is home to some of the most delicate bones (Malleus, Incus, Stapes) in the body, and damage to the eardrum or middle ear can cause hearing loss and deafness in a range of ways.

Hearing Loss Vs. Deafness

It is important to distinguish between the different levels of hearing loss.

Hearing loss is a reduced ability to hear sounds in the same way as other people.
Deafness occurs when a person cannot understand speech through hearing, even when sound is amplified.
Profound deafness refers to a total lack of hearing. An individual with profound deafness is unable to detect sound at all.
The severity of hearing impairment is categorized by how much louder volumes need to be set at before they can detect a sound.

Some people define profoundly deaf and totally deaf in the same way, while others say that a diagnosis of profound deafness is the end of the hearing spectrum.

Deafness and speech

Hearing loss can affect speech ability depending on when it occurs. This is an inability to fully or partially hear before learning how to utter or understand speech. An individual with prelingual deafness was born with a congenital deformity or will have lost hearing during infancy.

In the majority of cases, people with prelingual deafness have hearing parents and siblings. Many are also born into families who did not already know sign language. They consequently also tend to have slow language development. The few who were born into signing families tend not to face delays in language development.

If children with prelingual deafness are given cochlear implants before the age of 4 years, they can acquire oral language successfully.

Oral language and the ability to use social cues are very closely interrelated. That is why children with hearing loss, especially those with severe symptoms, may not only experience delayed language development, but also slower social development.

As a result, children with prelingual deafness risk becoming socially isolated, unless they attend a school that has a well-run special needs department with other children who have the same condition. Children, who identify with a “deaf subculture,” or those who have learned how to use sign language, might feel less isolated. However, some young people might experience isolation if their parents have not yet learned sign language.

There are cases of children with profound deafness who find themselves on the outer fringes of their hearing peers’ social circles while not being fully accepted by peers with total deafness, due to a lack of fluency in sign language.

Post-lingual deafness

Most people with hearing loss have post-lingual deafness. They acquired spoken language before their hearing was diminished. A medication side effect, trauma, infection, or disease may have caused losing their sense of hearing. In most people with post-lingual deafness, hearing loss onsets gradually. Household members, friends, and teachers may have noticed a problem before they acknowledged the disability. Depending on the severity of hearing loss, the individual may have had to use hearing aids, receive a cochlear implant, or learn how to lip-read.

People who experience hearing loss face different challenges, depending on when it occurs and how long it takes to develop. They might have to become familiar with new equipment, undergo surgery, learn sign language, and lip reading, and use various communication devices.

Unilateral and bilateral deafness

Single-sided deafness (SDD), or unilateral deafness, refers to hearing impairment in just one ear, while bilateral deafness is hearing impairment in both.

People with a unilateral hearing impairment may find it hard to carry on a conversation if the other person is on their affected side. Pinpointing the source of a sound may be more difficult, when compared with those who can hear well in both ears. Understanding what others are saying when there is a lot of environmental noise might be hard.

With little to no background noise, a person with unilateral deafness has virtually the same communicative abilities as a person with functional hearing in both ears.

Symptoms

The symptoms of hearing impairment depend on its cause. Some people are born without being able to hear, while others suddenly become deaf due to an accident or illness. For most people, symptoms of deafness progress gradually over time.

Some conditions may have hearing loss as a symptom, such as tinnitus or stroke.

Four levels of deafness

There are four levels of deafness or hearing impairment:

Mild deafness or mild hearing impairment: The person can only detect sounds between 20 and 45 decibels (dB). They may find it hard to understand the words other people are saying, especially if there is a lot of background noise.

Moderate deafness or moderate hearing impairment: The person can only detect sounds between 45 and 60 dB. Following a conversation using hearing alone is very difficult without using a hearing aid.

Severe deafness: The person only hears sounds above 65 to 85 dB. A severely deaf person must either lip-read or use sign language in order to communicate, even if they have a hearing aid.

Profound deafness: Anybody who cannot hear a sound below 85dB has profound deafness. Some people with profound deafness cannot hear anything at all, at any decibel level. Communication is carried out using sign language, lip-reading, or reading and writing

Diagnosis

Patients suffering with hearing loss need to first check his hearing. The diagnosis includes subjective and objective hearing tests for hearing loss by asking several questions regarding the symptoms, including when they started, whether or not they have gotten worse, and whether the individual is feeling pain alongside the hearing loss.

A physical examination of Ear with Otoscope (Fig 2.12)

An Otoscope is an instrument to examine the inside of the ear.

This is an instrument with a light at the end and magnifying glass for microscopic examination. The following may be detected during the examination: a blockage caused by a foreign object, a collapsed eardrum, an accumulation of earwax, an infection in the ear canal, an infection in the middle ear if a bulge is present in the eardrum., cholesteatoma, a skin growth behind the eardrum in the middle ear, fluid in the ear canal, a perforation in the tympanic membrane.

Diagnosis of Deafness.

Patient experiences with hearing: asking people to repeat what they said, it hard to understand people on the telephone, when patient miss the doorbell when it rings, he need concentrate while chatting face-to-face, people around notice you have hearing loss issue, he need to make TV or radio louder than other family members, hear male sound easily than female sound, misunderstanding people.

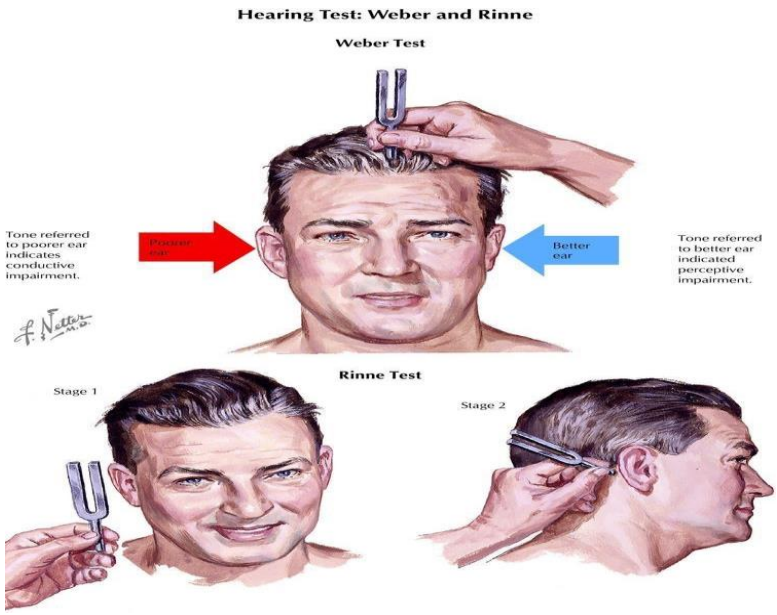
General screening test

The patient is asked to cover one ear and describe how well they hear words spoken at different volumes, as well as checking sensitivity to other sounds.

A Tuning fork test (Table 2.7)

This is also known as the Rinne test. A tuning fork having Frequencies like 512, 1024 is a metal instrument with two prongs that produces a sound when it is struck. Simple tuning fork tests may help to detect whether there is any hearing loss, and where the problem is.

Test	Normal	Conductive Hearing Loss	Sensorineural Hearing Loss
Rinne’s	AC > BC (Rinne’s Positive)	BC > AC (Rinne’s Negative)	AC > BC * (Rinne’s Positive)
Weber’s	Sound heard in midline	Sound Heard in affected ear	Sound head in good year



Hearing Test: Weber and Rinne (Fig 2.13)

Procedure of Tunning Fork Test-A tuning fork is vibrated and placed against the mastoid bone behind the ear. The patient is asked to indicate when they no longer hear any sound. The fork, which is still vibrating, is then placed 1 to 2 centimeters (cm) from the auditory canal. The patient is asked again whether they can hear the fork.

As air conduction is greater than bone conduction, the patient should be able to hear the vibration. If they cannot hear it at this point, it means that their bone conduction is superior to their air conduction.

This suggests a problem with sound waves getting to the cochlea through the ear canal.

Audiometry test:

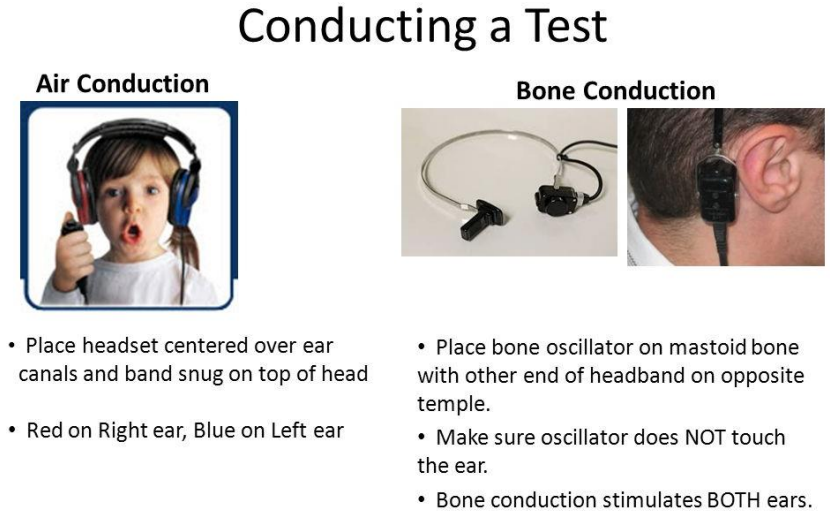
The patient wears earphones, and sounds are directed into one ear at a time. A range of sounds is presented to the patient at various tones. The patient has to signal each time a sound is heard.

Fig 2.14: Audiometry test

Air conduction test: Each tone is presented at various volumes from 250 -8000 frequencies of -5 to 110 dB, so that the audiologist can determine at which point the sound at that tone is no longer detected. The same test is carried out with words. The audiologist presents words at various tones and decibel levels to determine where the ability to hear stops.

Bone oscillator test: This is used to find out how well vibrations pass through the ossicles. A bone oscillator is placed against the mastoid. The aim is to gauge the function of the nerve that carries these signals to the brain.

Fig 2.15: Air Conduction and Bone Conduction Tests



Treatment

Medicinal-Ayurvedic, Modern (nervotonic)

Surgical-Tympanoplasty, Osciculoplasty, Stapedectomy, Cochlear Implant

Audiological-Speech therapy , Hearing aid

Treatment depends on both the cause and severity of the deafness. Sensorineural hearing loss is incurable but here we are trying with ayurvedic Karnpuran chikitsa to restore the hearing. When the hair cells in the cochlea are damaged, they cannot be repaired. However, various treatments and strategies can help improve quality of life.

Hearing aids (Fig 2.16)

Hearing aids can help to improve hearing and quality of life. These are wearable devices that assist hearing.

Hearing aids, which people typically wear inside the ear, can significantly help those with hearing loss. These devices magnify sound vibrations, making a person's sensory cells better able to detect them to enable clearer hearing.

Although hearing aids cannot cure deafness, they can positively impact an individual's life. However, despite this, the NIDCD reports that only around 25% of people Trusted Source who could benefit from a hearing aid have ever used one.

There are several types of hearing aid. They come in a range of sizes, circuitries, and levels of power. Hearing aids do not cure deafness but amplify the sound that enters the ear so that the listener can hear more clearly.

Hearing aids consist of a battery, loudspeaker, amplifier, and microphone. Today, they are very small, discreet, and can fit inside the ear. Many modern versions can distinguish background noise from foreground sounds, such as speech.

A hearing aid is not suitable for a person with profound deafness.

The audiologist takes an impression of the ear to make sure the device fits well. It will be adjusted to suit auditory requirements.

Examples of hearing aids include:

Behind-the-ear (BTE) hearing aids: These consist of a dome called an earmold and a case, with a connection linking one to the other. The case sits behind the outer ear, with the connection to the dome coming down the front of the ear. The sound from the device is either electrically or acoustically routed to the ear.

BTE hearing aids tend to last longer than other devices, as the electrical components are located outside the ear, meaning that there is less moisture and earwax damage These devices are more popular with children who need a sturdy and easy-to-use device.

In-the-canal (ITC) hearing aids: These fill the outer part of the ear canal and can be seen. Soft ear inserts, usually made of silicone, are used to position the loudspeaker inside the ear. These devices fit most patients straight away and have better sound quality.

Completely in the canal (CIC) hearing aids: These are tiny, discreet devices but not recommended for people with severe hearing loss.

Bone conduction hearing aids: These assist people with conductive hearing loss, as well as those unable to wear conventional type hearing aids. The vibrating part of the device is held against the mastoid with a headband. The vibrations go through the mastoid bone, to the cochlea. These devices can be painful or uncomfortable if worn for too long.

Cochlear implants (Fig 2.17)

Is an electronic device that stimulates the auditory nerve through electrodes placed in the bony cochlea allowing severely deaf people to perceive sound.

If the eardrum and middle ear are functioning correctly, a person may benefit from a cochlear implant.

This thin electrode is inserted into the cochlea. It stimulates electricity through a tiny microprocessor placed under the skin behind the ear.

A cochlear implant is inserted to help patients whose hearing impairment is caused by hair cell damage in the cochlea. The implants usually improve speech comprehension. The latest cochlear implants have new technology that helps patients enjoy music, understand speech better even with background noise, and use their processors while they are swimming.

According to the National Institutes of Health (NIH), there were about 58,000 adults and 38,000 children with cochlear implants in the U.S. as of 2012. The World Health A microphone: This gathers sound from the environment.

A speech processor: This prioritizes the sounds that matter more to the patient, such as speech. The electrical sound signals are split into channels and sent through a very thin wire to the transmitter.

A transmitter: This is a coil secured with a magnet. It is located behind the outer ear and transmits the processed sound signals to the internally implanted device.

On the inside:

A surgeon secures a receiver and stimulator in the bone beneath the skin. The signals are converted into electrical impulses and sent through internal wires to the electrodes.

Up to 22 electrodes are wound through the cochlea. The impulses are sent to the nerves in the lower passages of the cochlea and then directly to the brain. The number of electrodes depends on manufacturers of the implant.

Organization (WHO) says approximately 219,000 people globally Trusted Source use one, most of them in industrial countries.

On the outside, a cochlear implant consists of:

Children will usually have cochlear implants in both ears, while adults tend to have just one.

Sign language and lip-reading:

Sign language can help communication between people who are no longer able to hear.

Fig 2.18: Sign Language

Some people with hearing impairment may have speech problems, as well as difficulties in understanding speech from other people.

A high percentage of people with hearing impairment can learn other ways of communicating.

Lip reading and sign language can replace or complement oral communication.

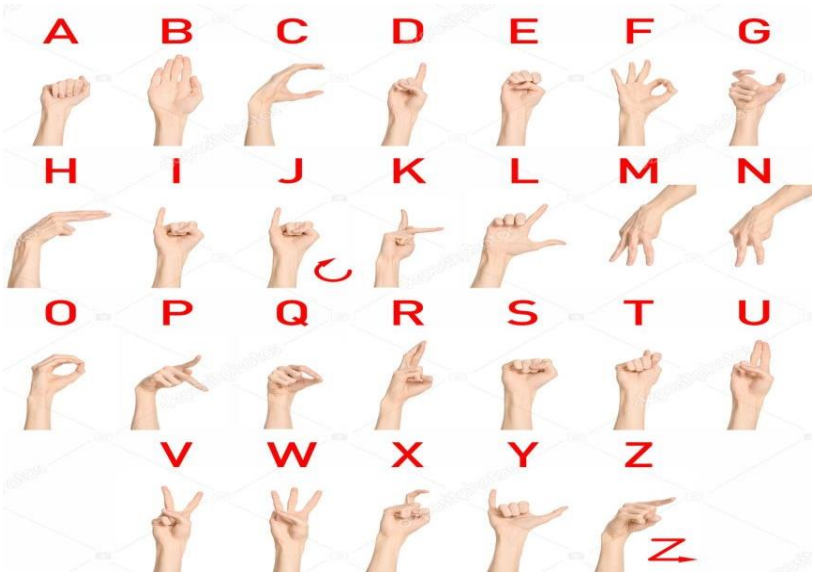
There is a range of sign languages that are, in some cases, wildly different to one another.

Lip reading (Fig 2.19)

Also known as speechreading, lip reading is a method for understanding spoken language by watching the speaker's lip, facial and tongue movements, as well as extrapolating from the data provided by the context and any residual hearing the patient might have.

People who became hearing impaired after they learned to speak can pick up lip reading rapidly; this is not the case for those who are born hearing-impaired.

Sign Language – Signs (Fig 2.20)



This is a language that uses signs made with the hands, facial expressions, and body postures, but no sounds. It is used mainly by those who are deaf.

There are several different types of sign languages. British Sign Language (BSL) is very different from American Sign Language (ASL). For instance, BSL uses a two-handed alphabet, whereas American sign language uses a one-handed alphabet.

Some countries use the sign language introduced by missionaries from far away. Norwegian sign language, for example, is used in Madagascar.

Sign language is completely different from the spoken form, word order, and grammar in BSL is not the same as it is in spoken English. ASL is more grammatically similar to spoken Japanese than spoken English.

Prevention of Hearing in normal life (Fig 2.21)

Always wear earplugs if you spend long periods of time exposed to loud noise.

Nothing can prevent the hearing problems that occur from birth or hearing impairments due to illnesses or accidents.

However, some measures can be taken to reduce the risk of losing some of your sense of hearing.

The structures in the ears can be damaged in several different ways. Long-term exposure to noise above 85 dB – the volume of a typical lawnmower – can eventually cause hearing loss.

The following measures may help protect patients hearing:

TV, radio, music players, and toys: Do not set the volume too high. Children are especially sensitive to the damaging effects of loud music. Noisy toys can put children's hearing at risk.

Headphones: Focus on isolating the sounds you want to hear and blocking out as much environmental sound as is possible, instead of drowning it out with high volume.

Occupational health: If patient is working in a noisy environment, such as discos, nightclubs, and pubs, wear earplugs or earmuffs.

Leisure venues: If patient is from pop concerts, motor racing, drag racing, and other noisy events, wear earplugs.

Cotton swabs: Do not prod them into adult or infant ears. The same applies to Q-tips or tissues.

Hearing can often deteriorate with age called as presbyacusis, but the risk can be reduced by taking the correct preventive measure early on.

According to the National Institute on Deafness and Other Communication Disorders (NIDCD), about 15% of adults. Trusted Source in the United States have some level of hearing loss.

Hearing aids can be costly, but many hearing aid manufacturers cater to people with different budgets by offering models that vary in performance, features, and price.

In some cases, individuals may get help with the costs associated with hearing aids. For instance, some insurance plans may cover some or all these expenses.

TINNITUS

Tinnitus (from the Latin word tinnitus meaning "ringing") is the perception of sound within the human ear in the absence of corresponding external sound.

Tinnitus is not a disease, but a Symptom that can result from a wide range of underlying causes: abnormally loud sounds in the ear canal for even the briefest period (but usually with some duration), ear infections, foreign objects in the ear, nasal allergies that prevent (or induce) fluid drain, or wax build-up. Withdrawal from a benzodiazepine addiction may cause tinnitus as well. In-ear headphones, whose sound enters directly into the ear canal without any opportunity to be deflected or absorbed elsewhere, are a common cause of tinnitus when volume is set beyond modest or moderate levels.

Tinnitus can also be caused by natural hearing impairment (as in aging), as a side effect of some medications, and as a side effect of genetic (congenital) hearing loss. However, the most common cause is noise-induced hearing loss.

As tinnitus is usually a subjective phenomenon, it is difficult to measure using objective tests, such as by comparison with noise of known frequency and intensity, as in an audiometric test. The condition is often rated clinically on a simple scale from "slight" to "catastrophic" according to the practical difficulties it imposes, such as interference with sleep, quiet activities, and normal daily activities[162].

Tinnitus is common; about one in five people between 55and 65 years old report symptoms on a general health questionnaire, and 11.8% on more detailed tinnitus-specific questionnaires[163].

History:

The first known writings on treatment of tinnitus appeared in the 16th cent BC in Egyptian papyruses. In Ayurveda also we find early references regarding tinnitus explained as Karnanad.

Definition:

"Tinnitus" comprises a family of symptoms rather than a specifiable disease state.

"Tinnitus is defined as the sensation of sound not brought about by simultaneously applied mechano acoustic or electrical signals" (Definition given by participants of symposium on tinnitus organized by the Ciba Foundation in 1981).

Definition by Dorland:

"Tinnitus - a noise in the ears, such as ringing, buzzing, roaring or clicking"

It seems to the patient that the sound is coming from inside the head then that sensation can be described as tinnitus. The Ciba definition was admirably brief, but it unfortunately excludes certain auditory sensations of mechano acoustic origin that quite often present clinically as tinnitus, that is spontaneous sounds heard within the head or neck which disturb the patient. Examples of these are physiological hum, pulsatile vascular sounds, palatal myoclonic clicks, and blowing sounds in the Eustachian tube patency.

Characteristics

Tinnitus can be perceived in one or both ears or in the head. It is usually described as a ringing noise, but in some patients, it takes the form of a high-pitched whining, electric buzzing, hissing, humming, tinging or whistling sound, or as ticking, clicking, roaring, "crickets" or "tree frogs" or "locusts (cicadas)", tunes, songs, beeping, or even a pure steady tone like that heard during a hearing test[164]. It has also been described as a "wooshing" sound, as of wind or waves[165]. Tinnitus can be intermittent, or it can be continuous, in which case it can be the cause of great

distress. In some individuals, the intensity can be changed by shoulder, head, tongue, jaw, or eye movements[166].

Causes:

Objective tinnitus:

In some cases, a clinician can perceive an actual sound (e.g., a bruit) emanating from the patient's ears. This is called objective tinnitus. Objective tinnitus can arise from muscle spasms that cause clicks or crackling around the middle ear[167]. Some people experience a sound that beats in time with the pulse (pulsatile tinnitus, or vascular tinnitus)[168]. Pulsatile tinnitus is usually objective in nature, resulting from altered blood flow or increased blood turbulence near the ear (such as from atherosclerosis or venous hum[169], but it can also arise as a subjective phenomenon from an increased awareness of blood flow in the ear. Rarely, pulsatile tinnitus may be a symptom of potentially life-threatening conditions such as carotid artery aneurysm[170] or carotid artery dissection[171]. Pulsatile tinnitus may also indicate vasculitis, or more specifically, giant cellarteritis. Pulsatile tinnitus may also be an indication of idiopathic intracranial hypertension[172].

Subjective Tinnitus:

Subjective tinnitus can have many possible causes, but most commonly results from otologic disorders – the same conditions that cause hearing loss. The most common cause is **noise-induced hearing loss**, **resulting from exposure to excessive or loud noises.** Tinnitus, along with sudden onset hearing loss, may have no obvious external cause. Ototoxic drugs can cause subjective tinnitus either secondary to hearing loss or without hearing loss and may increase the damage done by exposure to loud noise, even at doses that are not in themselves ototoxic[173].

Subjective tinnitus is also a side effect of some medications, such as aspirin, and may also result from an abnormally low level of serotonin activity. It is also a classical side effect of quinidine, a Class IA anti-arrhythmic. Over 260 medications have been reported to cause tinnitus as a side effect[174]. In many cases, however, no underlying physical cause can be identified.

Tinnitus can also occur due to the discontinuation of therapeutic doses of benzodiazepines as part of the benzodiazepine withdrawal syndrome. It can

sometimes be a protracted symptom from benzodiazepine withdrawal and persist for many months[175].

Causes of subjective tinnitus include[176]:

Otologic problems and hearing loss, Conductive herring loss, external ear infection, acoustic shock ,loud noise or music[177],cerumen (earwax) impaction ,middle ear effusion ,superior canal dehiscence, Sensorineural hearing loss, excessive or loud noise, presbycusis (age-associated hearing loss), Meniere's disease, acoustic neuroma , mercury or lead poisoning, ototoxic medications, analgesics, aspirin, nonsteroidal anti-inflammatory drugs, antibiotics like Ciprofloxacin, aminoglycosides, e.g., gentamicin, chloramphenicol, erythromycin, tetracycline, tobramycin, vancomycin, doxycycline (Vibramycin)[178],chemotherapy and antiviral drugsbleomycin, interferon, pegylated interferon-alpha-2b, cisplatin, mechlorethamine, methotrexate, vincristine ,

loop diuretics: bumetanide, ethacrynic acid**,** furosemide others: chloroquine, quinine, antidepressants, varenicline (Champix), naproxen

Neurologic disorders: Brain malformation ,multiple sclerosis, head injury**,** skull fracture, closed head injury, whiplash injury, temporomandibular joint disorder, giant cell arteritis.

Metabolic disorders: thyroid disease, hyperlipidemia, vitamin B 12deficiency, iron deficiency, anemia

Psychiatric disorders: Depression, anxiety

Other causes: tension myositis syndrome, fibromyalgia, vasculitis hypertonia (muscle tension), thoracic outlet syndrome, Lyme disease, hypnogogic sleep paralysis, glomus tympanicum tumor, anthrax vaccines which contain the anthrax protective antigen, psychedelic drugs can produce temporary tinnitus-like symptoms as a side effect.

PATHO-PHYSIOLOGY:

One of the possible mechanisms relies on otoacoustic emissions. The inner ear contains thousands of minute hairs, called stereocilia, which vibrate in response to sound waves, and cells which convert neural signals into tension on the vibrating basement membrane. The sensing cells relate to the vibratory cells through a neural

feedback loop, whose gain is regulated by the brain. This loop is normally adjusted just below onset of self-oscillation, which gives the ear spectacular sensitivity and selectivity. If something changes, it is easy for the delicate adjustment to cross the barrier of oscillation, and tinnitus results. Listening to loud music kills hair cells, and studies have shown as hair cells are lost, different neurons are activated, activating auditory parts of the brain, and giving the perception of sound. Another possible mechanism underlying tinnitus is damage to the receptor cells. Although receptor cells can be regenerated from the adjacent supporting Dieter's cells after injury in birds, reptiles, and amphibians, in mammals it is believed they can be produced only during embryogenesis. Although mammalian Dieter's cells reproduce and position themselves appropriately for regeneration, they have not been observed to trans differentiate into receptor cells except in tissue culture experiments[181,182]. Therefore, if these hairs become damaged, through prolonged exposure to excessive sound levels, for instance, then deafness to certain frequencies results. In tinnitus, they may relay information that an externally audible sound is present at a certain frequency when it is not.

The mechanisms of subjective tinnitus are often obscure. While it is not surprising that direct trauma to the inner ear can cause tinnitus, other apparent causes e.g., temporomandibular joint disorder (TMJD or TMD) and dental disorders are difficult to explain. Research has proposed there are two distinct categories of subjective tinnitus:

Otic tinnitus, caused by disorders of the inner ear or the acoustic nerve, and somatic tinnitus, caused by disorders outside the ear and nerve, but still within the head or neck. It is further hypothesized somatic tinnitus may be due to "central crosstalk" within the brain, as certain head and neck nerves enter the brain near regions known to be involved in hearing[183].

Studies by researchers at the University of Western Australia suggest tinnitus is caused by increased neural activity in the auditory brainstem where the brain processes sounds, causing some auditory nerve cells to become overexcited. The basis of this theory is most people with tinnitus also have hearing loss, and the frequencies they cannot hear are similar to the subjective frequencies of their tinnitus. Models of hearing loss and the brain support the idea a homeostatic response of central dorsal cochlear nucleus neurons could result in them being

hyperactive in a compensation process to the loss of hearing input. This, in turn, is related to changes in the genes involved in regulating the activity of those nerve cells. This proposed mechanism suggests possible treatments for the condition, involving the normalization or suppression of overactive neural activity through electrical or chemical means[184]. While most discussions of tinnitus tend to emphasize physical mechanisms, there is strong evidence the level of an individual's awareness of his or her tinnitus can be stress-related, and so should be addressed by improving the state of the nervous system generally, using gradual, unobtrusive, long-term treatments[185]. Since some tinnitus mimics electronic sounds, some recent research is focusing on electronics, the use of cell phones[186], and other modern electronic devices as possible causes.

Classification of Tinnitus:

By etiological diagnosis.
By site of dysfunction.

Other Type of Classification:
Clinical.
Nonclinical.

The diagnosis of tinnitus often has to be multiple since most cases of tinnitus are associated with Cochlear disorders and most of those have more than one cause.

Classification by site of auditory dysfunction:

Physiological –
Muscular hum/ vascular/ Brownian movement of air
Muscular snap

Patho physiological

Spontaneous
Noise induced
Drug induced
Toxemia

Pathological:
Extra auditory – muscular, respiratory, and vascular

Auditory Conductive – External ear, Middle ear, Sensory neural, Sensory Peripheral neural, Central neural

Reflex (non-auditory)

Cervical, Tympero mandibular, Psychological: Hallucinating, Imaginary

Classification of Tinnitus as:

- Subjective Tinnitus
- Objective Tinnitus.

Causes of Tinnitus: Otologic.

Subjective: Impacted wax, Fluid in middle ear, Acute and chronic otitis media, abnormally patent Eustachian tube, Meniere's disease**,** Otosclerosis**,** Presbyacusis**,** Noise trauma**,** Ototoxic drugs**,** Tumors of 8th nerve acoustic neuroma

Objective:

Vascular tumors of middle ear (glomus tumor), Aneurysm of carotid artery, Palatal myoclonus.

Non-Otologic factors of Tinnitus: Diseases of CNS, Anemia**,** Arterio sclerosis, Hypertension, Hypotension**,** Hypoglycemia**,** Epilepsy**,** Migraine, Psychogenic.

Triggering Factors of Tinnitus:

Stresses – domestic, marital, or occupational.

Changes in barometric pressure in flying (with barotraumatic symptoms), Surgical operations, Myelography, Drugs especially salicylates, NSAID's, Acute rapidly resolving middle ear infections, Acute toxic states, Metabolic disorders, Depression (endogenous or induced by such factors as toxemia, endocrine disturbance, or drugs)

Cochlear Mechanism of Tinnitus Generation:

Tinnitus would be associated with an increase in the spontaneous firing rate of auditory nerve fibers. Some propose that tinnitus might result from reduced cochlear neural activity. Another concept is that with mechanical insults to the cochlea, as from impulse noise or endolymphatic hydrops, damage may be caused to the electric insulation between hair cells or between the neural structures in the peripheral

auditory system. This could lead to cross talk between the structures and thus to phase locking of spontaneous neural activity, experienced subjectively as tinnitus.

Epidemiology (Prevalence in adults):

Estimates of tinnitus prevalence based on National Study of hearing and other studies are as follows:

About 35 – 45% remembers an experience of tinnitus of some type or duration at some time; most of these are not clinical tinnitus.

About 15% appear to have or to have experienced spontaneous tinnitus lasting over 5 minutes duration.

At least 8% experience tinnitus causing interference with their getting to sleep and / or moderate or severe annoyance.

0.5% experience tinnitus that has a severe effect on their ability to lead a normal life.

Determinants of Tinnitus:

For the individual, the determinants are usually the combination of factors leading to the hearing loss (usually sensory neural or without sensory neural element).

Age and noise

Gender (slightly more in females compared to males)

Socioeconomic status – the prevalence of tinnitus increases steadily from the professionally employed to the unskilled, even after controlling for noise exposure.

Geographical influences were not significant.

Clinical Aspects:

Tinnitus is common in virtually all forms of audiological disorders, either in association with a sensorineural hearing loss or revealed in conductive hearing loss by the reduction of ambient noise masking of physiological sounds or sensorineural tinnitus.

Relation to Hearing Impairment:

Tinnitus increases with increase of age, presumably during this aging process there will be chances of increased sensorineural hearing loss. But tinnitus is often

associated with patients said to have hearing "within normal limits" as per audiogram. Tinnitus often occurs where there is no awareness of the hearing impairment actually present, or its onset may draw the patient's attention to a pre-existing hearing difficulty. Symptomatically, it may be the precursor of noticeable hearing difficulty, and is important in that respect.

The Clinical Relevance of Tinnitus:

Tinnitus as a symptom deserves clinical attention for four reasons:

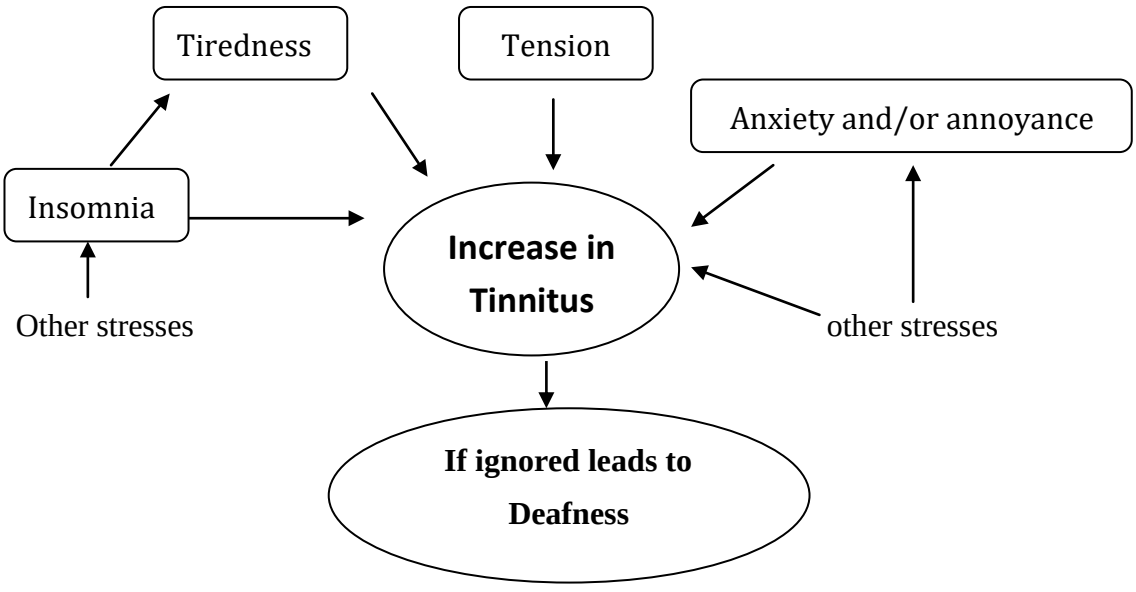
Occasionally it can be the first indicator of some important pathology. For example, an **acoustic neuroma** (vestibulo- cochlear schwannoma)

It is often a symptom accompanying hearing impairment.

In other instances, the tinnitus may be a warning sign of developing impairment and risk of future disability.

Finally, and most pressingly in practice, tinnitus is a symptom like pain which can cause much suffering and / or anxiety concerning its cause and its prognosis.

The Vicious Circles of Tinnitus: (Fig 2.22)



Management of Tinnitus:

History:

Apart from the usual history to be taken in investigating the cause of any form of audiological disorder, these additional points are also to be considered:

The time / severity course of the tinnitus, together with note of any apparent or suspected triggering or exacerbating factors (including drugs and foods).

The character and site of the most troublesome tinnitus sound, together with a brief description of any other tinnitus sounds.

The effects of the tinnitus, perhaps under a series of headings like insomnia, intrusiveness etc.,

Whether the tinnitus is a greater, equal, or lesser problem to the patient than any hearing difficulties that are being experienced.

The effect of environmental sounds in masking or reducing the loudness of tinnitus, an aspect which is often clarified by enquiring about the loudness of the tinnitus when it is quiet.

The times of day or night when the tinnitus is most troublesome.

Audio-logical Testing:

The purposes of audio-logical testing of a patient presenting with tinnitus are:

To assess the patient's hearing status for both diagnostic and rehabilitative purposes.

To provide a base line for the tinnitus tests.

To check against the possibility of the tinnitus being associated with a peripheral neural hearing loss, with its more serious implications.

Measurement of Tinnitus:

Pitch match frequency.

Tinnitus loudness match.

The patient's description of the loudness and annoyance of the tinnitus is the most relevant „measurement".

Minimal masking level.

Tone decay of masking.

Residual inhibition.

This series of testing should be followed in order; because tinnitus can sometimes be abolished, reduced, or increased by exposure to sounds. Ideally, the tinnitus tests should follow immediately after a basic air conduction audiogram without use of masking. There are a lot of limitations related to these tinnitus tests.

Prevention:

Tinnitus and hearing loss can be permanent conditions. If a ringing in the ears is audible following lengthy exposure to a source of loud noise, such as a music concert or an industrial workplace, it means lasting damage may already have occurred. Prolonged exposure to sound or noise levels as low as 70 dB can result in damage to hearing For musicians and DJs, special musicians' earplugs play an important role in preventing tinnitus; they can lower the volume of the music without distorting the sound and can prevent tinnitus from developing in later years. For anyone using loud electrical appliances, such as hair dryers or vacuum cleaners, or who work in noisy environments such as building sites, where earmuffs are impractical, earplugs are also helpful in reducing noise exposure. This is also the case for while riding motorcycles, mopeds etc. While operating lawn mowers, hammer drills, grinders, and similar, earmuffs may be more appropriate for hearing protection. It is also important to check medications for potential ototoxicity. Ototoxicity of multiple medicines can have a cumulative effect and can greatly increase the damage done by noise. If ototoxic medications must be administered, close attention by the physician to prescription details, such as dose and dosage interval, can reduce the damage done[187].

Management of Tinnitus:

In all forms of medicine, the first and most ideal line of treatment is to treat the cause.

Medical Management:

In Meniere's disease salt reduced diet, a diuretic, and a cochlear vasodilator, e.g., Betahistine reduces tinnitus. In pulsatile type of tinnitus along with hypertension can

be an indication for anti-hypertensive therapy at blood pressure levels below those usually considered to need treatment. Hypoglycemia may be a factor in tinnitus that is worse immediately after sleep, especially on waking in the early morning. In such cases a bed side ready to drink glucose rich mineral drink always helps.

Since tinnitus is often revealed or exacerbated by an element of conductive hearing loss, this should be looked for with view to treatment, which may be medical, for example nasal or systemic decongestants and / or antihistamines

Other lines of medical treatment include use of **sodium fluoride** in otosclerosis and **zinc sulphate** in supposed **zinc deficiency** and search for and avoidance of food with **salt rich**, drug, and drink „allergies" together with avoidance of other aggravating factors such as stress and noise exposure, which occasionally may necessitate a change of work or early retirement.

Surgical:

There have been many analyses of the results of reconstructive surgery of the middle ear, of de-compressive or destructive surgery of the internal ear, and of section of the eighth nerve for conditions associated with tinnitus. The surgical indication has usually been hearing difficulty or vertigo. But occasionally in the case of eighth nerve surgery it has been for tinnitus. In a significant proportion of cases, the tinnitus has been increased by surgery. It would therefore seem that, with very few exceptions, surgery is not advisable where tinnitus is the primary indication. Indeed, the risk of making the tinnitus worse or starting off a troublesome tinnitus should be regarded as a weighting factor against surgery whenever the advisability of a middle or internal ear operation as a treatment for deafness, vertigo or infection is in doubt the exceptions to the above generalization relate mainly to surgery for tinnitus caused by vascular disorders or middle ear and pharyngeal muscular disorders and for perilymph leaks. Surgery for these is not certain to cure the tinnitus, particularly in vascular cases when the tinnitus is liable to return as new venous channels are opened, but at least it is unlikely to make the tinnitus worse.

Counseling:

Since tinnitus can rarely be cured and only rarely is its intrinsic loudness or unpleasantness reduced by physical or pharmacological treatments, the patient has to be helped to understand and learn to cope with tinnitus. Consequently, counseling is the most important single component in management of tinnitus and requires much care and time.

There are three types of Counseling:

Medical Counseling

Lay Counselling

Psychological Counselling

Hearing Aids

Tinnitus Maskers: Mechanisms of therapeutic masking

Continuous complete masking

Continuous partial masking □Inhibitory masking

Desensitization by masking

Given due care in counseling, fitting and follow up, maskers have a major role to play in tinnitus management at present.

Other techniques that are used in tinnitus management are:

A. Psychological Treatment:

B. Cognitive therapy, Relaxation training therapy, Hypnosis, Biofeedback, Medication coupled with yoga, Drug treatments.

C. Drug treatment fall into two classes: Those intended to reduce the effects of the tinnitus and those believed to reduce the tinnitus itself.

The drugs used are usually tranquillizers, anti-depressants, and sedatives.

The Anti tinnitus drugs used are:

Intravenous lignocaine, carbamazepine, phenytoin sodium etc.

Irrespective of their mode of action or site of action, a number of drugs with membrane stabilizing‟ properties have been tried in the hope of finding one that is effective in suppressing tinnitus and can be taken by mouth.

Electrical stimulation of cochlea

Cochlear iontophoresis, Ultrasonic irradiation, Dietary supplements – Sodium fluoride, Zinc sulphate, Vitamins, Acupuncture, Ginkgo biloba extract.

DRUG REVIEW

Looking back into the dim obscurity of prehistoric time one finds endless and continuous struggle made by man to fight against disease. The drugs are used to increase human health by elimination or suppression of disease, its symptoms and to improve the quality of life.

The word drug is thought to originate from old French "drogue", possibly deriving later "droge-vate" from Middle Dutch meaning "dry barrels", referring to medicinal plants preserved in them[226]. In pharmacology, a drug is a chemical substance used in the treatment, cure, prevention, diagnosis or to enhance physical and mental well-being[227]. WHO also stresses upon the importance of drug and defines it as "Any substance or product that is used or intended to be used to modify or explore physiological systems or pathological states for the benefits of the recipient."[228]. This definition appears more in arrangement with the terms of Ayurveda, which aims at the preservation of good health apart from mitigation of disease. Ayurveda gives an elaborate description of various therapeutic measures not merely for radical removal of the causative factors but also at the restoration of equilibrium of Dosha.

The medicine plays a vital role in achieving success against the disease. Dravya is the important tool of a physician included in (vaidya, rugn, paricharak, aushadhi) Chatushpada[229]. According to Acharya Charaka, "A drug which not understood perfectly in terms of its Nidana Panchak and therapeutic properties, is comparable to poison, armaments, flames and the thunderbolt, while the perfectly valued drug is comparable to ambrosia[230]. Inclusion of drug in "Trisutra" of Ayurveda i.e. Hetu, Linga and Aushadha by Acharya Charaka signifies the importance of drug[231]. Acharya Charaka has asserted that each substance on this earth is useful in combating illness when used rationally for a specific purpose[232,233]. While explaining the relationship between the drug and the physician, Acharya Charaka was of the opinion that after proper evolution of the patient and his disease, the physician having a complete and sound knowledge of the drug to be used in that particular case, should rationally administer it to the patient[234].

According to Ayurveda, drug or diet article that reverses or break the Samprapti without producing any side effects has been looked upon as ideal[235,236]. According to Acharya Vagbhata, selection of drug is based on many subtle factors that are

involved in the pathogenesis of that particular disease, as the treatment is nothing but only Samprapti Vighatana /bhang[237].

In ancient text, a lot of single as well as compound drugs are described in various contexts for internal as well as external use in diseases like Karnanad and Karnbadhirya where all the Nidanas show the predominance of Vata Dosha. Thus, the drug to be selected should mainly have Vatahara property due to the predominance of Vata Dosha in Karnanad and karnbadhirya.

Probable mode of action of the trial Medicine:

The probable mode of action can be explained on the basis of Pharmaco- therapeutic properties of various constituents of trial drugs on SamptaptiVighatana.

Pharmaco therapeutic properties of various constituents has the basis of so many theories viz. Rasa-Panchaka theory, PanchaBhautika theory, Doshika theory and Dhatu Nirmana theory. But one common factor is divulged from all these theories that the drug having pharmaco- therapeutic property, similar to the qualities of a particular Dosha, provoke/vitiate that particular Dosha, and result in pacification of that particular property, which are opposite to the particular Dosha. Following this principle our trial medicine oil is prepared **Asthimajjapachak kashay sidha tail w**hich is mentioned in Sushruta Samhita, BhaishajyaRatnavali and Chakradatta. Asthimajjapachak kashay is maintioned in jwar chikitsa has been selected for the present clinical study in view of asthimajjagatavastha of karn rog.

Keeping in view the above facts one such formulation i.e., Asthimajjapachak kashay siddha Taila and Asthimajjapachak kashay guggul vati which mentioned in chaturthak jwar are selected is also used by" vaidyaraj Datarshastri" in Panckbautik chikitsa for asthimajjagat vyadhi avastha. As karn badhirya is combination of asthi and majja gata rog so drug having rasayan property to rejunuate and stop disease process is used / tried here.

कलिङ्गकाःपटोलस्यपत्रंकटुकरोहिणी।

पटोलंसारिवामुस्तापाठाकटुकरोहिणी॥

पटोलनिम्बत्रिफलामृद्वीकामुस्तवत्सकाः।

किराततिक्तममृताचन्दनांविश्वभेषजम्॥

धात्रीमुस्तामृताक्षौद्रमर्धश्लोकसमापनाः।

पञ्चैतेसन्ततादीनांपञ्चानांशमनामताः॥ अ.ह./चि./१–४८–४९

Control Medicine – used for Group A
Asthimajjapachak kashay gugulvati – given abhyantartah of Agasti pharmacy

Trial Medicine – used for Group B
Asthimajjapachak kashay sidha tail – self prepared for Karnpuran

Rasapanchak (Table 2.8)

	Name of the Drug	Ras	Virya	Vipak	Guna	Karma
1	Amruta (Tinospora Cordifolia)	Katu, Tikta, Kashay	Ushna	Madhur	Guru, shit	Tridoshaghna, Rasayan, Dipana Mutrajanan, Jwarghna
2	Amalaki (Phyllanthus emblica)	Amla Pradhan Pancharas, except lavana	Sheet	Madhur	Snigdha, Laghu	Kaphaghna, Rasayan, Pittashamak, antioxidant
3	Musta (Cyperus Rotundus)	Katu, Tikta Kashay	Sheet	Katu	Ruksh Laghu	Lekhana, Krimighna, Kaphaghna, Mutral
4	Guggul (Commiphora mukul)	Tikta, Katu	Ushna	Katu	Laghu, Ruksha, Tikshna, Vishada, Sukshma, Snigdha	Vrishya, Balya, Rasayana, Dipana, Medohara, Krimighna

Amalaki (Fig 2.23)

Amalaki Latin Name: Emblica Officinalis

Family: Euphorbiaceae

English: Emblic Myrobalan, Indian Goose Berry

Hindi: Avala

Synonyam: Dhatri, Vayastha, Sheeta, Pancharasa, Rochani, Vrishya, Amrita

Gana:

According to charak: Vayahsthapana, Virechanopaga,

Sushrut: Triphala, Amalakyadi, Parushakadi

Part used: Phala (Fruit)

Ras (Lavanvargit): Pancha Rasa

Guna: Rukshalaghusheeta

Veerya: Sheeta

Vipaka: Madhura

Prabhav: Vayahsthapana

Doshaghanata: Tridoshashamaka

Chemical Constitution: - Tannin - Phyllemblin - Phosphorous, iron and calcium

Uses: Diuretic - Laxative - Hair growing - Anti-viral - Anti-aging - Antioxidant

Karma

Ayurvedic perspective of Amalaki: Rasayana, Vayahsthapana, Sarvadoshahara, Medhya, Vrishya, Jivaniya, Balya, Shramahara, Nadi Indriyabalaprada, Dahaprashamana, Mutrala Mehahara, Chaksushya, Keshya, Hridya, Sandhaniya, Rochana, Anulomana

According to modern ganraral pharmacological action

Restorative, Alterative, General tonic, Nervinetonic, Aphrodisiac, Laxative, Cardiac tonic, Diuretic, Antipyretic, Stomachic, Astringent, Liver tonic, Anti-aging, Antioxidant, Digestive, Hairtonic, Anti-inflammatory, Refrigerant, Anti-scorbutic.

Specific Action: Mastiskadaurbalya, Indriyadaurbalya, Vibandha, Aruchi, Agnimandhya, Amlapitta, Kshaya, Prameha, Mutravikar, Daurbalya, Shosha, Hridroga, Yakrita Plihavikara, Raktapitta, Pradara, Garbhashaydaurbalya Kustha, Jvara, daha, yonidaha

According to modern specific pharmacological action

Nervine debility, Weakness of memory, Leucorrhoea, General delocity, Dyspepsia, Hyperacidity, Anorexia, Anemia, Urinary disorders, Spermatorrhoea, Epitaxis, Menorrhagia, Jaundice, Scurvy, Constipation, Blood Impurities, Diabetes Mellitus.

Musta (Fig 2.24)

Latin name: cyperus rotandus

Family: cyperaceae

Synonyms: mustaka, varida, kuruvinda

Part used: tuber

Rasapanchaka

Rasa: tikta, katu, kashaya

Guna: laghu, ruksha

Virya: sheeta

Vipaka: katu

Doshaghnata: kapha-pitta shamaka (Fig 2.25)

Karma: twagdoshahara, shothahara, deepana, pachana, grahi, trishnanigrahana, krimighna, sangrahaka, raktaprasadana, garbhashayasankochaka, jwarghna, balya, medhya, stanyajanana, nadibalya, stanyashodhana

Rogaghnata: kaphapaittikavikara, twakavikara, netraroga, mastishka-daurbalya, apasmara, aruchi, agnimandya[242], ajeerna, sangrahani18, trishna, krimiroga, raktavikara, kasa, shwasa, mootrakrichhara, rajorodha, sutikaroga, stanyavikara, pama, kandu, jwara, daurbalya.

Chemical constituents: β – sitosterol, pinene, cineol, linolenic, linolic, oleic, myristic and stearic acids, cyperotundone, α-rotunol, β-rotanol, cyperolone, cyperenone, aureusidin.

Pharmacological activities: tranquillizing, anti-inflammatory, anti-pyretic, oestrogenic, antiemetic, smooth muscle relaxant, antimicrobial, diuretic. Ƒ the rhizomes give successful results in the treatment of irregular menstruation, dysmenorrhoea, dyspepsia, diarrhea and vomiting[244]. *ƒ* cyperus rotundus has been utilized in the treatment of anaemia and general weakness[245].

Ref-18) ch. Chi. – 30/207-209. Chakrapani 19) ch. Chi. – 30/211-213 20) su. Su. – 14/21

Guduchi (Fig 2.26)

Latin name - Tinospora cordifolia Willd

Family - Menispermaceae

Vernacular Names

Gujarati - Galo

Hindi - Giloya

English - Gullacha

Synonyms - Amrita, Madhuparni, Vatsadani, Tantrika, Kundalini, Chhinnaruha, Chakralakshanika

Gana

Charaka - Vayahsthapana, Dahaprashamana, Trishanigrahana, Stanyasodhana, Triptighna

Sushruta - Guduchyadi, Patoladi, Aragvadhadi, Kakolyadi, Vallipanchamala

Parts used - Stem

Rasa panchaka

Rasa - Tikta, Katu, Kashaya

Guna - Guru, Snigdha

Virya - Ushna

Vipaka - Madhura

Dosha Karma - Tridoshaghna

Karma - Rasayana, Dipana, Vayahsthapana, Balya,

Fig 2.27: Guduchi Churn

Dahaprashamana, Vishaghna, Bhutaghna,

Valitapalitanashini, Jvaraghna, Krimighna

Chemical Constitution

Gliloin (glucocide C23H32O10)

Giloinina (non-glucocide)

Gilosteroid

Uses

Diuretic

Anti-rheumatic

Anti-inflammatory

Action: It is Rasayana, Deepana, Grahi and Anahahara. Hence it is used in Daha, Jvara, Kushtha, Vatrakta, Pandu, Prameha, Kasa, Chardi, Krimi etc. Chemical composition: It contains Berberine alkaloid, bitter glycoside Giloin, Volatile oil and fatty acids. Stem and root contain starch extract, which is mainly used in fever.

Pharmacological action: It is Stomachics, bitter tonic, aphrodisiac and demulcent given in dyspepsia and debility caused by repeated attacks of fever. It is given in skin disorders. Modern research proved that it has hepatoprotective effect, hypoglycaemic effect, immunomodulatory action, litholytic action, anti-inflammatory, analgesic, antipyretic effects, effect on smooth muscles, antiallergic effect and antimicrobial effect. It also reduces blood-urea.

Gugulu (Fig 2.28)

Latin name - Commiphoramukul

Family - Burseraceae

Vernacular Names

Gujarati - Gugala

Hindi - Gugala

English - Indian Bedellium

Synonyms - Devadhupa, Kaushika, Kumbha

Gana

Charaka - Sangyasthapana

Sushruta - Eladi

Parts used - Resin (Gum)

Rasa panchaka

Rasa - Tikta, Katu

Guna - Laghu, Ruksha, Tikshna, Vishada, Sukshma, Snigdha,

Picchila (New Guggulu)

Virya - Ushana

Vipaka - Katu

Dosha Karma - Tridoshaghna

Karma - Vrishya, Balya, Rasayana, Dipana, Medohara,

Krimighna

Chemical Constitution

Steroids

Carbohydrate

Aliphatic esters (gum-resin portion of Guggulu content)

Pentosan, Pentose and Furfural

Caryophylline, Myrcena

Z-Guggulosterone and E-Guggulosterone

Uses

Anti-inflammatory

Anti-Rheumatic

Hypolipidemic

Hypocholesteremic

Guggulu: Sanskrit Name - Guggulu Botanical Name - Commiphoramukul Engl. Family - Burseraceae English Name - Gum guggulu, Indian bdellium Synonyms - Guggulu, Devadhoopa, Kaushika, Kalaniryas, Kumbha, Ulukhalaka, Palankasha, Pura, Mahishaksha, Jatayu. Part used - Gum resin Pharmacodynamics: Rasa - Tikta, Kashaya Katu Guna - Snigdha, PichhilaVeerya - UshnaVipaka - KatuDoshaghnata - Kapha-VataNashaka Properties and Uses: According to Charaka in the disease of stomach. Sushruta has indicated its use in Urustanbha, Shotha, Karnadurgandha, etc. Vagbhata mentioned in ShvasarogaChakradatta refers its use in Gridhrasi, Kroshtukshirsha, Vidradhi etc.

Guggulu is on olea-resin obtain from the plant commiphora mukul and is very much used in India system of medicine as astringent, antiseptic, expectorant, aphrodisiac, demulcent, carminative, antispasmodic, emmenagogue and use in rheumatism. The drug is described as hridya, medoghna and mehaghna, ashmaghna. It also reduces level of cholesterol and obesity Oleo-resin gum of C. mukul has been proved to be a potent hypocholesterolemic, hypo-lipidaemic, antiatherosclerotic agent both in clinical as well as in experimental studies. A steroidal compound isolated from the petroleum ether extract of the plant possessed significant anti-inflammatory activity on rat paw oedema produced by carrageenin. The steroidal fraction had a significant

effect on the primary as well as the secondary inflammation induced by Freud's adjuvant, the activity being less than that of hydrocortisone acetate in primary inflammation, but it is more effective than hydrocortisone in reducing the severity of secondary lesions (Arora et al, 1971, 1972). Further study showed that the steroidal component of fraction A had a pronounced antiarthritic effect and is superior to phenyl-butazone and comparable to hydrocortisone (Sharma and Jain, 1978). The oleo-resin fraction possessed significant anti-arthritic and anti-inflammatory activities. Only the acidic fraction showed significant activity while the monoacid and solid fraction were inactive (Santha Kumari et.al, 1964).

Chemistry: From the gum-resin, sesamin, cholesterol, few other steroids, essential oil containing steroidal ketones, alcohols and aliphatic triols (mostly as esters of ferulic acid) were reported. The structure elucidation of steroidal constituents viz, Z-guggulsterone, E-guggulsterone, three new sterols guggulsterols-I, -II and III have been established along with partial synthesis of guggulsterol II from diosgenin. In addition, diterpenoid constituents cembrene-A and Mukulol, some fatty tetrols-octadecan-1,2,3,4-tetrols, eicosan-1, 2,3,4, -tetrol and non-adecan-1,2,3,4, - tetrol were reported (CRUP).

Two new sterols viz, guggulsterols-IV & V have been reported for the first time. Known compounds isolated were guggul-sterols-I, -II &III and guggulsterones-Z and E. (CSMDRIA, M). A diterpene alcohol, guggulsterone, guggulsterol-I-II & III were isolated from the gum-resin (CRUD). Pharmacology: Gum resin showed different pharmacological properties, uses and clinical application: astringent, expectorant, aphrodisiac, demulcent, carminative, antispasmodic, emmenagogue, to enrich blood, in snake bite and scorpion sting, antifertility, arthritis, leprosy, in impotence and sterility, in liver disorder and hemiplagia, hypocholestraemic, hypolipidaemic, atherosclerosis, thyroid stimulating, psoriasis and cardiac ischaemia. The significant pharmacological properties which led to clinical trials are: hypocholestraemic, hypolipidaemic, antiarthritic, thyroid, stimulating in cardiac ischaemia and in psoriasis. Clinical studies with shunthiguggulu or rheumatoid arthritis on 63 patients showed much improvement in age group of 11-40 years (Prem Kishore et. al: 1982).

Fig 2.29: Amalaki, Musta, Amruta and Guggul

The protective effect of Asthimajjapachak guggul wati is conceived to be at both the levels:

1 At Hair Cell

2 At CNS (Cochlear nerve)

- On CNS it can be through its GABAergic modulation (an important neurotransmitter) as well as its role to increase in acetylcholine receptor activity and stimulating the growth of axons and dendrites of nerve cells.[33]

- On hair cell level it may affect by its active constituents like withaferin A and sitoindosides VII –X which are reported to have an anti-oxidant activity by reducing lipid peroxidation[221].

- This suggests that Asthimajjapachakguggul wati help in lowering down the degenerative changes occurring at cellular level and empowering the function of sensory organs (may enhance the normal hearing).

- Moreover, Asthimajjapachakguggul wati due to its "Samanaihi vardhesham " quality easily increases the properties of other drugs processed with it without leaving its own properties.

- The vitiation of Vata is the major factor in the development of the disease. In the management of Karnanad, Vatashamaka and Shrotoshodhaka Dravyas are generally advised.

Karnpuran:

Photographs of the procedure (Fig 2.30)

Poorve Karma

Fig 2.30-1: position of the patient

Fig 2.30-2: abhyang with Tila Taila & local Swedan around the ear

Pradhan Karma

Fig 2.30-3: filling of ear with asthimajjapachak siddha tail & dharanakala of Tail in the same position for 100 matras

Paschata Karma

Fig 2.30-4: Cleaning of the ear with dry cotton varti

Drug preparation: Asthimajjapachakkashaysidha tail for group B

Tila Taila:

- Sesame oil used for Abhyanga and Karnapoorana contains magnesium, copper, calcium, iron, zinc, and vitamin B6[218].
- As Magnesium and zinc supplements can help restore stability to inner ear. It may be absorbed by Abhyanga and Karnapoorana. Thus Karnapoorana is conductive to

the nutrition of the skin and the softness of the muscles. It penetrates into the skin quickly and enters the blood stream, through the capillaries and supply nutrition to nerves. It has a unique quality of getting absorbed easily by the pores in the skin and thereby acts as a catalyst.

- Acharya Charaka in Sutrasthana Snehadhyaya explained that, **"Snehoanilam Hanti"** which means that Snehana is the supreme treatment for Vata Dosha.

Fig 2.31: Asthimajjapachakkashaysidha tail

Material and method:

अथ स्नेहपरिभाषा –

कल्काच्चतुर्गुणीकृत्य घृतं वा तैलमेव वा । चतुर्गुणे द्रवे साध्यं तस्य मात्रा पलोन्मिता ।।१।।
निक्षिप्य क्काथयेत्तोयं क्काथ्यद्रव्याच्चतुर्गुणम् । पादशिष्टं गृहीत्वा च स्नेहं तेनैव साधयेत् ।।२।।
जलप्रमाणमाह–

चतुर्गुणं मृदुद्रव्ये कठिनेऽष्टगुणं जलम् । तथा च मध्यमे द्रव्ये दद्यादष्टगुणं पयः ।।३।।
अत्यन्तकठिने द्रव्ये नीरं षोडशिकं मतम् । शा. म. ख. - 9

Medicated sneha i.e., taila (oil) is prepared by mixing one part of kwath (paste of drugs), four of oil and the dose of sneha is one pala. For preparing decoction, if the drug is very hard sixteen parts of water are taken and reduced to quarter (1/4).

Prepared asthimajjapachak kashaya siddha tila tail as below –

Kawth preparation:

One kg of mixture of amruta musta amalaki churna are taken in equal proportion and soaked overnight in 16 lit of water and boiled on medium flame till the kwath becomes one fourth of the total quantity. Each drug was tested in laboratory for microscopic and macroscopic analysis and pharmacognosy. The reports are attached in the annexure.

Oil preparation:

The prepared kwath (about 4 lit) was mixed with one litre of oil (tila tail) and heated on low flame till only oil remained. It was tested for all conformity tests of water in the oil. The oil was then filtered with muscline cloth and kept for cooling. The total drug was about 920 ml.

The preparation procedure was repeated three times to obtain sufficient yield for 250 patients. The prepared oil was sent to the laboratory (about 50 ml) for physical, chemical, and microscopic analysis and microbil study.

After satisfactory reports from the laboratory, the oil was filled in 10 ml of dropper bottles with all asecptic precautions and dispensed to the patients as per dose. The reports are included in the Annexure.

केवलक्काथपाके विधानमाह-

द्रव्येण केवलेनैव स्नेहपाको भवेद्यदि । तत्राम्बुपिष्टः कल्कः स्याज्जलं चात्र चतुर्गुणम् ।।९।।

क्काथेन केवलेनैव पाको यत्रेरितः क्कचित् । क्काथ्यद्रव्यस्य कल्कोऽपि तत्र स्नेहे प्रयुज्यते ।।१०।।

If sneha (ghee or oil) is to be prepared with only water the quantity of water should be four times (of the paste or sneha) and the same is also the case if only decoction it to be used or any other liquid is to be used (9-10).

Signs of sheha preparation

वर्तिवत्स्नेहकल्कः

स्याद्यदाङ्गुल्या विमर्दितः ।।१२।।

शब्दहीनोऽग्निनिक्षिप्तः स्नेहः सिद्धो भवेत्तदा । यदा फेनोद्गमस्तैले फेनशान्तिश्च सर्पिषि ।।१३।।

गन्धवर्णरसोत्पत्तिः स्नेहसिद्धिस्तदा भवेत् । स्नेहपाकस्त्रिधा प्रोक्तो मृदुर्मध्यः खरस्तथा ।।१४।।

ईषत्सरसकल्कस्तु स्नेहपाको मृदुर्भवेत् । मध्यपाकस्य सिद्धिश्च कल्के नीरसकोमलः ।।१५।।

ईषत्कठिनकल्कश्च स्नेहपाको भवेत्खरः । तदूर्ध्वं दग्धपाकः स्याद्दाहकृन्निष्प्रयोजनः ।।१६।।

आमपाकश्च निर्वीर्यो वह्निमान्द्यकरो गुरुः ।

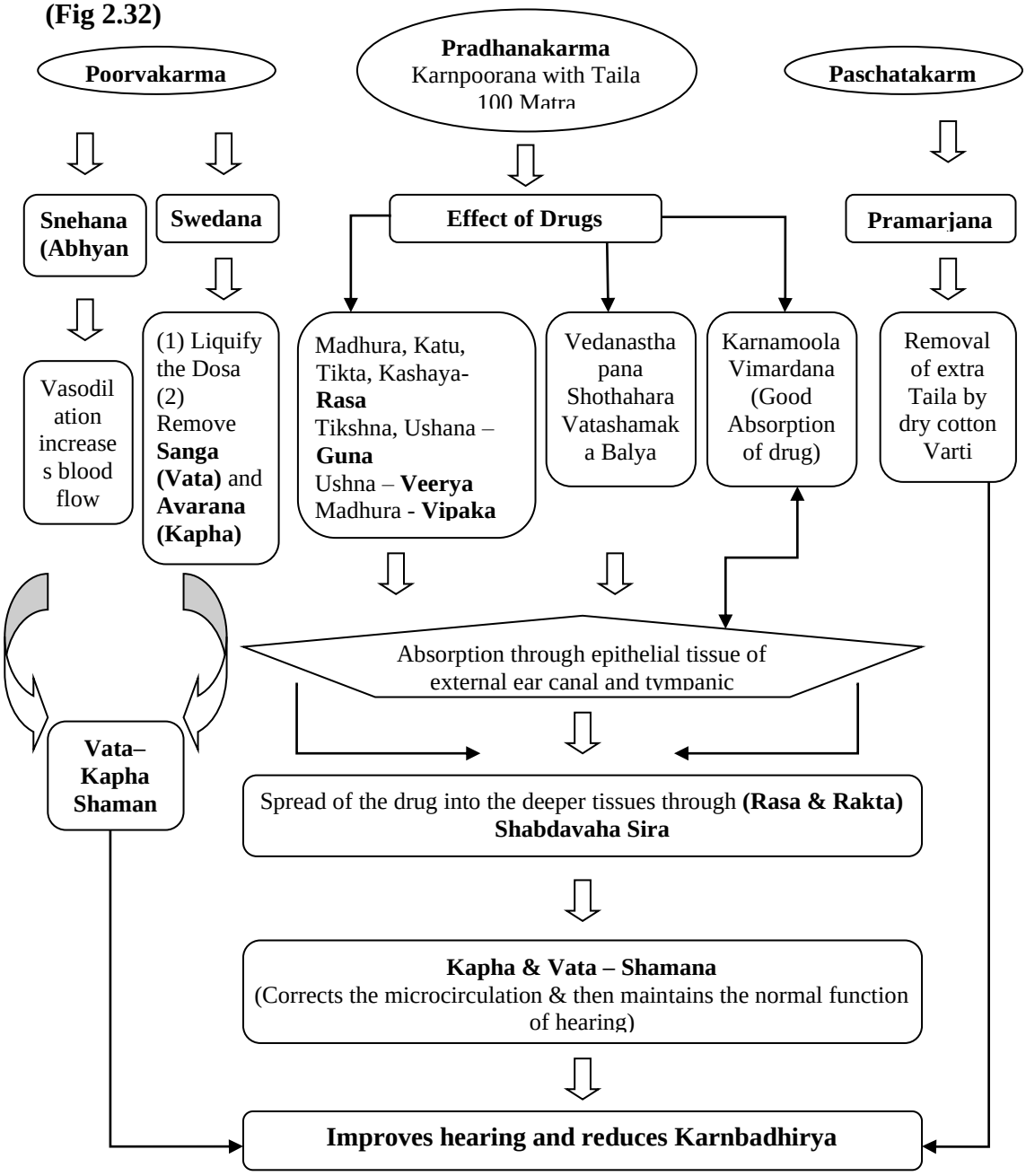
A small quantity of kalka taken out at the end of boiling and rolled in between the fingers, if it assumes a wick-like shape and does not produce any cracking noise if thrown on fire it is the test for properly cooked sneha; likewise, appearance and disappearance of bubbles at the terminal stage of cooking oil and ghee respectively, and emission of good smell, colour, and taste are the other tests for properly cooked sneha (ghee or oil).

Snehapaka (cooking) is of three types: mrudu (mild), madhya (moderate) and khara (hard boiled). A small quantity of kalka taken out and pressed between finger if yields large quantity of sneha (oil or ghee) it is said to be in mrdupāka, if it does not yield any sneha but is soft in consistence the pāka is madhyama, if the kalka does not yield any sneha and is hard it is said to be in khara. Boiling still further will result in dagdha pāka (over burnt) which not only becomes unworthy but even causes burning sensation by using it. Even so is amapāka (deficient cooking) which is not only ineffective but also causes indigestion (12-17).

Probable mode of action of Karnapoorana:

The disease Karnbadhirya is Vatadominant and so compound drug employed should also have Vatashamaka qualities, so that it can counteract vitiated Doshas to disintegrate the pathology of the disease.

Probable mode of action of asthimajjapachak siddha tail as karnpuran (Fig 2.32)



(1) Abhayanga:

- Before Karnapoorana, **Abhyanga** is specifically done in Murdha Pradesha which causes vasodilatation in the skin and muscles by stimulating receptors of the sympathetic nervous system. Vasodilatation increases blood flow and helps to remove the toxic products.
- Dulhana has explained in detail about absorption of Sneha. The Abhyang is done for sufficient time; the oil reaches to the different Dhatu. Hence it is clear that potency of drug used in oil is absorbed into the skin. Dulhana also mention that when Snehana reaches to the particular Dhatu it subsides the disease of that particular Dhatu[222].
- Acharya Charaka has described that Vayu dominates in the Sparshnendriya and its site is Tvaka. The Abhyang is exceedingly beneficial to the skin[223]. So it is useful in the disease Karnbadhirya which caused by vitiated Vata.

(2) Swedana:

- Acharya Charaka[224] has described mechanism of **Swedana Karma** as given below:
    - It helps to dissolve Shleshma.
    - It makes the channels soft, by which Vatadi Doshas and other contents can flow through in their normal directions.
    - It increases the secretion of vitiated Shleshma thorough the channel.
- So, due to Ushna Guna of Swedana, Kapha Dosha gets liquefied. When lukewarm oil enters into the Shabdavaha Strotas, network of Strotas carry the Tail towards the desired sites and cleanses the channel. By its Shodhana property of its ingredients, probably it removes the Ama at the celluler level and pacifies the vitiated Vata and KaphaDosha.
- Due to Stroto Shodhana and VataKapha Shamana, Avarana and Sanga of Vata & Kapha Dosha is removed and nutrition is brought to the respective sites.
- So, after breaking Aavarna and Sanga by Abhyangand Swedana, Karnapoorana has been carried out in Karnbadhirya deafness, patients in the present study.

- **Asthimajjapachak tail Karnapoorana:**
- It is hypothesized that **Asthimajjapachak tail** helps in the absorption through epithelial tissue of external ear canal and tympanic membrane that can maintain normal function of hearing and equilibrium.
- Spread of the drug in to the deeper tissues through (Rasa & Rakta) Shabdavaha Sira.
- According to ‗Kedarikulya Nyaya', Karnapoorana will improve the blood supply of ear first.
- As the result of Karnapoorana, Kapha and Vata- Shamana takes place which will Correct the microcirculation, then maintains the normal function of hearing and relieve sounds from the ear (Karnbadhirya).

RESEARCH METHODOLOGY

Clinical study:

Research was conducted in this project-on workers working in industries where sound level is very high about 80 db, we went to the industries and examined more than 300 employees for this project.

Where we conducted Audiometry of each person before and after the trial medicine was given.

Audiometry was performed in noise proof room on pure tone audiometer.

Study Design

Selection of the patients:

The patients suffering from Karnbadhirya were randomly selected from industrial area of Pimpri Chinchwad. Industries visited –

- Eskay Engichem, Chinchwad
- Trishul Forging Industries, Chinchwad
- V V Engineers, Talawade

Place of work: **Tilak Maharashtra Vidyapeeth, Pune**

Clinical study place of registration: B.S.D.T. Ayurved collage and Research Center Wagholi, Pune.

Plan of work:

The study was conducted in different steps as mentioned below.

Proforma: A special case proforma was prepared to maintain the records of the entire observations regarding the disease.

Patients were examined clinically and with audiometry, Otoscopy.

Patients having moderate hearing loss were selected for the clinical study for clinical trial after informed consent.

Total no of patients 242

Grouping and Posology:

All the selected patients fulfilling the criteria were randomly divided into two groups.

Group-A: Asthimajjapachak kashay wati orally. 250 gm two times a day at vyanodan kal with water.

Group-B: Asthimajjapachak kashay siddha tail sneh swed purvak Karnpuran once a day after sunset.

Dose: 4 - 6 drops in each ear = 100 matra (approx. 5mints) Karnpuran.

Aushadhasevana Kala: Evening (Karnapoorana) and wati twice a day vyanodan kal.

Duration: 30 days.

Follow–up: 45 days for recurrence.

Total three months treatment, first two weeks for samprapti bhang with Aampachakvati (Agasti Pharma), then one month for Asthimajjapachak Guggul vati Abhyantartah 250 mg twice a day vyanodan kal with water , next 6 weeks patient was observed for recurrence of the diseases, given to group A.

For group B Asthimajjapachak kashay siddha taila is given for sneh swed purvak Karnpuran for one month 100 matra once a day after sunset.

Sample size: 142 individuals for group A and 100 for group B.

Sampling was done on randomised method.

Group A- Asthimajjapachakvati (amtuta, musta amalaki guggul siddha) with water 250mg bid for one month

Group B - asthimajjapachakkashay sidda tail for karnpuran 100 matra (5 min) after sunset time for one month.

Total duration of trials: 3months

Treatment Protocol:

Screening of patient was done.

Informed written consent was taken (Annexure II)

Assessment is done by otoscopy and Audiometry.

Standard Operating Procedure (SOP):

The improvement if any in the objective test was recorded.

Observations recorded in case record form (Annexure I)

Inclusion criteria –

Patients were selected on the basis of symptoms of karnbadhirya which was diagnosed by audiometric test.

Patients Age -21 to 60 years.

Patients Gender - either

Exclusion criteria:

Mentally retarded

Diabetes Mellites, Hypertension,

Chronic supportive otitis media

History of trauma

Any specific medication using for other diseases

Congenital anomaly. The clinical trial was assessed for its efficacy on the basis of following subjective and objective criteria.

Subjective:

Relief in signs and symptoms in terms of intensity, frequency and duration obtained in the patients were considered for the assessment.

Karn Badhirya: Yes (1) or No (0)

Objective:

Materials and Methods:

Audiometric tests were performed on each patient before and after the treatment. (Table 3.1)

Before Treatment (BT)	After Treatment (AT)	Recurrence
0^{th} day	45^{th} day	90^{th} day

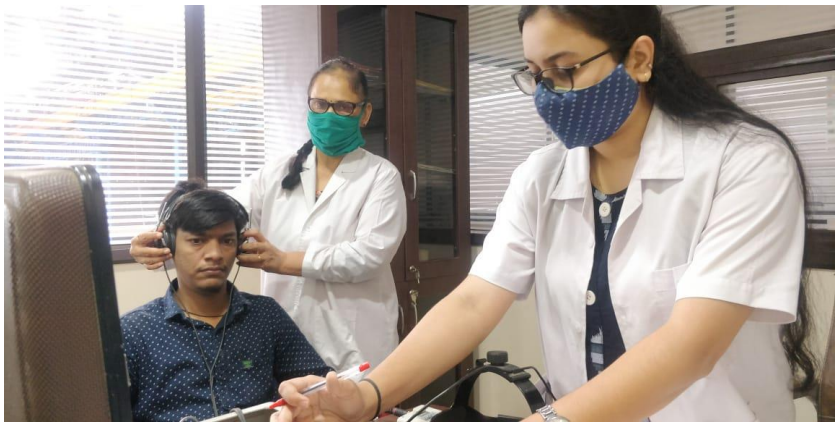
Measuring scale for pure tone Audiometry (Table 3.2)

Objective parameter:

Grade	Degree of Hearing in dB	Type of Hearing Loss
0	0 to 20	Normal hearing
1	20 to 45	Mild hearing loss
2	45 to 65	Moderate hearing loss
3	65 to 85	Severe Hearing loss
4	Above 85	Profound Hearing loss

Photographs of soundproof room and while conducting Audiometry (Fig 3.1)



Material used for study for group A: Aampachakvati and the control drug Asthimajjapachak Guggul vati (dhatri, musta, amruta), Abhyantartah was procured from Agasti Pharma. The drug authentication and permission letters are in the annexure.

Prepared asthimajjapachak kashaya siddha tila tail as below –

Kawth preparation:

One kg of mixture of amruta musta amalaki churna are taken in equal proportion and soaked overnight in 16 liters of water and boiled on medium flame till the kwath

becomes one fourth of the total quantity. Each drug was tested in laboratory for microscopic and macroscopic analysis and pharmacognosy. The reports are attached in the annexure.

Oil preparation:

The prepared kwath (about 4 lit) was mixed with one litre of oil (tila tail) and heated on low flame till only oil remained. It was tested for all conformity tests of water in the oil. The oil was then filtered with muscline cloth and kept for cooling. The total drug was about 920 ml.

The preparation procedure was repeated three times to obtain sufficient yield for 250 patients. The prepared oil was sent to the laboratory (about 50 ml) for physical, chemical, and microscopic analysis and microbil study.

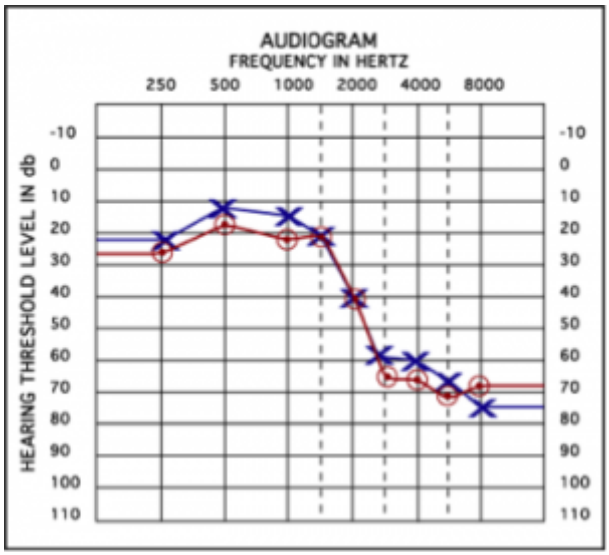
After satisfactory reports from the laboratory, the oil was filled in 10 ml of dropper bottles with all asecptic precautions and dispensed to the patients as per dose. The reports are included in the annexure.

Fig 3.2: Asthimajjapachakkashaysidha tail

SOP for Pure tone Audiometry:

Variety of sounds, such as tones and speech, are played at different intervals into one ear at a time, to determine patients' range of hearing. Instructions were given for each sound. Patient was asked to raise their hand when a sound becomes audible. Recording of each result is recorded as Audiogram.

Graph 3.2: Audiogram



Data evaluated according to standards.

Tools applied for assessment of data:

The effect of therapy in both the groups is assessed by applying students paired 't' test for comparing before treatment and after treatment obtained scores of subjective parameters. The results were interpreted at $p< 0.05$, $p <0.01$ and $p <0.001$ significance levels. The obtained results were interpreted as:

Insignificant $P > 0.05$

Significant $P < 0.05$

Significant $P < 0.01$

Highly Significant $P < 0.001$

ANALYSIS AND INTERPRETATION

OBSERVATIONS:

Table 4.1: Age groups (in years) wise distribution

Age Group in years	Group A		Group B		Total	
	No. of patients	Percentage	No. of patients	Percentage	No. of patients	Percentage
21 – 30	50	35.21%	22	22.00%	72	29.75%
31 – 40	79	55.63%	62	62.00%	141	58.26%
41 – 50	15	10.56%	16	16.00%	31	12.81%
Total	142	100 %	100	100 %	242	100 %

χ^2_{cal} = 5.20 χ^2_{tab} = 5.99 p > 0.05

Here $\chi^2_{cal} < \chi^2_{table}$ i.e. χ^2 test was insignificant, it means observation in both groups were at baseline i.e. there was no difference in age wise selection of patients in both groups.

In Group A - majority of the patients i.e. 79 (55.63 %) were reported in age group 31 to 40 years, followed by 50 (35.21 %) patients observed in the age group 21 to 30 years and 15 (10.56 %) patients observed in the age group 41 to 50 years.

Where in Group B – majority of the patients i.e. 62 (62 %) were reported in age group 31 to 40 years, followed by 22 (22 %) patients observed in the age group 21 to 30 years and 16 (16 %) patients observed in the age group 41 to 50 years.

Graph 4.1: Age groups (in years) wise distribution

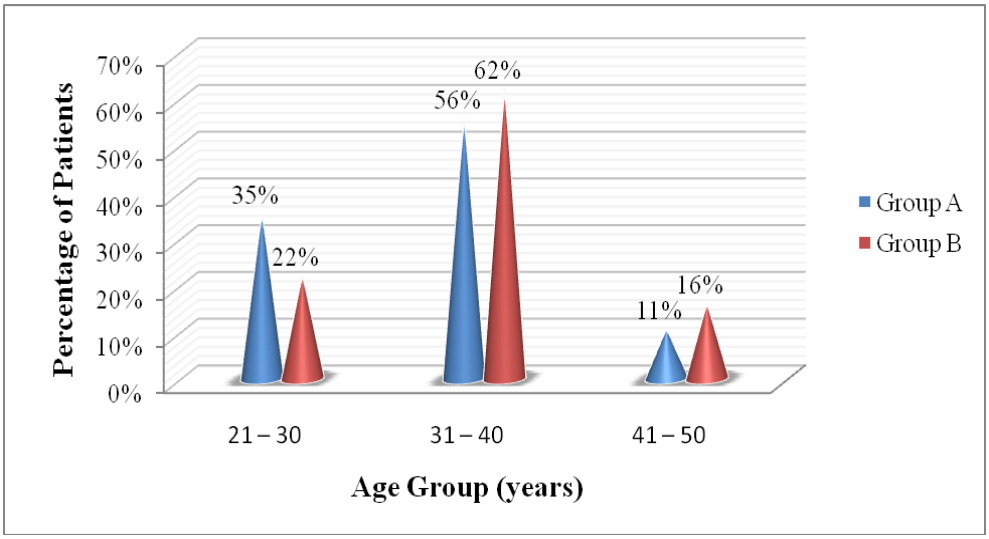


Table 4.2: Gender wise distribution

Gender	Group A		Group B		Total	
	No. of patients	Percentage	No. of patients	Percentage	No. of patients	Percentage
Female	9	6.34%	5	5.00%	14	5.79%
Male	133	93.66%	95	95.00%	228	94.21%
Total	142	100 %	100	100%	242	100 %

χ^2_{cal} = 0.19 χ^2_{tab} = 3.84 p > 0.05

Here $\chi^2_{cal} < \chi^2_{table}$ i.e. χ^2 test was insignificant, it means observation in both groups were at baseline i.e. there was no difference in gender wise selection of patients in both groups.

The above table shows that –

In Group A– Maximum 133 (93.66 %) patients were Male and 9 (6.34 %) patients were Female.

In Group B – Majority of patients i.e. 95 (95 %) were Female and 5 (5 %) patients were Male.

Graph 4.2: Gender wise distribution

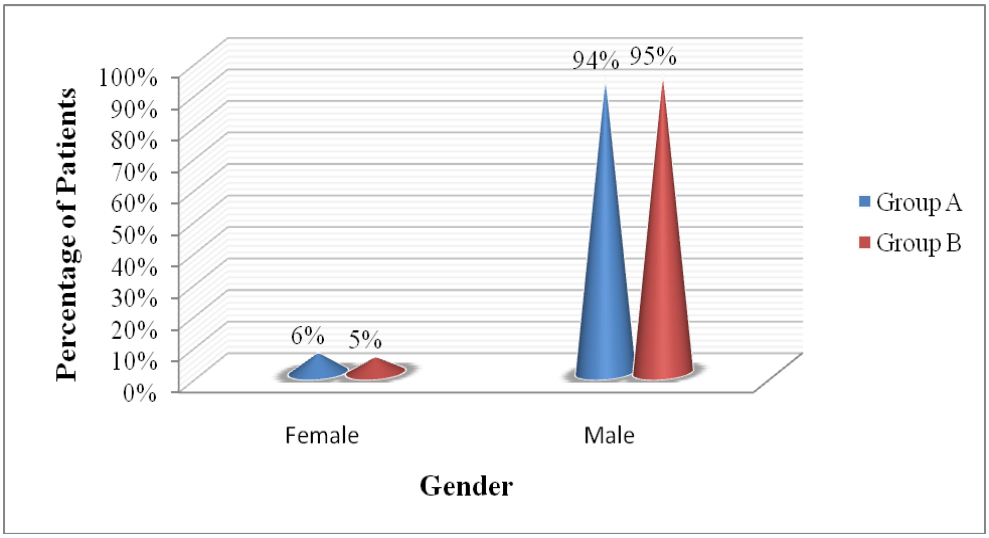


Table 4.3: Religion wise distribution

Religion	Group A		Group B		Total	
	No. of patients	Percen tage	No. of patients	Percen tage	No. of patients	Percen tage
Hindu	133	93.66%	89	89.00%	222	91.74%
Muslim	3	2.11%	4	4.00%	7	2.89%
Christian	4	2.82%	5	5.00%	9	3.72%
Sikh	2	1.41%	2	2.00%	4	1.65%
Total	142	100%	100	100 %	242	100 %

χ^2_{cal} = 1.73 χ^2_{tab} = 7.83 P > 0.05

Here $\chi^2_{cal} < \chi^2_{table}$ i.e. χ^2 test was insignificant, it means observation in both groups were at baseline i.e. there was no difference in religion wise selection of patients in both groups.

The above table shows that –

In Group A – Maximum 133 (93.66 %) patients were Hindu, 4 (2.82 %) patients were Christian, 3 (2.11 %) patients were Muslim and 2 (1.41 %) patients were Sikh.

Where in Group B – Maximum 89 (89 %) patients were Hindu, 5 (5 %) patients were Christian, 4 (4 %) patients were Muslim and 2 (2 %) patients were Sikh.

Graph 4.3: Religion wise distribution

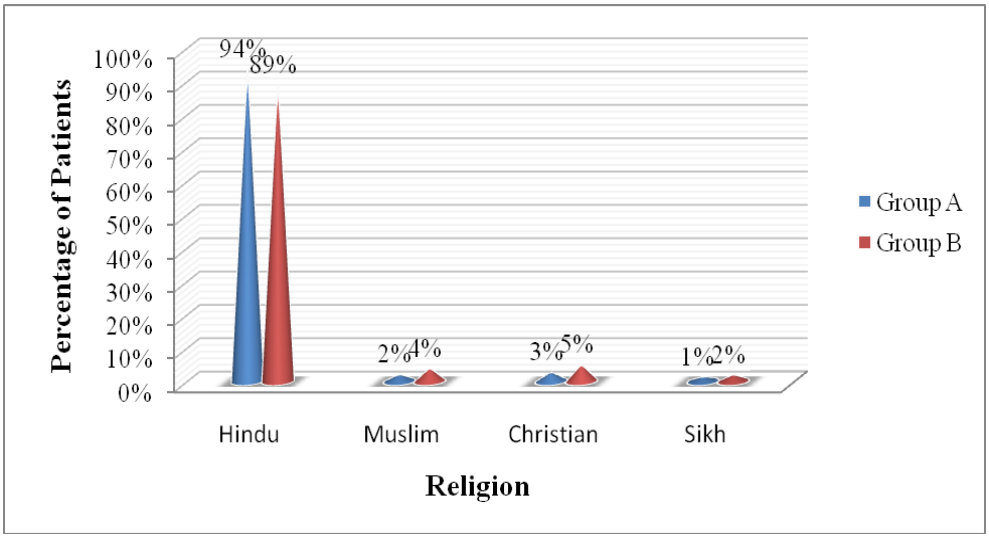


Table 4.4: Marital Status wise distribution

Marital Status	Group A		Group B		Total	
	No. of patients	Percen tage	No. of patients	Percen tage	No. of patients	Percen tage
Unmarried	32	22.54%	32	32.00%	64	26.45%
Married	110	77.46%	68	68.00%	178	73.55%
Total	142	100%	100	100 %	242	100 %

χ^2_{cal} = 2.70 χ^2_{tab} = 3.84 p > 0.05

Here $\chi^2_{cal} < \chi^2_{table}$ i.e. χ^2 test was insignificant, it means observation in both groups were at baseline i.e. there was no difference in Marital Status wise selection of patients in both groups.

The above table shows that –

In Group A – Maximum 110 (77.46 %) patients were Married and 32 (22.54 %) patients were Unmarried.

Where in Group B – Maximum 68 (68 %) patients were Married and 32 (32 %) patients were Unmarried.

Graph 4.4: Marital Status wise distribution

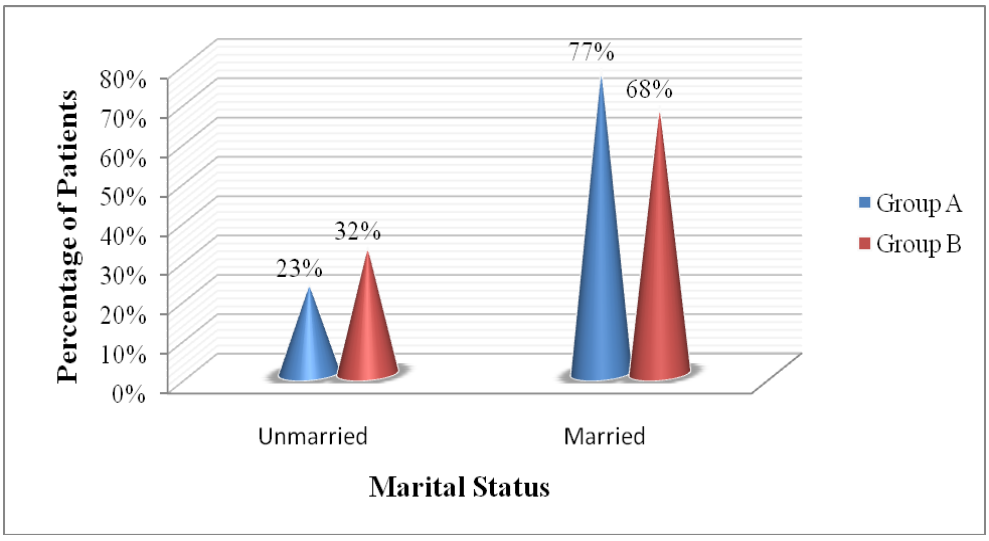


Table 4.5: Occupation wise distribution

Occupation	Group A		Group B		Total	
	No. of patients	Percen Tage	No. of patients	Percen tage	No. of patients	Percen tage
Labour	109	76.76%	84	84.00%	193	79.75%
Service	33	23.24%	16	16.00%	49	20.25%
Total	142	100 %	100	100 %	242	100 %

χ^2_{cal} = 1.90 χ^2_{tab} = 3.84 p > 0.05

Here $\chi^2_{cal} < \chi^2_{table}$ i.e. χ^2 test was insignificant, it means observation in both groups were at baseline i.e. there was no difference in occupation wise selection of patients in both groups.

The above table shows that –

In Group A – maximum 109 (76.76 %) patients were Labour, and 33 (23.24 %) patients were doing Service.

Where in Group B – maximum 84 (84 %) patients were Labour, and 16 (16 %) patients were doing Service.

Graph 4.5: Occupation wise distribution

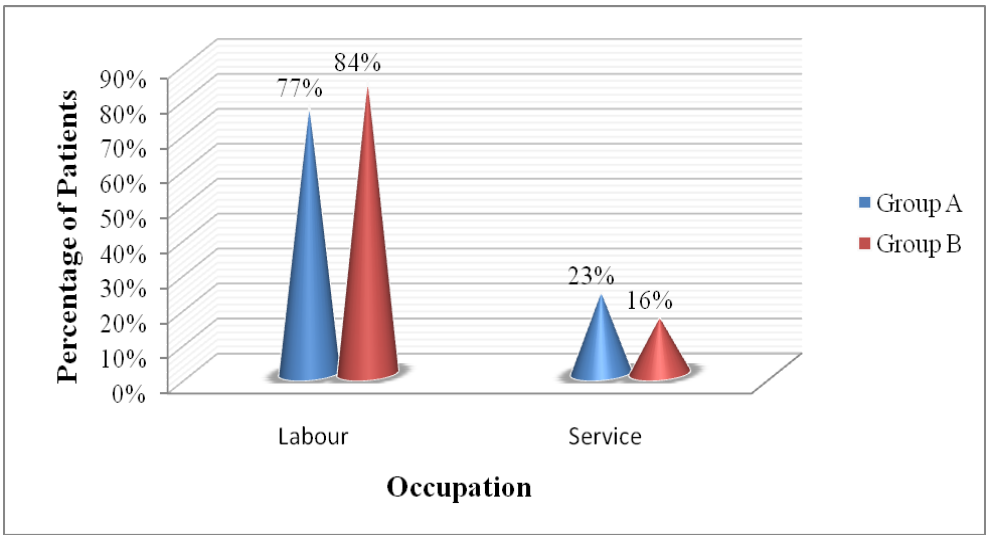


Table 4.6: Pulse Rate (in beats per minute) wise distribution

Pulse Rate (in beats / minute)	Group A		Group B		Total	
	No. of patients	Percen tage	No. of patients	Percen tage	No. of patients	Percen tage
71 – 80	72	50.70%	59	59.00%	131	54.13%
81 – 90	67	47.18%	39	39.00%	106	43.80%
91 – 100	3	2.11%	2	2.00%	5	2.07%
Total	142	100%	100	100 %	242	100 %

χ^2_{cal} = 1.64 χ^2_{tab} = 5.99 P > 0.05

Here $\chi^2_{cal} < \chi^2_{table}$ i.e. χ^2 test was insignificant, it means observation in both groups were at baseline i.e. there was no difference in Pulse Rate wise selection of patients in both groups.

The above table shows that –

In Group A – Maximum 72 (50.70 %) patients were having Pulse rate in between 71 to 80, 67 (47.18 %) patients were having Pulse rate in between 81 to 90, and 3 (2.11 %) patients were having Pulse rate in between 91 to 100.

Where in Group B – Maximum 59 (59 %) patients were having Pulse rate in between 71 to 80, 39 (39 %) patients were having Pulse rate in between 81 to 90 and 2 (2 %) patients were having Pulse rate in between 91 to 100.

Graph 4.6: Pulse Rate (in beats per minute) wise distribution

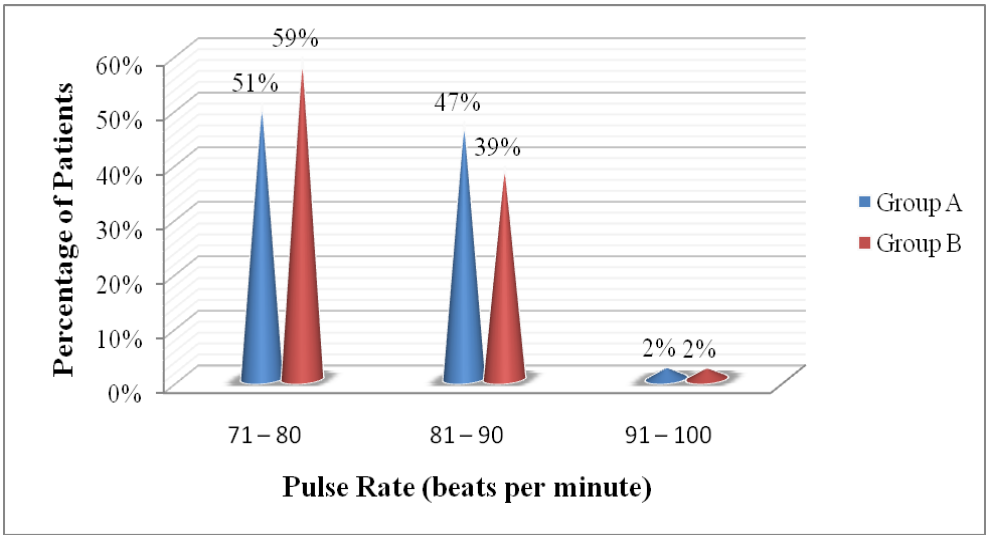


Table 4.7: Systolic Blood Pressure (in mm of Hg) wise distribution

Systolic Blood Pressure	Group A		Group B		Total	
	No. of patients	Percen tage	No. of patients	Percen tage	No. of patients	Percen tage
101 – 110	2	1.41%	1	1.00%	3	1.24%
111 – 120	48	33.80%	45	45.00%	93	38.43%
121 – 130	51	35.92%	31	31.00%	82	33.88%
131 – 140	37	26.06%	20	20.00%	57	23.55%
141 – 150	4	2.82%	3	3.00%	7	2.89%
Total	142	100%	100	100 %	242	100 %

χ^2_{cal} = 3.33 χ^2_{tab} = 9.49 p > 0.05

Here $\chi^2_{cal} < \chi^2_{table}$ i.e. χ^2 test was insignificant, it means observation in both groups were at baseline i.e. there was no difference in Systolic Blood Pressure wise selection of patients in both groups.

The above table shows that –

In Group A – Maximum 51 (35.92 %) patients were having systolic BP in between 121 to 130, 48 (33.80 %) patients were having systolic BP in between 111 to 120, 37 (26.06 %) patients were having systolic BP in between 131 to 140, 4 (2.82 %) patients were having systolic BP in between 141 to 150, and 2 (1.41 %) patients were having systolic BP in between 101 to 110.

In Group B – Maximum 45 (45 %) patients were having systolic BP in between 111 to 120, 31 (31 %) patients were having systolic BP in between 121 to 130, 20 (20 %) patients were having systolic BP in between 131 to 140, 3 (3 %) patients were having systolic BP in between 141 to 150, and 1 (1 %) patient was having systolic BP in between 101 to 110.

Graph 4.7: Systolic Blood Pressure (in mm of Hg) wise distribution

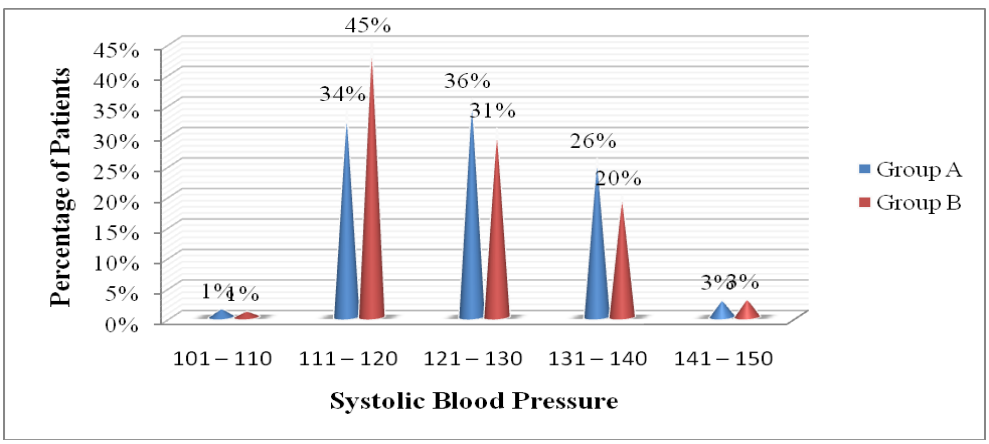


Table 4.8: Diastolic Blood Pressure (in mm of Hg) wise distribution

Diastolic Blood Pressure	Group A		Group B		Total	
	No. of patients	Percen tage	No. of patients	Percen tage	No. of patients	Percen tage
61 – 70	1	0.70%	1	1.00%	2	0.83%
71 – 80	105	73.94%	84	84.00%	189	78.10%
81 – 90	36	25.35%	15	15.00%	51	21.07%
Total	142	100%	100	100 %	242	100 %

χ^2_{cal} = 0.62 χ^2_{tab} = 3.84 p > 0.05

Here $\chi^2_{cal} < \chi^2_{table}$ i.e. χ^2 test was insignificant, it means observation in both groups were at baseline i.e. there was no difference in Diastolic Blood Pressure wise selection of patients in both groups.

The above table shows that –

In Group A – Maximum 105 (73.94 %) patients were having diastolic BP in between 71 to 80, 36 (25.35 %) patients were having diastolic BP in between 81 to 90 and 1 (1 %) patient was having diastolic BP in between 61 to 70.

In Group B – Maximum 84 (84 %) patients were having diastolic BP in between 71 to 80, 15 (15 %) patients were having diastolic BP in between 81 to 90 and 1 (1 %) patient was having diastolic BP in between 61 to 70.

Graph 4.8: Diastolic Blood Pressure (in mm of Hg) wise distribution

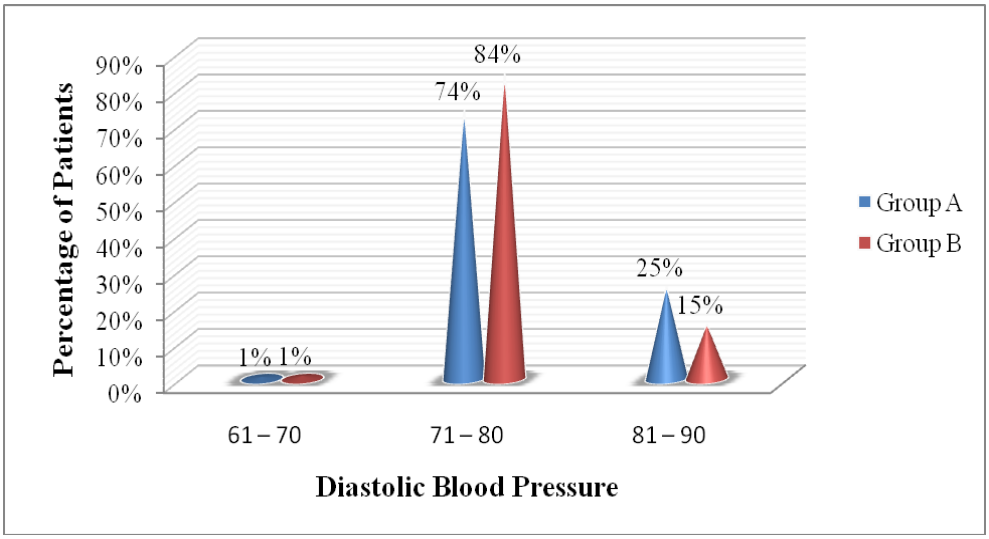


Table 4.9: Socio Economical Status distribution

Socio Economical Status	Group (A)		Group (B)		Total	
	No. of patients	Percen tage	No. of patients	Percen tage	No. of patients	Percen Tage
Poor Class	82	57.75%	55	55.00%	137	56.61%
Lower Middle Class	38	26.76%	28	28.00%	66	27.27%
Upper Middle Class	22	15.49%	17	17.00%	39	16.12%
Total	142	100 %	100	100 %	242	100 %

χ^2_{cal} = 0.193 χ^2_{tab} = 5.99 p > 0.05

Here $\chi^2_{cal} < \chi^2_{table}$ i.e. χ^2 test was insignificant, it means observation in both groups were at baseline i.e. there was no difference in Socio Economical Status wise selection of patients in both groups.

The above table shows that –

In Group A – majority of the patients i.e. 82 (57.75 %) were belonging to Poor Class, 38 (26.76 %) patients were belonging to Lower Middle Class and 22 (15.49 %) patients were belonging to Upper Middle Class.

Where in Group B – majority of the patients i.e. 55 (55 %) were belonging to Poor Class, 28 (28 %) patients were belonging to Lower Middle Class and 17 (17 %) patients were belonging to Upper Middle Class.

Graph 4.9: Socio Economical Status distribution

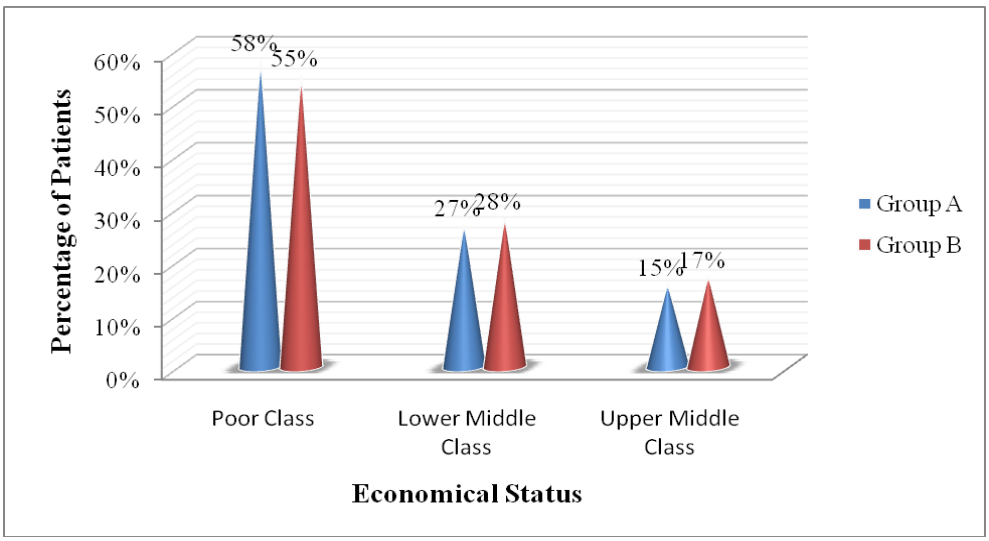


Table 4.10: Education wise distribution

Education	Group (A)		Group (B)		Total	
	No. of patients	Percen tage	No. of patients	Percen tage	No.of patients	Percen tage
Illiterate	2	1.41%	5	5.00%	7	2.89%
S.S.C.	49	34.51%	39	39.00%	88	36.36%
H.S.C.	58	40.85%	41	41.00%	99	40.91%
Graduate	33	23.24%	15	15.00%	48	19.83%
Total	142	100 %	100	100 %	242	100 %

χ^2_{cal} = 4.94 χ^2_{tab} = 7.83 p > 0.05

Here $\chi^2_{cal} < \chi^2_{table}$ i.e. χ^2 test was insignificant, it means observation in both groups were at baseline i.e. there was no difference in Education wise selection of patients in both groups.

The above table shows that –

In Group A – Maximum 58 (40.85 %) patients were studied up to H.S.C., 49 (34.51 %) patients were studied up to S.S.C., 33 (23.24 %) patients were Graduate and 2 (1.41 %) patients were Illiterate.

Where in Group B – Maximum 41 (41 %) patients were studied up to H.S.C., 39 (39 %) patients were studied up to S.S.C., 15 (15 %) patients were Graduate, and 5 (5 %) patients were Illiterate.

Graph 4.10: Education wise distribution

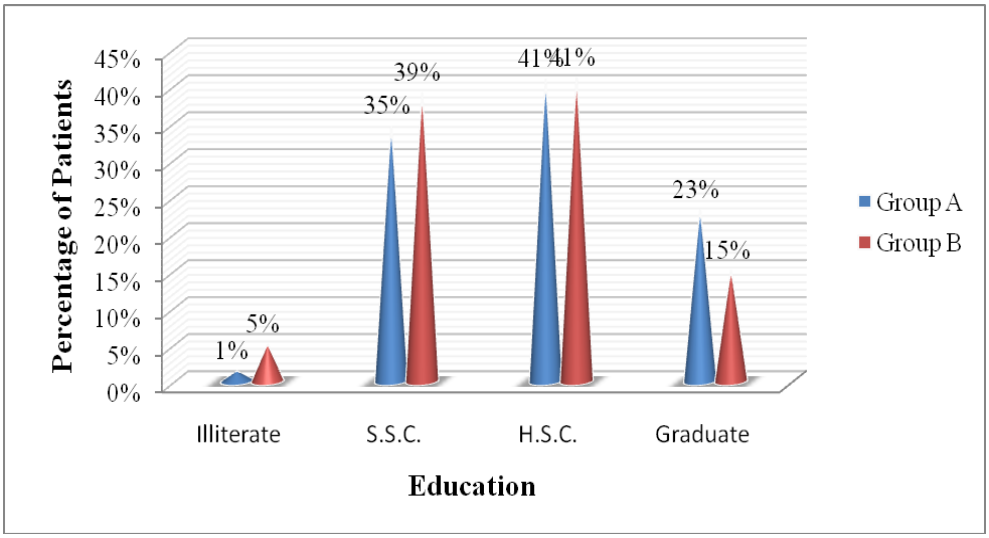


Table 4.11: Type of Hearing Loss wise distribution

Type of Hearing Loss	Group (A)		Group (B)		Total	
	No. of patients	Percen tage	No. of patients	Percen tage	No. of patients	Percen tage
Conductive	0	0.00%	0	0.00%	0	0.00%
SN	142	100.00%	100	100.00%	242	100.00%
Mixed	0	0.00%	0	0.00%	0	0.00%
Total	142	100 %	100	100 %	242	100 %

The above table shows that –

In Group A and Group B – all 142 (100 %) patients in Group A and 100 (100 %) in Group B were having sensory type of Hearing Loss.

Graph 4.11: Type of Hearing Loss wise distribution

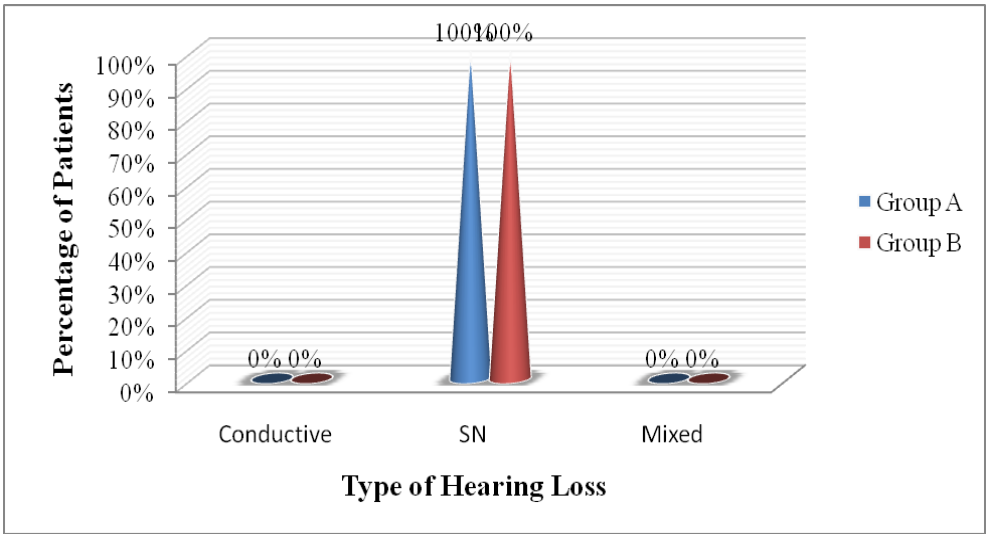


Table 4.12: Degree of Hearing Loss (Right and Left Ear) wise distribution

Degree of Hearing Loss	Group (A)		Group (B)		Total	
	No. of patients	Percen tage	No. of patients	Percen tage	No.of patients	Percen tage
Mild	0	0.00%	0	0.00%	0	0.00%
Moderate	142	100.00%	100	100.00%	242	100.00%
Total	142	100 %	100	100 %	242	100 %

The above table shows that –

In Group A and Group B – all 142 (100 %) patients in Group A and 100 (100 %) in Group B were having moderate degree of Hearing Loss in Right and Left ear.

Graph 4.12: Degree of Hearing Loss (Right and Left Ear) wise distribution

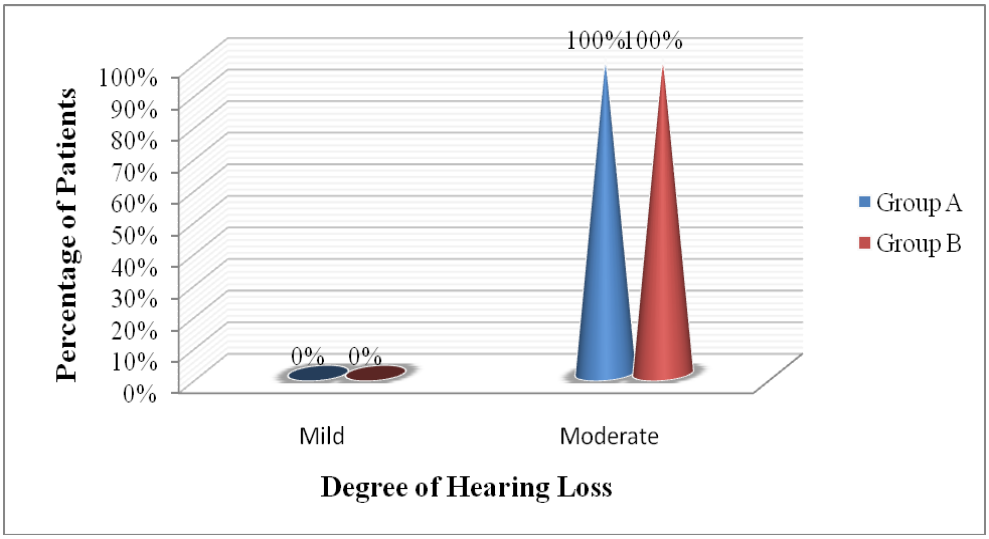


Table 4.13: Duration to Exposure (in years) wise distribution

Duration to Exposure	Group (A)		Group (B)		Total	
	No. of patients	Percen tage	No. of patients	Percen tage	No. of patients	Percen tage
1 to 10	78	54.93%	46	46.00%	124	51.24%
11 to 20	61	42.96%	47	47.00%	108	44.63%
21 to 30	3	2.11%	7	7.00%	10	4.13%
Total	142	100 %	100	100 %	242	100 %

χ^2_{cal} = 4.51 χ^2_{tab} = 5.99 p > 0.05

Here $\chi^2_{cal} < \chi^2_{table}$ i.e. χ^2 test was insignificant, it means observation in both groups were at baseline i.e. there was no difference in Duration to exposure wise selection of patients in both groups.

The above table shows that –

In Group A – Maximum 78 (54.93 %) patients were having duration to exposure in between 1 to 10 years, 61 (42.96 %) patients were having duration to exposure in between 11 to 20 years and 3 (2.11 %) patients were having duration to exposure in between 21 to 30 years.

Where in Group B – Maximum 47 (47 %) patients were having duration to exposure in between 11 to 20 years, 46 (46 %) patients were having duration to exposure in between 1 to 10 years and 7 (7 %) patients were having duration to exposure in between 21 to 30 years.

Graph 4.13: Duration to Exposure (in years) wise distribution

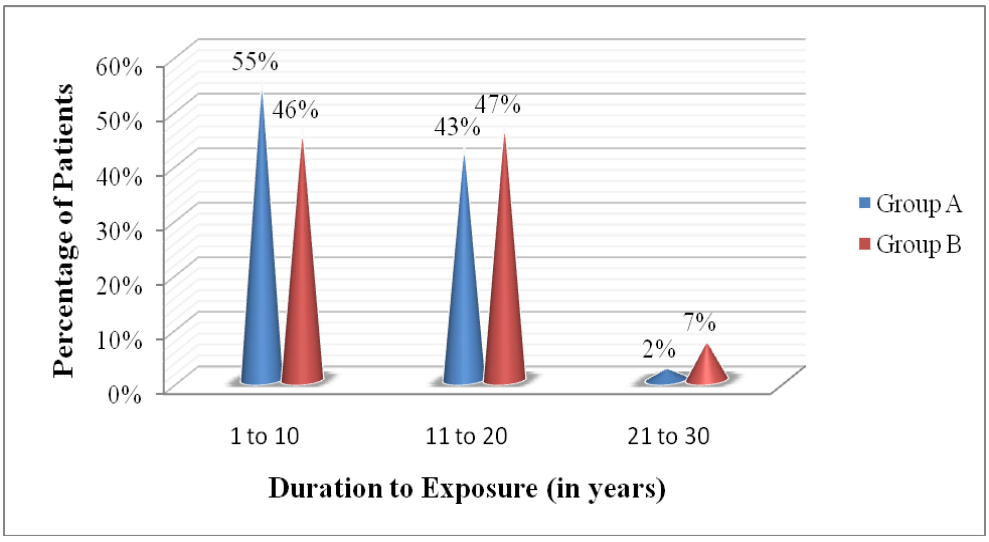


Table 4.14: Using any Aid wise distribution

Using any Aid	Group (A)		Group (B)		Total	
	No. of patients	Percen tage	No. of patients	Percen tage	No.of patients	Percen Tage
No Protective Aid	65	45.77%	31	31.00%	96	39.67%
Protective Aid	77	54.23%	69	69.00%	146	60.33%
Total	142	100 %	100	100 %	242	100 %

χ^2_{cal} = 3.35 χ^2_{tab} = 3.84 p > 0.05

Here $\chi^2_{cal} < \chi^2_{table}$ i.e. χ^2 test was insignificant, it means observation in both groups were at baseline i.e. there was no difference in Duration to exposure wise selection of patients in both groups.

The above table shows that –

In Group A – Maximum 77 (54.23 %) patients were using Protective Aid and 65 (45.77 %) patients were not using any Protective Aid.

Where in Group B – Maximum 69 (69 %) patients were using Protective Aid and 31 (31 %) patients were not using any Protective Aid.

Graph 4.14: Using any Aid wise distribution

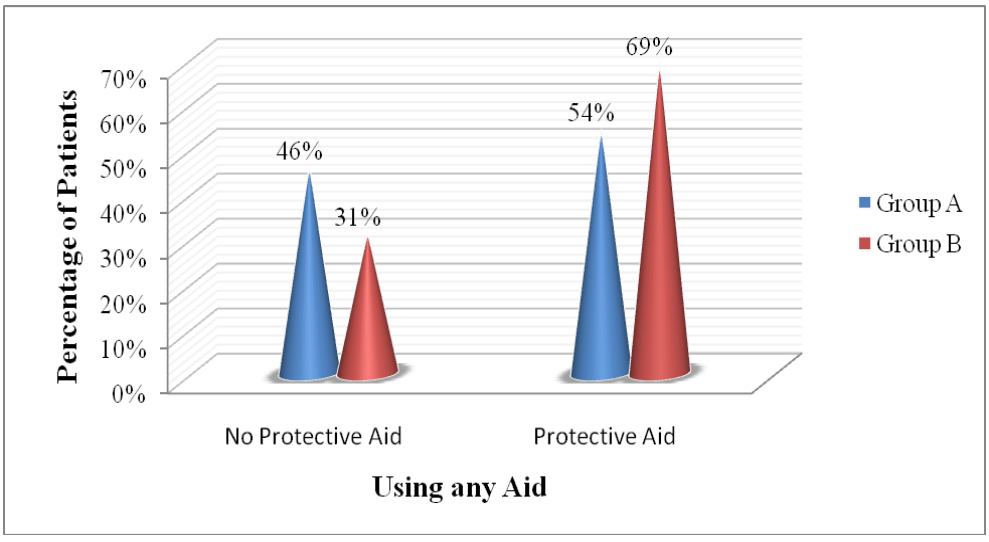


Table 4.15: Etiological Factor wise distribution

Etiological Factor	Group (A)		Group (B)		Total	
	No. of patients	Percen tage	No. of patients	Percen tage	No.of patients	Percen tage
Exposure to Noise	142	100%	100	100%	242	100%
Total	142	100 %	100	100 %	242	100 %

The above table shows that –

In Group A and Group B – all 142 (100 %) patients in Group A and 100 (100 %) patients in Group B were having Exposure to noise as an etiological factor.

Graph 4.15: Etiological Factor wise distribution

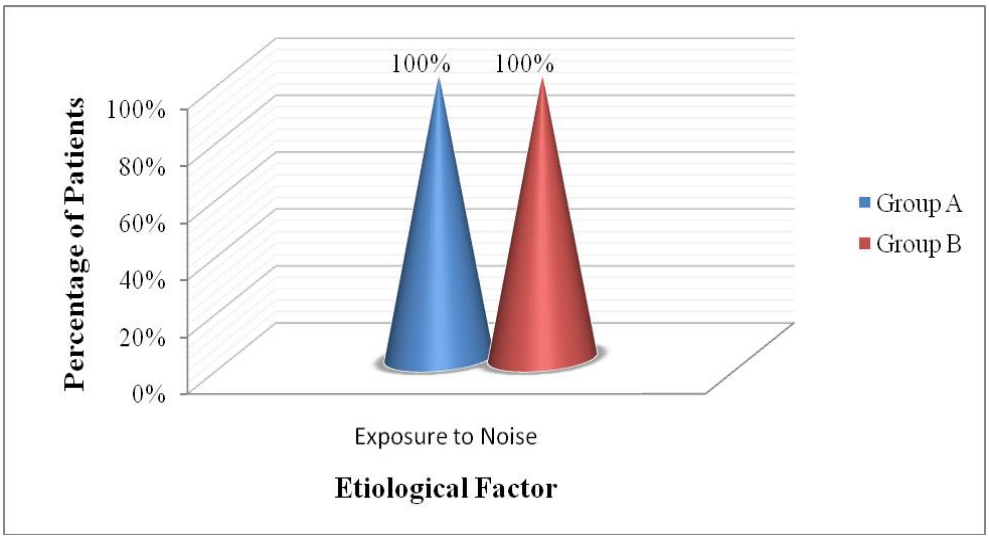


Table 4.16: Sleep wise distribution

Sleep	Group A		Group B		Total	
	No. of patients	Percen tage	No. of patients	Percen tage	No. of patients	Percen tage
Normal	51	35.92%	42	42.00%	93	38.43%
Delayed	57	40.14%	31	31.00%	88	36.36%
Disturbed	34	23.94%	27	27.00%	61	25.21%
Total	142	100%	100	100%	242	100%

χ^2_{cal} = 2.13 χ^2_{tab} = 5.99 p > 0.05

Here $\chi^2_{cal} < \chi^2_{table}$ i.e. χ^2 test was insignificant, it means observation in both groups were at baseline i.e. there was no difference in Sleep wise selection of patients in both groups.

The above table revels that –

In Group A – Maximum 57 (40.14 %) patients were having delayed sleep, 51 (35.29 %) patients were having normal sleep and 34 (23.94 %) patients were having disturbed sleep.

In Group B – Maximum 42 (42 %) patients were having normal sleep, 31 (31 %) patients were having delayed sleep and 27 (27 %) patients were having disturbed sleep.

Graph 4.16: Sleep wise distribution

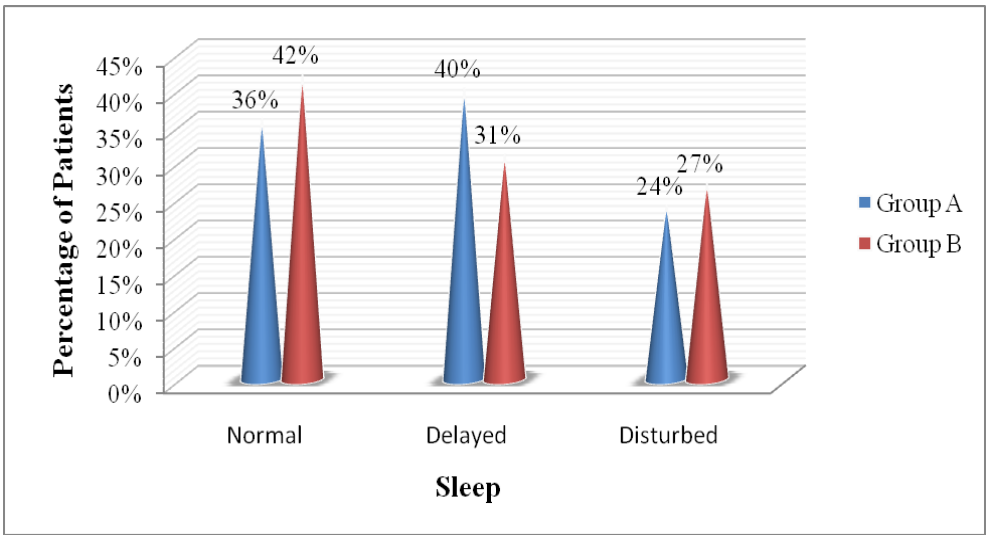


Table 4.17: Emotional Make-Up wise distribution

Emotional Make-Up	Group A		Group B		Total	
	No. of patients	Percen tage	No. of patients	Percen tage	No. of patients	Percen tage
Normal	52	36.62%	33	33.00%	85	35.12%
Anxiety	37	26.06%	30	30.00%	67	27.69%
Depression	20	14.08%	15	15.00%	35	14.46%
Jolly	33	23.24%	22	22.00%	55	22.73%
Total	142	100%	100	100%	242	100%

χ^2_{cal} = 0.622 χ^2_{tab} = 7.83 p > 0.05

Here $\chi^2_{cal} < \chi^2_{table}$ i.e. χ^2 test was insignificant, it means observation in both groups were at baseline i.e. there was no difference in emotional make-up wise selection of patients in both groups.

The above table revels that –

In Group A – Maximum 52 (36.62 %) patients were having normal emotional make-up, 37 (26.06 %) patients were Anxious, 33 (23.24 %) patients were having Jolly emotional make-up and 20 (14.08 %) patients were having depression emotional make-up.

In Group B – Maximum 33 (33 %) patients were having normal emotional make-up, 30 (30 %) patients were Anxious, 22 (22 %) patients were having Jolly emotional make-up and 15 (15 %) patients were having depression emotional make-up.

Graph 4.17: Emotional Make-Up wise distribution

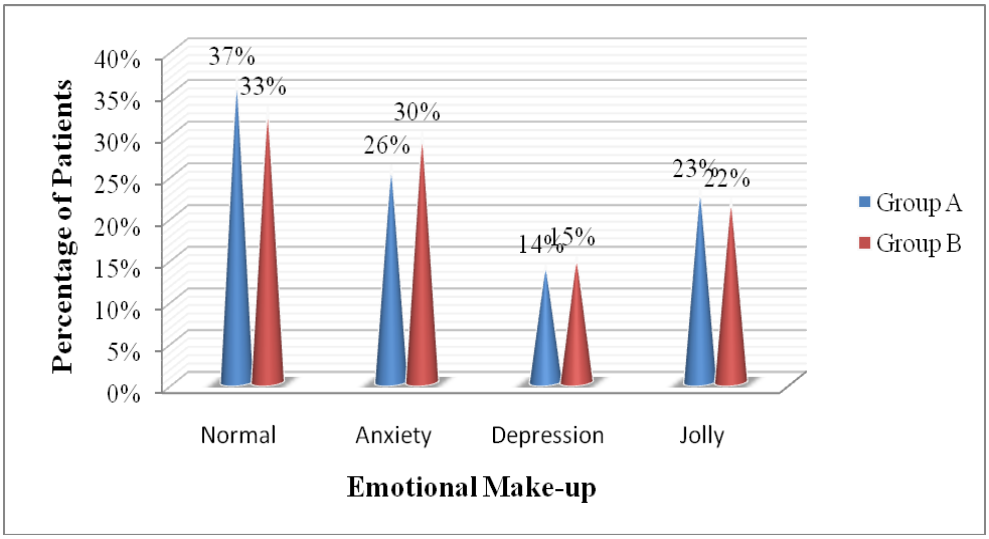


Table 4.18: Prakruti wise distribution

Prakruti	Group (A)		Group (B)		Total	
	No. of patients	Percen tage	No. of patients	Percen tage	No. of patients	Percen tage
VP	32	22.54%	25	25.00%	57	23.55%
VK	17	11.97%	10	10.00%	27	11.16%
PV	20	14.08%	22	22.00%	42	17.36%
PK	26	18.31%	8	8.00%	34	14.05%
KV	17	11.97%	15	15.00%	32	13.22%
KP	30	21.13%	20	20.00%	50	20.66%
Total	142	100%	100	100%	242	100%

χ^2_{cal} = 7.35 χ^2_{tab} = 11.07 p > 0.05

Here $\chi^2_{cal} < \chi^2_{table}$ i.e. χ^2 test was insignificant, it means observation in both groups were at baseline i.e. there was no difference in prakruti wise selection of patients in both groups.

The present study reveals that –

In Group A – maximum 30 (21.13 %) patients were having Kapha-Pitta Prakruti, followed by 26 (18.31 %) patients were having Pitta-Kapha Prakruti, 21 (14.79 %) patients were having Vata-Pitta Prakruti, 20 (14.08 %) patients were having Pitta-Vata Prakruti, 17 (11.97 %) patients were having Vata-Kapha Prakruti and another 17 (11.97 %) patients were having Kapha-Vata Prakruti.

In Group B – maximum 25 (25 %) patients were having Vata-Pitta Prakruti, followed by 22 (22 %) patients were having Pitta-Vata Prakruti, 20 (20 %) patients were having Kapha-Pitta Prakruti, 15 (15 %) patients were having Kapha-Pitta Prakruti, 10 (10 %) patients were having Vata-Kapha Prakruti and 8 (8 %) patients were having Pitta-Kapha Prakruti.

Graph 4.18: Prakruti wise distribution

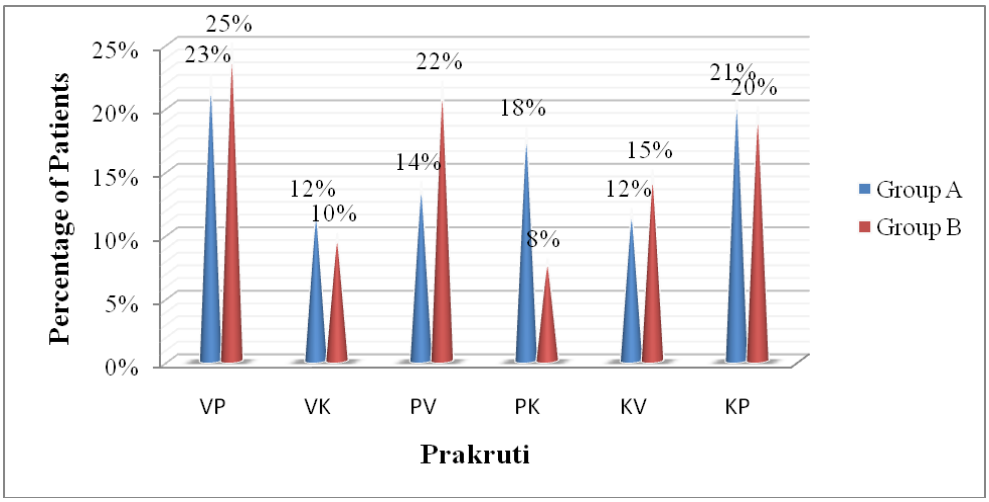


Table 4.19: Addiction wise distribution

Addiction	Group A		Group B		Total	
	No. of patients	Percen tage	No. of patients	Percen tage	No. of patients	Percen tage
Tobacco	34	23.94%	31	31.00%	65	26.86%
Smoking	25	17.61%	20	20.00%	45	18.60%
Alcohol	49	34.51%	19	19.00%	68	28.10%
No	34	23.94%	30	30.00%	64	26.45%
Total	142	100%	100	100%	242	100%

χ^2_{cal} = 7.10 χ^2_{tab} = 7.83 p > 0.05

Here $\chi^2_{cal} < \chi^2_{table}$ i.e. χ^2 test was insignificant, it means observation in both groups were at baseline i.e. there was no difference in addiction wise selection of patients in both groups.

The above table revels that –

In Group A – Maximum 49 (34.51 %) patients were having addiction of Alcohol, 34 (23.94 %) patients were having addiction of Tobacco, another 34 (23.94 %) patients were not having any type addiction and 25 (17.61 %) patients were having addiction of Smoking.

In Group B – Maximum 31 (31 %) patients were having addiction of Tobacco, 30 (30 %) patients were not having any type of addiction, 20 (20 %) patients were having addiction of Smoking and 19 (19 %) patients were having addiction of Alcohol.

Graph 4.19: Addiction wise distribution

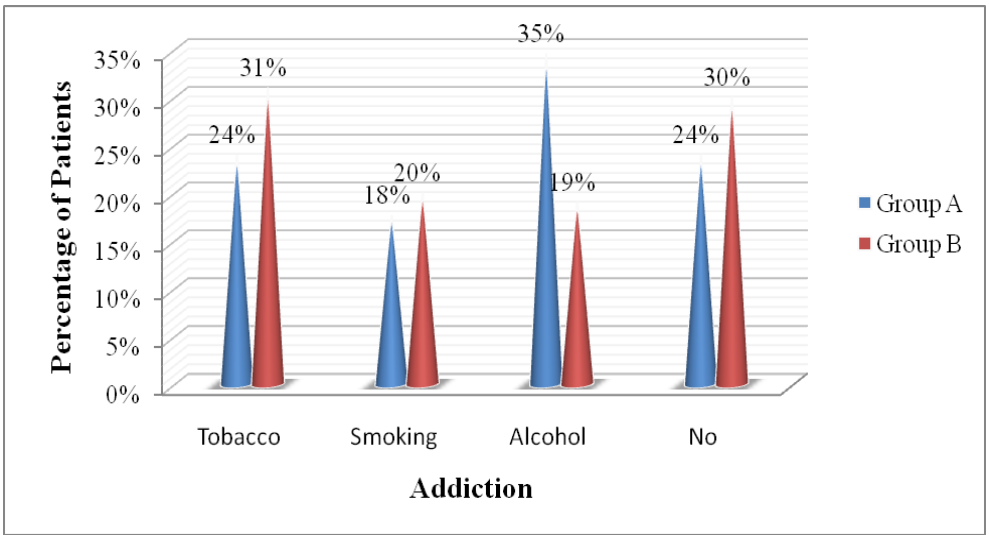


Table 4.20: Diet wise distribution

Diet	Group A		Group B		Total	
	No. of patients	Percen tage	No. of patients	Percen tage	No. of patients	Percen tage
Pure Vegetarian	36	25.35%	19	19.00%	55	22.73%
Mixed	106	74.65%	81	81.00%	187	77.27%
Total	142	100%	100	100%	242	100%

χ^2_{cal} = 1.34 χ^2_{tab} = 3.84 p > 0.05

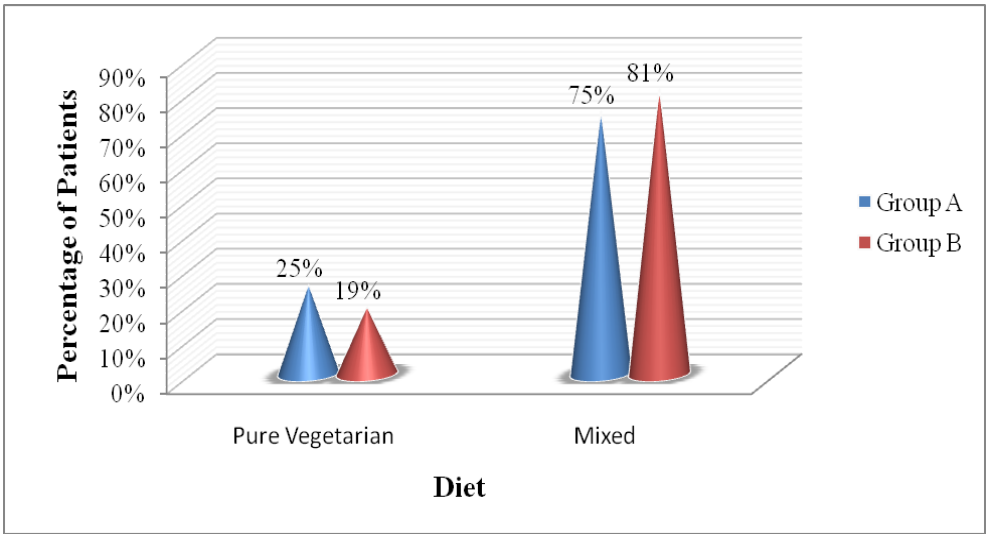
Here $\chi^2_{cal} < \chi^2_{table}$ i.e. χ^2 test was insignificant, it means observation in both groups were at baseline i.e. there was no difference in diet wise selection of patients in both groups.

The above table revels that –

In Group A – Maximum 106 (74.65 %) patients were having Mixed type of diet and 36 (25.35 %) patients were Pure vegetarian.

In Group B – Maximum 81 (81 %) patients were having Mixed type of diet and 19 (19 %) patients were Pure vegetarian.

Graph 4.20: Diet wise distribution



EFFECT OF THERAPIES:

Group A - Effect of Asthimajjapachak Kashay Guggulwati:

In this group, 142 patients of Karnbadhirya (noise induced sudden sensory neural hearing loss) completed the full course of treatment and so the effect of Group A therapy quoted from here onwards.

Statistical Analysis:

The null hypothesis, H_0:

The effect of treatment on all symptoms in Asthimajjapachak Kashay Guggulwati (Group A) is not significant.

The alternate hypothesis, H_a:

The effect of treatment on all symptoms in Asthimajjapachak Kashay Guggulwati (Group A) is significant.

All the values in following tables are calculated by applying Chi Square test and student's t – Paired t test. Statistical analysis of every symptom is described separately in the following tables.

2 by 3 contingency table is made for testing efficacy of Karnbadhirya (Deafness).

Table 4.21: Chi square table – Karnbadhirya (Deafness) – Right Ear

		BT	AT
Karnbadhirya (Deafness) Right Ear	No	0	26
	Mild	0	116
	Moderate	142	0
Total		142	142

Chi square (χ^2) value of the above table is 286.

Degrees of freedom (df) = (Column – 1) (Row – 1)
= (2 – 1) (3 – 1)
= (1) (2)
= 2

Chi square (χ^2) tabulated value of df = 2 is 5.99 at $P<0.05$ i.e. at 95 % level of significance.

As the calculated chi square (χ^2) value is higher than the tabulated (χ^2) value, we should reject the null hypothesis and accept the alternate hypothesis for Karnbadhirya (Deafness) – Right ear in Group A.

Table 4.22: Chi square table – Karnbadhirya (Deafness) – Left Ear

		BT	AT
Karnbadhirya (Deafness) Left Ear	No	0	28
	Mild	0	114
	Moderate	142	0
Total		142	142

Chi square (χ^2) value of the above table is 284.

Degrees of freedom (df) = (Column – 1) (Row – 1)
= (2 – 1) (3 – 1)
= (1) (2)
= 2

Chi square (χ^2) tabulated value of df = 2 is 5.99 at P<0.05 i.e. at 95 % level of significance.

As the calculated chi square (χ^2) value is higher than the tabulated (χ^2) value, we should reject the null hypothesis and accept the alternate hypothesis for Karnbadhirya (Deafness) – Left ear in Group A.

Table 4.23: Audiometry – Right Ear – 500 Frequency

Symptom	Audiometry – Right Ear – 500 Frequency
Mean Score, B.T.	44.89
Mean Score, A.T.	26.79
S.D. (±)	7.50
S.E. (±)	0.63
t	28.74
P	<0.05
Result	Significant

As the t value calculated is greater than the t tabulated value at p=0.05, we should reject the null hypothesis H_0 and accept the alternate hypothesis H_a for Audiometry – Right Ear – 500 Frequency in Group A.

Table 4.24: Audiometry – Right Ear – 1000 Frequency

Symptom	Audiometry – Right Ear – 1000 Frequency
Mean Score, B.T.	44.15
Mean Score, A.T.	27.78
S.D. (±)	4.42
S.E. (±)	0.37
t	44.12
P	<0.05
Result	Significant

As the t value calculated is greater than the t tabulated value at p=0.05, we should reject the null hypothesis H_0 and accept the alternate hypothesis H_a for Audiometry – Right Ear – 1000 Frequency in Group A.

Table 4.25: Audiometry – Right Ear – 2000 Frequency

Symptom	Audiometry – Right Ear – 2000 Frequency
Mean Score, B.T.	44.33
Mean Score, A.T.	27.00
S.D. (±)	6.00
S.E. (±)	0.50
t	34.38
P	<0.05
Result	Significant

As the t value calculated is greater than the t tabulated value at p=0.05, we should reject the null hypothesis H_0 and accept the alternate hypothesis H_a for Audiometry – Right Ear – 2000 Frequency in Group A.

Table 4.26: Audiometry – Left Ear – 500 Frequency

Symptom	Audiometry – Left Ear – 500 Frequency
Mean Score, B.T.	43.62
Mean Score, A.T.	27.71
S.D. (±)	4.32
S.E. (±)	0.36
t	43.90
P	<0.05
Result	Significant

As the t value calculated is greater than the t tabulated value at p=0.05, we should reject the null hypothesis H_0 and accept the alternate hypothesis H_a for Audiometry – Left Ear – 500 Frequency in Group A.

Table 4.27: Audiometry – Left Ear – 1000 Frequency

Symptom	Audiometry – Left Ear – 1000 Frequency
Mean Score, B.T.	44.22
Mean Score, A.T.	28.87
S.D. (+)	4.06
S.E. (+)	0.34
t	44.98
P	<0.05
Result	Significant

As the t value calculated is greater than the t tabulated value at p=0.05, we should reject the null hypothesis H_0 and accept the alternate hypothesis H_a for Audiometry – Left Ear – 1000 Frequency in Group A.

Table 4.28: Audiometry – Left Ear – 2000 Frequency

Symptom	Audiometry – Left Ear – 2000 Frequency
Mean Score, B.T.	44.12
Mean Score, A.T.	29.93
S.D. (+)	3.70
S.E. (+)	0.31
t	45.68
P	<0.05
Result	Significant

As the t value calculated is greater than the t tabulated value at p=0.05, we should reject the null hypothesis H_0 and accept the alternate hypothesis H_a for Audiometry – Left Ear – 2000 Frequency in Group A.

Conclusion - Group A:

The effect of **Asthimajjapachak Kashay Guggulwati (Group A)** is significant at $p<0.05$ for Karnbadhirya (Deafness) Right Ear and Left Ear.

Asthimajjapachak Kashay Guggulwati (Group A) is found to be statistically significant for objective criteria such as Audiometry over different frequency for Right and Left Ear.

Group B - Effect of Asthimajjapachak Kashay siddha tail Karnpuran:

In this group, 100 patients of Karnbadhirya (noise induced sudden sensory neural hearing loss) completed the full course of treatment and so the effect of Group B therapy quoted from here onwards.

Statistical Analysis:-

The null hypothesis, H_0:

The effect of treatment on all symptoms in Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is not significant.

The alternate hypothesis H_a:

The effect of treatment on all symptoms in Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant.

All the values in following tables are calculated by applying Chi Square test and student's t – Paired t test. Statistical analysis of every symptom is described separately in the following tables.

2 by 3 contingency table is made for testing efficacy of Karnbadhirya (Deafness).

Table 4.29: Chi square table – Karnbadhirya (Deafness) – Right Ear

		BT	AT
Karnbadhirya (Deafness) Right Ear	No	0	30
	Mild	0	70
	Moderate	100	0
Total		100	100

Chi square (χ^2) value of the above table is 200.

Degrees of freedom (df) = (Column – 1) (Row – 1)
= (2 – 1) (3 – 1)
= (1) (2)
= 2

Chi square (χ^2) tabulated value of df = 2 is 5.99 at $P<0.05$ i.e. at 95 % level of significance.

As the calculated chi square (χ^2) value is higher than the tabulated (χ^2) value, we should reject the null hypothesis and accept the alternate hypothesis for Karnbadhirya (Deafness) – Right ear in Group B.

Table 4.30: Chi square table – Karnbadhirya (Deafness) – Left Ear

		BT	AT
Karnbadhirya (Deafness) Left Ear	No	0	49
	Mild	0	51
	Moderate	100	0
Total		100	100

Chi square (χ^2) value of the above table is 200.

Degrees of freedom (df) = (Column – 1) (Row – 1)
= (2 – 1) (3 – 1)
= (1) (2)
= 2

Chi square (χ^2) tabulated value of df = 2 is 5.99 at P<0.05 i.e. at 95 % level of significance.

As the calculated chi square (χ^2) value is higher than the tabulated (χ^2) value, we should reject the null hypothesis and accept the alternate hypothesis for Karnbadhirya (Deafness) – Left ear in Group B.

Table 4.31: Audiometry – Right Ear – 500 Frequency

Symptom	Audiometry – Right Ear – 500 Frequency
Mean Score, B.T.	44.75
Mean Score, A.T.	23.55
S.D. (±)	6.2
S.E. (±)	0.62
t	34.19
P	<0.05
Result	Significant

As the t value calculated is greater than the t tabulated value at p=0.05, we should reject the null hypothesis H_0 and accept the alternate hypothesis H_a for Audiometry – Right Ear – 500 Frequency in Group B.

Table 4.32: Audiometry – Right Ear – 1000 Frequency

Symptom	Audiometry – Right Ear – 1000 Frequency
Mean Score, B.T.	43.25
Mean Score, A.T.	24.55
S.D. (±)	9.09
S.E. (±)	0.909
t	20.57
P	<0.05
Result	Significant

As the t value calculated is greater than the t tabulated value at p=0.05, we should reject the null hypothesis H_0 and accept the alternate hypothesis H_a for Audiometry – Right Ear – 1000 Frequency in Group B.

Table 4.33: Audiometry – Right Ear – 2000 Frequency

Symptom	Audiometry – Right Ear – 2000 Frequency
Mean Score, B.T.	44.70
Mean Score, A.T.	22.65
S.D. (±)	4.61
S.E. (±)	0.46
t	47.82
P	<0.05
Result	Significant

As the t value calculated is greater than the t tabulated value at p=0.05, we should reject the null hypothesis H_0 and accept the alternate hypothesis H_a for Audiometry – Right Ear – 2000 Frequency in Group B.

Table 4.34: Audiometry – Left Ear – 500 Frequency

Symptom	Audiometry – Left Ear – 500 Frequency
Mean Score, B.T.	45.00
Mean Score, A.T.	22.90
S.D. (±)	5.69
S.E. (±)	0.56
t	38.81
P	<0.05
Result	Significant

As the t value calculated is greater than the t tabulated value at p=0.05, we should reject the null hypothesis H_0 and accept the alternate hypothesis H_a for Audiometry – Left Ear – 500 Frequency in Group B.

Table 4.35: Audiometry – Left Ear – 1000 Frequency

Symptom	Audiometry – Left Ear – 1000 Frequency
Mean Score, B.T.	45.00
Mean Score, A.T.	22.95
S.D. (±)	5.17
S.E. (±)	0.51
t	42.58
P	<0.05
Result	Significant

As the t value calculated is greater than the t tabulated value at p=0.05, we should reject the null hypothesis H_0 and accept the alternate hypothesis H_a for Audiometry – Left Ear – 1000 Frequency in Group B.

Table 4.36: Audiometry – Left Ear – 2000 Frequency

Symptom	Audiometry – Left Ear – 2000 Frequency
Mean Score, B.T.	45.20
Mean Score, A.T.	25.35
S.D. (±)	6.75
S.E. (±)	0.67
t	29.36
P	<0.05
Result	Significant

As the t value calculated is greater than the t tabulated value at p=0.05, we should reject the null hypothesis H_0 and accept the alternate hypothesis H_a for Audiometry – Left Ear – 2000 Frequency in Group B.

Conclusion – Group B:

The effect of **Asthimajjapachak Kashay siddha tail Karnpuran (Group B)** is significant at $p<0.05$ for Karnbadhirya (Deafness) Right Ear and Left Ear.

Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is found to be statistically significant for objective criteria such as Audiometry over different frequency for Right and Left Ear.

COMPARATIVE ANALYSIS:

Statistical Analysis:

The null hypothesis, H_0:

- One sided

There is no significant difference between effect of Asthimajjapachak Kashay Guggulwati (Group A) and Asthimajjapachak Kashay siddha tail Karnpuran (Group B) in all symptoms.

- Two sided

The effect of treatment on all symptoms in Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is not significant than in Asthimajjapachak Kashay Guggulwati (Group A).

The alternate hypothesis H_a:

- One sided

There is a significant difference between effect of Asthimajjapachak Kashay Guggulwati (Group A) and Asthimajjapachak Kashay siddha tail Karnpuran (Group B) in all symptoms.

- Two sided

The effect of treatment on all symptoms in Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant than in Asthimajjapachak Kashay Guggulwati (Group A).

All the values in following tables are calculated by applying Chi Square test and student's t – Unpaired t test. Let us see the statistical analysis for every symptom separately.

Table 4.37: Chi square table – Karnbadhirya (Deafness) – Right Ear

		AT	
		Group A	Group B
Karnbadhirya (Deafness) Right Ear	No	26	30
	Mild	116	70
Total		142	100

Chi square (χ^2) value of the above table is 4.50.

Degrees of freedom (df) = (Column – 1) (Row – 1)
= (2 – 1) (2 – 1)
= (1) (1)
= 1

Chi square (χ^2) tabulated value of df = 1 is 3.84 at P<0.05 i.e. at 95 % level of significance.

As the calculated chi square (χ^2) value is higher than the tabulated (χ^2) value, we reject the null hypothesis and accept the alternate hypothesis i.e. Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant than Asthimajjapachak Kashay Guggulwati (Group A) for Karnbadhirya (Deafness) – Right ear.

Graph 4.21: Karnbadhirya (deafness) – Right Ear – AT

according to Table 4.21 and 4.29

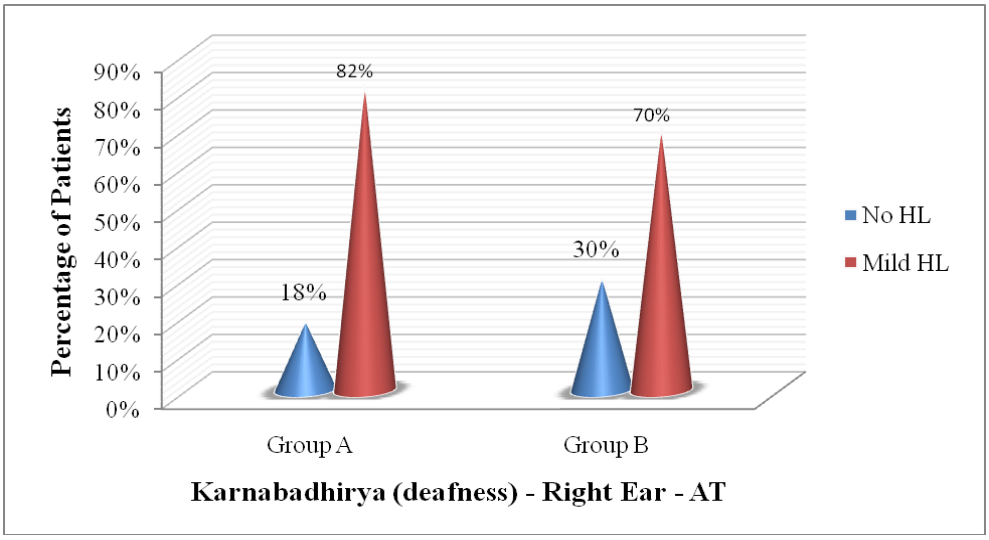


Table 4.38: Chi square table – Karnbadhirya (Deafness) – Left Ear

		AT	
		Group A	Group B
Karnbadhirya (Deafness) Right Ear	No	28	49
	Mild	114	51
Total		142	100

Chi square (χ^2) value of the above table is 23.19.

Degrees of freedom (df) = (Column – 1) (Row – 1)
= (2 – 1) (2 – 1)
= (1) (1)
= 1

Chi square (χ^2) tabulated value of df = 1 is 3.84 at P<0.05 i.e. at 95 % level of significance.

As the calculated chi square (χ^2) value is higher than the tabulated (χ^2) value, we reject the null hypothesis and accept the alternate hypothesis i.e. Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant than Asthimajjapachak Kashay Guggulwati (Group A) for Karnbadhirya (Deafness) – Left ear.

Graph 4.22: Karnbadhirya (deafness) – Left Ear – AT

according to Table 4.22 and 4.30

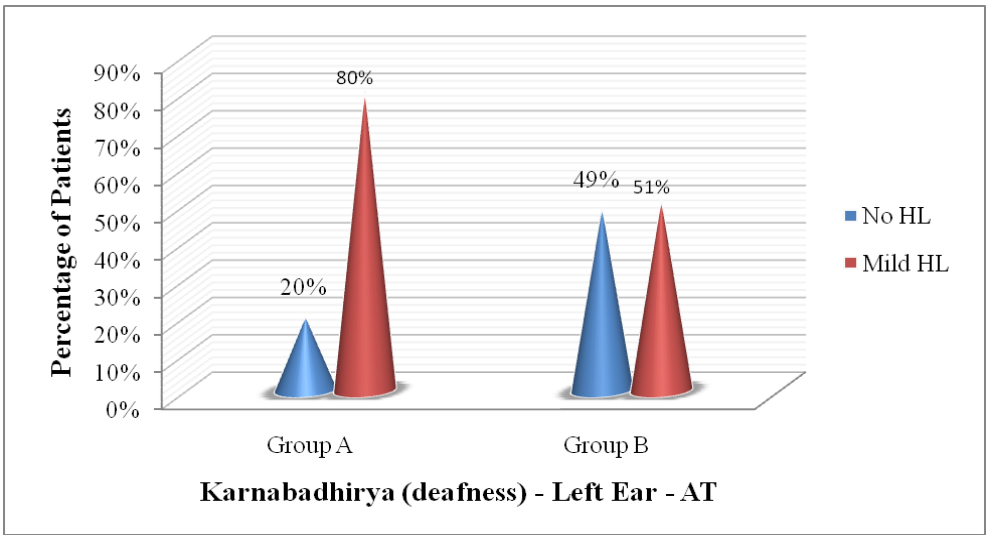


Table 4.39: Audiometry – Right Ear – 500 Frequency

Symptom	Audiometry – Right Ear – 500 Frequency
Mean Difference Score, Group A	18.09
Mean Difference Score, Group B	21.20
Combined S.D. (±)	6.99
S.E. (±)	0.913
t	3.39
P	<0.05
Result	Significant

As the t value calculated is greater than the t tabulated value at p=0.05, where df = 240, we reject the null hypothesis and accept the alternate hypothesis i.e. Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant than Asthimajjapachak Kashay Guggulwati (Group A) for Audiometry – Right Ear – 500 Frequency.

Graph 4.23: Audiometry – Right Ear – 500 Frequency

according to Table 4.23 and 4.31

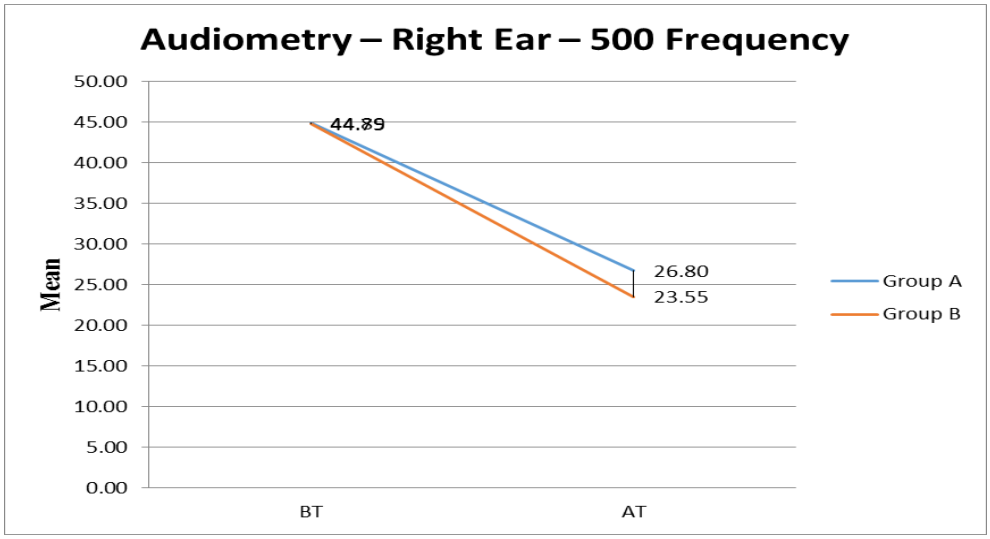


Table 4.40: Audiometry – Right Ear – 1000 Frequency

Symptom	Audiometry – Right Ear – 1000 Frequency
Mean Difference Score, Group A	16.37
Mean Difference Score, Group B	18.70
Combined S.D. (±)	6.75
S.E. (±)	0.88
t	2.64
P	<0.05
Result	Significant

As the t value calculated is greater than the t tabulated value at p=0.05, where df = 240, we reject the null hypothesis and accept the alternate hypothesis i.e. Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant than Asthimajjapachak Kashay Guggulwati (Group A) for Audiometry – Right Ear – 1000 Frequency.

Graph 4.24: Audiometry – Right Ear – 1000 Frequency

according to Table 4.24 and 4.32

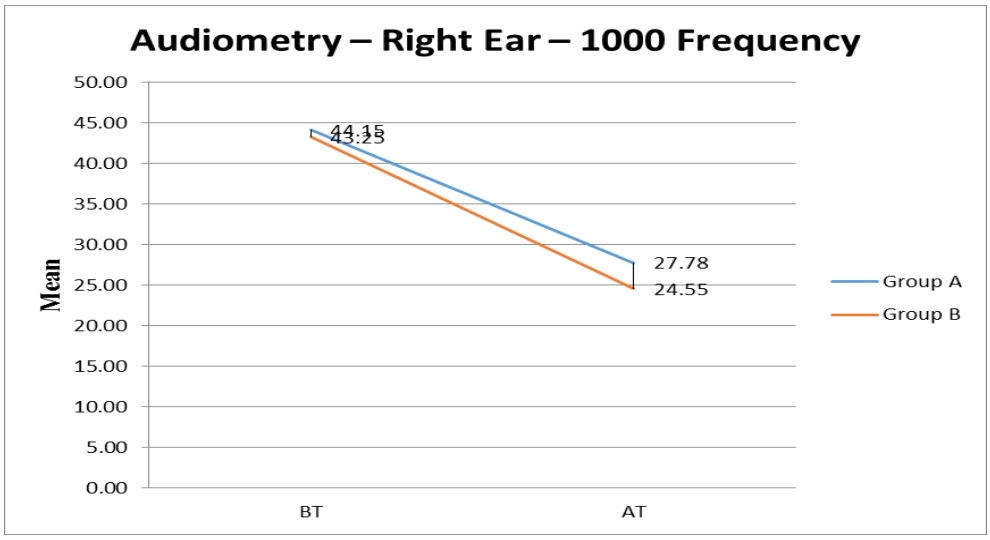


Table 4.41: Audiometry – Right Ear – 2000 Frequency

Symptom	Audiometry – Right Ear – 2000 Frequency
Mean Difference Score, Group A	17.32
Mean Difference Score, Group B	22.05
Combined S.D. (±)	5.47
S.E. (±)	0.71
t	6.61
P	<0.05
Result	Significant

As the t value calculated is greater than the t tabulated value at p=0.05, where df = 240, we reject the null hypothesis and accept the alternate hypothesis i.e. Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant than Asthimajjapachak Kashay Guggulwati (Group A) for Audiometry – Right Ear – 2000 Frequency.

Graph 4.25: Audiometry – Right Ear – 2000 Frequency

according to Table 4.25 and 4.33

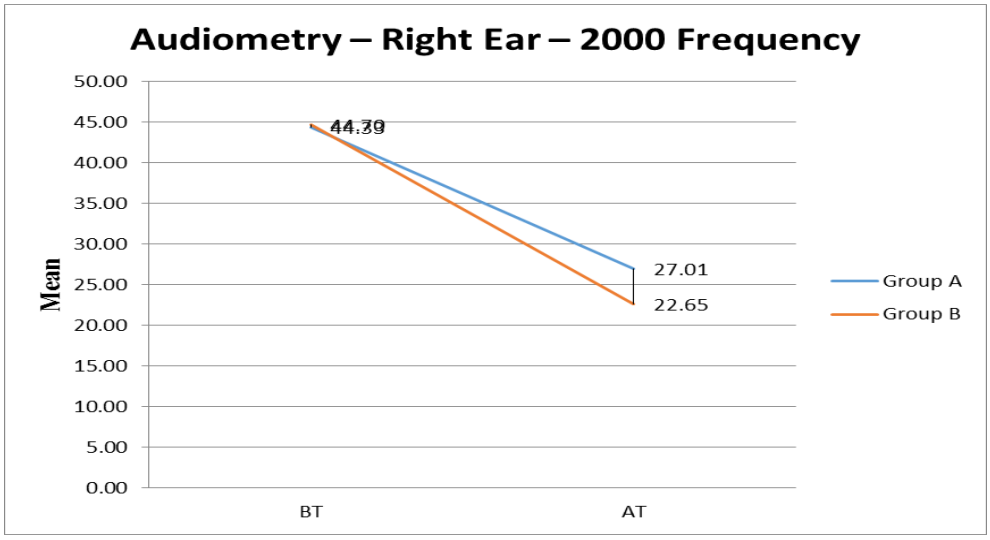


Table 4.42: Audiometry – Left Ear – 500 Frequency

Symptom	Audiometry – Left Ear – 500 Frequency
Mean Difference Score, Group A	15.91
Mean Difference Score, Group B	22.10
Combined S.D. (±)	4.93
S.E. (±)	0.64
t	9.60
P	<0.05
Result	Significant

As the t value calculated is greater than the t tabulated value at p=0.05, where df = 240, we reject the null hypothesis and accept the alternate hypothesis i.e. Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant than Asthimajjapachak Kashay Guggulwati (Group A) for Audiometry – Left Ear – 500 Frequency.

Graph 4.26: Audiometry – Left Ear – 500 Frequency

according to Table 4.26 and 4.34

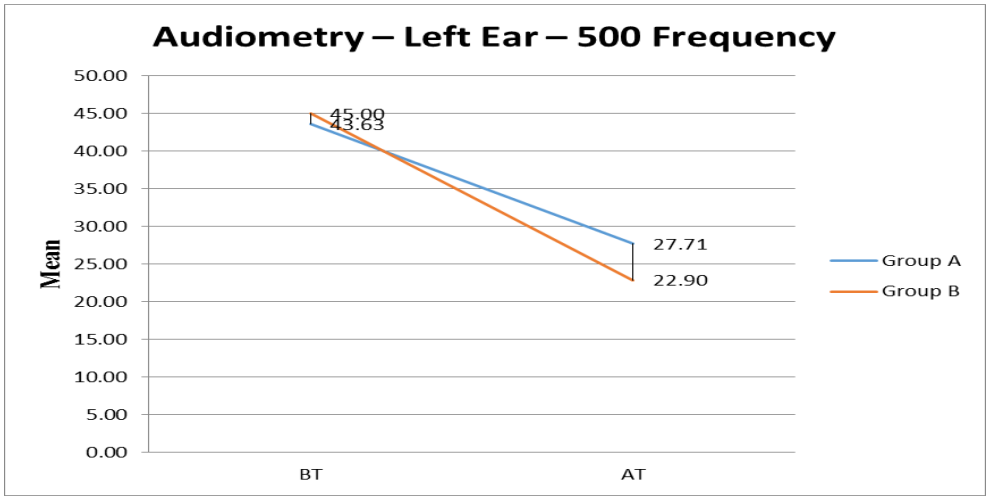


Table 4.43: Audiometry – Left Ear – 1000 Frequency

Symptom	Audiometry – Left Ear – 1000 Frequency
Mean Difference Score, Group A	15.35
Mean Difference Score, Group B	22.05
Combined S.D. (±)	4.55
S.E. (±)	0.59
t	11.25
P	<0.05
Result	Significant

As the t value calculated is greater than the t tabulated value at p=0.05, where df = 240, we reject the null hypothesis and accept the alternate hypothesis i.e. Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant than Asthimajjapachak Kashay Guggulwati (Group A) for Audiometry – Left Ear – 1000 Frequency.

Graph 4.27: Audiometry – Left Ear – 1000 Frequency

according to Table 4.27 and 4.35

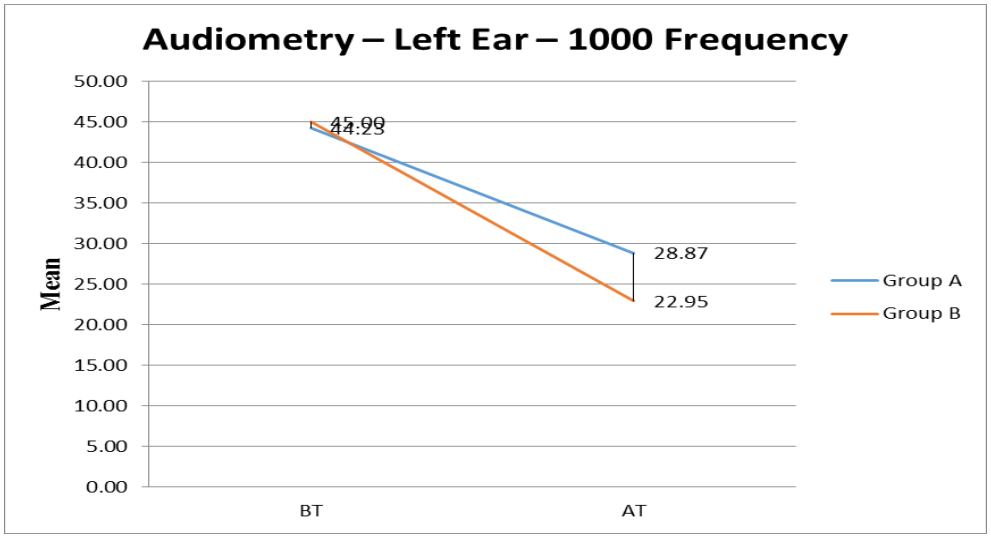


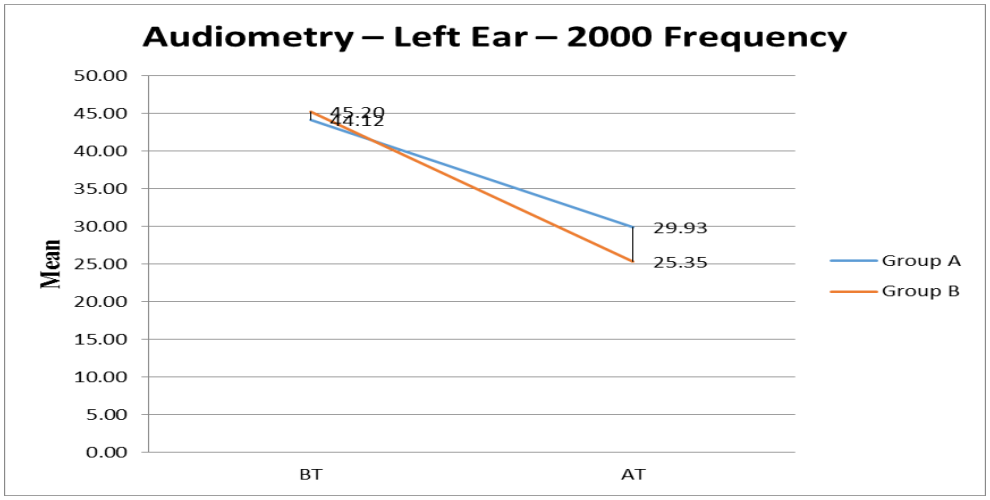
Table 4.44: Audiometry – Left Ear – 2000 Frequency

Symptom	Audiometry – Left Ear – 2000 Frequency
Mean Difference Score, Group A	14.19
Mean Difference Score, Group B	19.85
Combined S.D. (±)	5.18
S.E. (±)	0.67
t	8.36
P	<0.05
Result	Significant

As the t value calculated is greater than the t tabulated value at p=0.05, where df = 240, we reject the null hypothesis and accept the alternate hypothesis i.e. Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant than Asthimajjapachak Kashay Guggulwati (Group A) for Audiometry – Left Ear – 2000 Frequency.

Graph 4.28: Audiometry – Left Ear – 2000 Frequency

according to Table 4.28 and 4.36



Conclusion of Comparative Analysis:

There is no significant difference between effect of Asthimajjapachak Kashay Guggulwati (Group A) and Asthimajjapachak Kashay siddha tail Karnpuran (Group B) for Karnbadhirya (Deafness) Right Ear and Left Ear, where $p>0.05$.

The effect of Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant than Asthimajjapachak Kashay Guggulwati (Group A) for Audiometry – Right Ear and Left Ear at Frequencies 500, 1000 and 2000, where $p<0.05$.

DISCUSSION:

The aim and objective of any research is to reach up to a definite conclusion, by understanding the concepts in their correct manner. Study of any concept under various headings gives its complete knowledge, but correct and complete understanding and proper interpretation of the various concepts helps to reach the goal and discussion plays very important role for the same.

Discussion is the main step in any research. This is the part where scholar and guide kept their views and what they found from whole data. It is the process of examining the facts through their merits and demerits to obtain proper knowledge about facts.

Through discussion we can look back at the problems stated that we face and plan for the future, which can contribute something to the society. . Discussion is the important step which helps in understanding the subject and guides to make a conclusion. In spite of detailed classical study and experimentation, one cannot accept it without proper reasoning of observations. It can either accept the hypothesis or reject it.

As our Acharyas have clearly mentioned in classics without the "Tarka and Yukti" one could not get the principle theme of the work[1]. According to ancient research methodology, Upanayana (Discussion) is the step preceding Nigamana (Conclusion)[2]. Discussion is a process of re-examining the obtained data and which forms the base for conclusion. A theory is accepted only after giving proper reasoning for the gained observations, so discussion is a very important and crucial part of scientific research work. The aim of discussion should not be victory for a research scholar, but it term as a progress of research study. Thereby moving forward, the discussion of this work has been catalogued under specific subtitles.

Ayurveda promotes various treatments for the diseased by giving proper remedy for it and also helps for preserving person's health through regimes which can be followed in daily routine life. The plan of study is to carry out a systematic standardized clinical work, which itself justifies the aim and objectives of any research work. Present work is based on diseases, Karnbadhirya 'where the attempt has been made to compile every aspect of the diseases maintained scientifically and systematically.

The entire discussion can be divided mainly into six parts:

- Discussion on the selection of problem.
- Discussion on conceptual study
- Discussion on drug review.
- Discussion on clinical study.
- Discussion on effect of therapy.
- Probable mode of action of Asthimajjapachak Panch Kashaya Guggulwati and Asthimajjapachak Panch Kashaya Siddha Tail Karnpuran.

Discussion on the selection of the problem:

The existence of Karna Roga and its treatment were available in the Vedic period[3]. Acharya Sushruta has mentioned 28 Karna Rogas and its treatment in detail. Out of them, Karnbadhirya is considered as the most common diseases affecting the function of ear. They can be co-related to Deafness in modern medical literature i.e. loss of hearing in the ear causing great distress and emotional handicap. Deafness can lead to something more than a nuisance to the patient. Modern science does not have promising treatment to cure Deafness hence it only highlights as to reduce the ill effects of Deafness and tinnitus rather than getting rid from it. There are known cases of suicidal attempts by the patients suffering from Deafness and tinnitus. Patients prefer to be deafness rather than having tinnitus.

Badhirya is one of the most common and most prevalent ailments which we come across in medical practice. It is not a disease itself; it is a symptom of many disease conditions for example, age related hearing loss, ear injury or a circulatory system disorder, neurological disorder. In the present day the incidence of badhiryata is increasing due to noisy surroundings, loud and continues noise from professional lifestyle, so it is necessary to find out a remedy for it. Ayurveda gives promising results in treating Deafness and in a few years it will bea leading line of management as compared to the other branches of medicine. Hence, Karnbadhirya (Deafness) was selected for the present study.

As per modern science deafness is easy to diagnose with the help of Audiometry but difficult to treat[4]. Hearing aids are used to reduce its intensity in the patient, but all these gives a temporary relief because of this, the recurrence rate is high and the

modern faculty refers patients for Ayurvedic line of management. Every treatment aspect mentioned for deafness in Ayurveda is found to be cheap and does not have any side effects compared to the present synthetic preparations which have the potential to cause side effects.

Karnbadhirya (Deafness) is one of the most common ENT disorder and it is one of the challenging problems for all ENT specialist, it looks simples but doesn‘t have satisfactory relief for the patients after visiting ENT clinic repeatedly. Pune, Pimpri-Chinchwad is one of the developing industrialized area, so together with other factors the chance of affecting from Deafness and tinnitus is increasing.

The treatment adopted for Karnbadhirya (Deafness) in modern system of medicine does not have fully satisfied remedy. Surgical intervention is rare in such type of cases and it is performed only when complications are observed.[4]

So, looking at the problems and necessity for treating the patients suffering from Karnbadhirya (Deafness), an attempt had been made to reveal the efficacy of Karnpuran in the management of Karnbadhirya (Deafness).

Discussion on conceptual study:

In Ayurvedic classics various terms are used to locate the organ Karna. Detailed anatomical description is not available directly in the classics but we can get the clinical anatomy during the description of Karna Roga, Karna Paalisandhana Vidhi, Karnavedhana Samskaara, etc. Acharya Madhavakara clearly differentiated the terms Shrotra and Karna. Shrotra is an invisible part which is responsible for hearing and covered externally by Karna Shashkuli. Hence to get detailed information about the anatomy and physiology of the ear one must to take help of modern medicine.

Karnbadhirya (Deafness) is the perception of sound within the human ear of corresponding external sound. Karnbadhirya (Deafness) is not a disease, but a symptom that can result from a wide range of underlying causes; as a closely similar entity to Karnbadhirya (Deafness) has been taken for consideration from modern medical sciences aspect. General etiological factors are the excessive useof mobile and headphones, hearing capacity decreases and also causes Karnbadhirya (Deafness). Loud noise exposure, smoking, consumption of alcohol are the common causes of Karnbadhirya (Deafness) today, and it often damages hearing as well. Most

people with Karnbadhirya (Deafness) have some degree of hearing loss,[5] in that they are often unable to hear clearly external sounds that occur within the same range of frequencies as their "phantom sounds".[6] This has led to the suggestion that one cause of tinnitus might be a homeostatic response of central dorsal cochlear nucleus auditory neurons that makes them hyperactive in compensation to auditory input loss.[7]

As Karnbadhirya (Deafness) is usually a false subjective phenomenon, it is difficult to measure using objective tests, such as by comparison with noise of known frequency and intensity, as in an audiometric test. It causes interference with sleep, quiet activities, and normal daily activities.[8] Unfortunately, many people are unconcerned about the harmful effects of excessively loud noise from firearms, high intensity music, or other sources.

Coming on the Nidana aspect, it has been said that the causative factors for the diseases of Karna are responsible for the disease Karnbadhirya (Deafness) as well. Some specific causative factors like Shrama, Kshaya, Kashaya and Ruksha Bhojana, ect. It attributed Vata as the main Dosha responsible for Karnbadhirya (Deafness).

Thus Karnpuran studied in this work, if used daily; could probably prevent or reduce Karnbadhirya (Deafness). The treatment principle explained by our Acharyas is common for Badhirya, Karnanad, Vataja Karnashoola and Karnakshweda. This is probably because all the four are predominantly Vataja Rogas with association of other Doshas and in all these conditions the main factor is reduced blood supply to the inner ear which is treated more effectively by Ayurveda.

In Ashtanga Hriday, Acharya Vagbhata, specifically mentions that if Karnanad is neglected it may lead to Karnbadhirya.

The present study compares Karnbadhirya Deafness which presents as various degrees of hearing loss in the ear. This study was designed in the form of comparative study, in order to compare the efficacy of Karnpuran of asthimajjapachakkashay sidha tail with abhyantartah asthimajjapachak guggul wati..

Discussion on drug review:

Amalaki:

Amalaki has Rasayana, Balya and Indriya balyakara properties thus it can prevent age related degenerative changes in the inner ear.

Amalaki is used as an adaptogen, a substance said to increase the ability to with stand the stress of all types. Like other adaptogens Amalaki is supposed to improve the strength of a particular organ (cochlea and the hearing capacity), overall health, strengthen the immunity. All these properties help in improving the blood supply of the inner ear and reduce the acuity of the deafness felt by the patient.

Amalaki has an anti-oxidant action and produces a sound sleep which is very essential to a person suffering from deafness by doing Karnpuran.

It has been proved that noise exposure is one of the commonest cause for deafness. Amalaki has promising results in reducing the stress caused by noise and also improves the hearing capacity of the individual. Stress is not a direct cause of deafness but it will generally make an already existing case worse.

Nadi balyakara and Indriya balyakara property of Amalaki helps in improving hearing tendency of Karnendriya.

Amruta:

Amruta has Rasayana, Anulomana, Balya and Hrudya properties thus it can prevent age related degenerative changes in the inner ear.

Amruta does shodhana of asthi dhatu because of its Tikta rasa, which is very essential for a person suffering from deafness. Shodhana of asthi dhatu increases hearing capacity of patient.

Amruta is used in dourbalya /kshay so it reduces dourbalya of inner ear.

Musta:

Musta has property of balya for nadi. It reduces kleda because of its tikta, katu rasa, which is very helpful for a person suffering from deafness by increasing hearing tendency.

Tila Tail:

Sesame oil used for Abhyanga and Karnpuran is vat shamak, shodhan.[31]

Magnesium and zinc supplements are helps to restore the stability of inner ear. It may be absorbed by Abhyanga and Karnpuran. Thus Karnpuran is conducive to the nutrition of the skin and the softness of the muscles. It penetrates into the skin quickly and enters the blood stream, through the capillaries and supply nutrition to nerves. It has a unique quality of getting absorbed easily by the pores in the skin and thereby acts as a catalyst.

Guggulu:

Guggulu is vata shamak by virtue of its ushna guna. It is balyakara for nadi, so it helps reducing hearing loss by improving nadi in the karna. Karnbadhirya is vatavyadhi and guggul is shrestha in treating vatavyadhi. Guggul does meda ksharan by its ruksha and vishada guna which is responsible for doing anulomana of medavrutta vata. This action increases hearing tendency.

Karnpuran: Karna is one of the Adhisthana of Vata- Dosha[10] and according to Acharya Charaka, Karnbadhirya is a Vataja NanatmajaVyadhi and mainly Vata predominant causative factors are responsible for Karnanad. Snehana becomes important to control the localized increased Vata Dosha. Bilva has Sothahara, Vedanasthapana, and nutritive action and TilaTaila has Vatashamaka and Nadi Balya properties. Thus, asthimajjapachak tail having Vatashamaka properties which may help to relieve symptoms of disease.

Probable mode of action of Karnpuran:

The disease Karnbadhirya is Vata dominant and so compound drug employed should also have Vatashamaka qualities, so that it can counteract vitiated Doshas to disintegrate the pathology of the disease.

Asthimajjapachak Kashay siddha tail Karnpuran:

It is hypothesized that Asthimajjapachak Kashay siddha tail helps in the absorption through epithelial tissue of external ear canal and tympanic membrane that can maintain normal function of hearing and equilibrium.

Spread of the drug into the deeper tissues through (Rasa & Rakta) Shabdavaha Sira.

Karnpuran will improve the blood supply of ear according to Kedarikulya Nyaya,.

As the result of Karnpuran, Kapha and Vata Shamana takes place which will Corrects the microcirculation, then maintains the normal function of hearing.

Hence, Karnpuran (considered by Acharya Charaka as one of the Sneha Pravicharana) gains importance in the management of Karnbadhirya (Deafness) – Vata predominant diseases. The use of Sneha especially Taila helps to subside Vata Dosha and clears the Strotas of Karna.

Asthimajjapachak kashay (dhatri, musta, amruta) guggulwati:[11]This medicinal wati is effective in checking all types of Vata diseases.

Asthimajjapachak kashay (dhatri, musta, amruta) siddha tail Karnpuran: Dhatri, Musta and Amruta having Vatahara property. Tail having "Samskarasya Anuvartanatva‖[12] when processed with Vatashamaka drugs and having Rasayana Guna becomes the best line of treatment for Karnbadhirya. Hence Asthimajjapachak kashay (dhatri, musta, amruta) siddha tail Karnpuran was selected**.**

Thus, both the trial drugs can relieve Karnbadhirya and prevent degenerative changes occurring at cellular level.

Discussion on clinical study:

More than 300 patients were selected for the present study and randomly divided into two groups as follows:

Group A: 161 patients enrolled for Group A treatment during course of time. Out of 161, 149 patients completed treatment and gave complete follow up. 12 patients were drop out. Out of 149 patients, 142 patients were selected by simple random sampling – lottery method for preparation of master chart.

Group B: 160 patients enrolled for Group B treatment during course of time. Out of 160, 129 patients completed treatment and gave complete follow up. 31 patients

were drop out. Out of 129 patients, 100 patients were selected by simple random sampling – lottery method for preparation of master chart.

Hence, forth the results are analyzed and discussed under sub headings similar to that of the observations.

Discussion on demographic data:

Age: Majority of the patients i.e. 58.26 were reported in the age group of 31 – 40 years followed by 29.75 % in the age group of 21 – 30 years and 12.81 % patients were from the age group 41 – 50 years. Research was conducted on noise induced sudden sensory neural hearing loss, who were working in an industry, so 50 % of the patients were having age less than 40 years. It can be inferred that this age group is a Vata dominant due to working patternin the life. (Table – 1)

Gender: The present clinical study on Karnbadhirya reveals that there is a male predominance 94.21 % followed by 5.79 % of females.

This may be due to men were working constantly exposed to noisy atmosphere at work place and women does not preferred such type of occupation. (Table – 2)

Religion: 91.74 % of patients were Hindus. 3.72 % were Christian. 2.89 % were Muslim. 1.65 % were Sikh. This reflects the geographical predominance of Hindu community in this particular region. (Pimpri - Chinchwad). (Table – 3)

Marital status: 73.55 % of patients were Married and 26.45 % were Unmarried. Average age of marriage in our society is around 30 years and according to age group almost 30 % patients were having age less than 30 years, so remaining 70 % patients were married. (Table – 4)

Occupation: Majority of the patients involved in this clinical study i.e. 79.75 % were in labour followed by 20.25 % in servicemen. Patients were enrolled in this research study are working in an industry where noise was loud, so labour category patients are more. (Table – 5)

Pulse rate: The present clinical study reveals that maximum numbers of patients i.e. 54.13 % were having pulse rate in between 71 to 80 beats per minute. Most of the patients were of age less than 30 years, so pulse rate was observed to be normal. (Table – 6)

Systolic Blood Pressure: The present clinical study reveals that maximum numbers of patients i.e. 38.43 % were having Systolic Blood Pressure in between 111 to 120 mm of Hg, followed by 33.88 % were having Systolic Blood Pressure in between

121 to 130 mm of Hg. Most of the patients were of age less than 30 years, so Systolic Blood Pressure was observed to be normal. (Table – 7)

Diastolic Blood Pressure: The present clinical study reveals that maximum numbers of patients i.e. 78.10 % were having Diastolic Blood Pressure in between 71 to 80 mm of Hg, followed by 21.07 % were having Systolic Blood Pressure in between 81 to 90 mm of Hg. Most of the patients were of age less than 30 years, so Diastolic Blood Pressure was observed to be normal. (Table – 8)

Socio-economic status: In the present clinical study maximum numbers of patients i.e. 56.61 % were from poor class, followed by 27.27 % of lower middle class and 16.12 % were from upper middle class. This shows that the disease is more prevalent in people of poor socio- economic status. This may be due to poor class people working in an industry. (Table – 9)

Education: The present clinical study reveals that maximum numbers of patients were having higher secondary education i.e. 40.91 %, followed by 36.36 patients were having secondary education. This may be due to job profile of working people in an industry which doesn't require higher education. (Table – 10)

Type of Hearing Loss: The present clinical study had all patients of sensory neural hearing loss i.e.. (Table – 11)

Degree of Hearing Loss: The present clinical study reveals that moderate hearing loss in right ear and left ear observed was in all 100 % patients. (Table – 12)

Duration to Exposure (in years): The present clinical study reveals that maximum numbers of patients i.e. 51.24 % were having duration in between 1 to 10 years, 44.63 % were having duration in between 11 to 20 years, and 4.13 % were having duration in between 21 to 30 years of working schedule. It may be due to negligence towards loud noise in an industry during starting years of job. (Table – 13)

Using any Aid: The present clinical study reveals that maximum numbers of patients i.e. 60.33 % were using protective aid while working and 39.67 % were not using any protective aid while working in an industry. Use of protective aid shows that the mild degree of hearing loss. (Table – 14)

Etiological Factor: The present research study reveals that exposure to noise as an etiological factor in all patients. All patients were selected from an industry so this was observed. (Table – 15)

Sleep: The present research study reveals that, normal sleep in maximum number of patients i.e. 38.43 %, delayed sleep was observed in 36.36 % patients and disturbed

sleep was observed in 25.21 % patients. The difference observed may be due to age, degree of hearing loss, emotional make-up of patients and greater attention toward tinnitus at night time, when surrounding is quiet. (Table – 16)

Emotional Make-up: The present research study reveals that, normal emotional make- up in maximum number of patients i.e. 35.12 %, anxiety was observed in 27.69 % patients, jolly nature was observed in 22.73 % patients, and depressed emotional make- up was seen in 14.46 % patients. The difference observed may be due to age, financial status, family problems, etc. of patients and it may lead to Dhatu Kshaya and vitiation of Vata Dosha thus causing Karnbadhirya (Deafness). (Table – 17)

Prakruti: 23.55 % patients were of Vata-Kapha Prakruti, followed by 20.66 % of Kapha-Pitta Prakruti, 17.36 % of Pitta-Vata Prakruti, 14.05 % of Pitta-Kapha Prakruti. Though, Karnbadhirya – deafness occurs due to aggravation of Vata as described in Ayurvedic samhita. According to this sample size, no definite correlation between Prakruiti and Karnbadhirya – Deafness occurrence could be established. (Table – 18)

Addiction: Maximum i.e. 28.10 % patients were found to be addicted to Alcohol while 26.86 % were addicted to Tobacco, 18.60 % of population were addicted to smoking and 26.45 % of population was not having any type of addiction. (Table – 19)

Diet: 77.27 % patients were having mixed type of diet while remaining 22.73 % patients were pure vegetarian. (Table no. 20)

EFFECT OF THERAPIES:

Effect on Subjective and Objective criteria:

Asthimajjapachak Kashay Guggulwati, (Group A)

Statistically significant ($p<0.05$) relief was observed in the Groups of 142 patients treated with Asthimajjapachak Kashay Guggulwati (GROUP A) by applying Chi square test i.e. non parametric test to all following subjective criteria and paired t test to objective parameters.

Karnbadhirya (Deafness) Right Ear – 142 patients were having moderate Karnbadhirya in right ear before treatment. Out of 142, 116 patients were having mild Karnbadhirya and 26 patients were not having Karnbadhirya in right ear after treatment. Chi square value is 286, which is significant at $p<0.05$ i.e. at 95 % level of significance.

Karnbadhirya (Deafness) Left Ear – 142 patients were having moderate Karnbadhirya in right ear before treatment. Out of 142, 114 patients were having mild Karnbadhirya and 28 patients were not having Karnbadhirya in right ear after treatment. Chi square value is 284, which is significant at $p<0.05$ i.e. at 95 % level of significance.

Audiometry – Right Ear – 500 Frequency – Before treatment mean score was 44.89 and it was decreased to 26.79 after treatment and t value is 28.74, which is significant at $p<0.05$ i.e. at 95 % level of significance.

Audiometry – Right Ear – 1000 Frequency – Before treatment mean score was 44.15 and it was decreased to 27.78 after treatment and t value is 44.12, which is significantat $p<0.05$ i.e. at 95 % level of significance.

Audiometry – Right Ear – 2000 Frequency – Before treatment mean score was 44.33 and it was decreased to 27 after treatment and t value is 34.38, which is significant at $p<0.05$ i.e. at 95 % level of significance.

Audiometry – Left Ear – 500 Frequency – Before treatment mean score was 43.62 and it was decreased to 27.71 after treatment and t value is 43.90, which is significant at $p<0.05$ i.e. at 95 % level of significance.

Audiometry – Left Ear – 1000 Frequency – Before treatment mean score was 44.22 and it was decreased to 28.87 after treatment and t value is 44.98, which is significant at $p<0.05$ i.e. at 95 % level of significance.

Audiometry – Left Ear – 2000 Frequency – Before treatment mean score was 44.12 and it was decreased to 29.93 after treatment and t value is 45.68, which is significant at $p<0.05$ i.e. at 95 % level of significance.

Asthimajjapachak Kashay siddha tail Karnpuran, (Group B)

Statistically significant ($p<0.05$) relief was observed in the Groups of 100 patients treated with Asthimajjapachak Kashay siddha tail Karnpuran (GROUP B) by applying Wilcoxon sign rank test and Chi square test i.e. non parametric test to all following subjective criteria and paired t test to objective parameters.

Karnbadhirya (Deafness) Right Ear – 100 patients were having moderate Karnbadhirya in right ear before treatment. Out of 100, 70 patients were having mild Karnbadhirya and 30 patients were not having Karnbadhirya in right ear after treatment. Chi square value is 200, which is significant at $p<0.05$ i.e. at 95 % level of significance.

Karnbadhirya (Deafness) Left Ear – 100 patients were having moderate Karnbadhirya in right ear before treatment. Out of 100, 51 patients were having mild Karnbadhirya and 49 patients were not having Karnbadhirya in right ear after treatment. Chi square value is 200, which is significant at $p<0.05$ i.e. at 95 % level of significance.

Audiometry – Right Ear – 500 Frequency – Before treatment mean score was 44.75 and it was decreased to 23.55 after treatment and t value is 34.19, which is significant at $p<0.05$ i.e. at 95 % level of significance.

Audiometry – Right Ear – 1000 Frequency – Before treatment mean score was 43.25 and it was decreased to 24.55 after treatment and t value is 20.57, which is significant at $p<0.05$ i.e. at 95 % level of significance.

Audiometry – Right Ear – 2000 Frequency – Before treatment mean score was 44.70 and it was decreased to 22.65 after treatment and t value is 47.82, which is significant at $p<0.05$ i.e. at 95 % level of significance.

Audiometry – Left Ear – 500 Frequency – Before treatment mean score was 45.00 and it was decreased to 22.90 after treatment and t value is 38.81, which is significant at $p<0.05$ i.e. at 95 % level of significance.

Audiometry – Left Ear – 1000 Frequency – Before treatment mean score was 45.00 and it was decreased to 22.95 after treatment and t value is 42.58, which is significant at $p<0.05$ i.e. at 95 % level of significance.

Audiometry – Left Ear – 2000 Frequency – Before treatment mean score was 45.20 and it was decreased to 25.35 after treatment and t value is 29.36, which is significant at $p<0.05$ i.e. at 95 % level of significance.

Comparative analysis: Asthimajjapachak Kashay Guggulwati, (Group A) and Asthimajjapachak Kashay siddha tail Karnpuran, (Group B)

For comparative analysis of Asthimajjapachak Kashay Guggulwati (Group A) and Asthimajjapachak Kashay siddha tail Karnpuran (Group B), Chi square test i.e. non parametric test was used to all following subjective criteria and unpaired t test to objective criteria.

Karnbadhirya (Deafness) Right Ear – 116 patients were having mild Karnbadhirya and 26 patients were having no Karnbadhirya in right ear after treatment in Asthimajjapachak Kashay Guggulwati (Group A). 70 patients were having mild Karnbadhirya and 30 patients were having no Karnbadhirya in right ear after treatment in right ear after treatment Asthimajjapachak Kashay siddha tail Karnpuran (Group B). Chi square value is 4.50 so Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant than Asthimajjapachak Kashay Guggulwati (Group A) at $p<0.05$ i.e. at 95 % level of significance.

Karnbadhirya (Deafness) Left Ear – 114 patients were having mild Karnbadhirya and 24 patients were having no Karnbadhirya in right ear after treatment in Asthimajjapachak Kashay Guggulwati (Group A). 51 patients were having mild Karnbadhirya and 49 patients were having no Karnbadhirya in right ear after

treatment in right ear after treatment Asthimajjapachak Kashay siddha tail Karnpuran (Group B). Chi square value is 23.19 so Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant than Asthimajjapachak Kashay Guggulwati (Group A) at $p<0.05$ i.e. at 95 % level of significance.

Audiometry – Right Ear – 500 Frequency – Mean score of difference of Asthimajjapachak Kashay Guggulwati (Group A) was 18.09 and that of Asthimajjapachak Kashay siddha tail Karnpuran (Group B) was 21.20 and t value is 3.39, so Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant than Asthimajjapachak Kashay Guggulwati (Group A) at $p<0.05$ i.e. at 95 % level of significance.

Audiometry – Right Ear – 1000 Frequency – Mean score of difference of Asthimajjapachak Kashay Guggulwati (Group A) was 16.37 and that of Asthimajjapachak Kashay siddha tail Karnpuran (Group B) was 18.70 and t value is 2.64, so Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant than Asthimajjapachak Kashay Guggulwati (Group A) at $p<0.05$ i.e. at 95 % level of significance.

Audiometry – Right Ear – 2000 Frequency – Mean score of difference of Asthimajjapachak Kashay Guggulwati (Group A) was 17.32 and that of Asthimajjapachak Kashay siddha tail Karnpuran (Group B) was 22.05 and t value is 6.61, so Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant thanAsthimajjapachak Kashay Guggulwati (Group A) at $p<0.05$ i.e. at 95 % level of significance.

Audiometry – Left Ear – 500 Frequency – Mean score of difference of Asthimajjapachak Kashay Guggulwati (Group A) was 15.91 and that of Asthimajjapachak Kashay siddha tail Karnpuran (Group B) was 22.10 and t value is 9.60, so Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant thanAsthimajjapachak Kashay Guggulwati (Group A) at $p<0.05$ i.e. at 95 % level of significance.

Audiometry – Right Ear – 1000 Frequency – Mean score of difference of Asthimajjapachak Kashay Guggulwati (Group A) was 15.35 and that of Asthimajjapachak Kashay siddha tail Karnpuran (Group B) was 22.05 and t value is

11.25, so Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant thanAsthimajjapachak Kashay Guggulwati (Group A) at p<0.05 i.e. at 95 % level of significance.

Audiometry – Right Ear – 2000 Frequency – Mean score of difference of Asthimajjapachak Kashay Guggulwati (Group A) was 14.19 and that of Asthimajjapachak Kashay siddha tail Karnpuran (Group B) was 19.85 and t value is 8.36, so Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant thanAsthimajjapachak Kashay Guggulwati (Group A) at p<0.05 i.e. at 95 % level of significance.

Probable mode of action of the trial drugs:

The probable mode of action can be explained on the basis of Pharmaco therapeutic properties of various constituents of trial drugs on Samprapti Vighatana.

Pharmaco therapeutic properties of various constituents has the basis of so many theories viz. Rasa-Panchak theory, Pancha Bhautika theory, Doshika theory and Dhatu Nirmana theory. But one common factor is divulged from all these theories that the drug having pharmaco- therapeutic property, similar to the qualities of a particular Dosha, provoke/vitiate that particular Dosha, and result in pacification of that particular property, which are opposite to the particular Dosha. Following this principle Asthimajjapachak kashay (dhatri, musta, amruta) guggulwati and Asthimajjapachak kashay (dhatri, musta, amruta) siddha tail Karnpuran has been selected for the present clinical study.

(A) Probable mode of action of Asthimajjapachak Kashay (Dhatri, Musta, Amruta) (Table 4.45)

Pharmaco – therapeutic properties of various Ingredients of **Asthimajjapachak kashaysiddha tail:**

	Name of the Drug	Ras	Virya	Vipak	Guna	Karma
1	Amruta (Tinospora Cordifolia)	Katu, Tikta, Kashay	Ushna	Madhur	Guru, shit	Tridoshaghna, Rasayan, Dipana Mutrajanan, Jwarghna
2	Amalaki (Phyllanthus emblica)	Amla Pradhan Pancharas, except lavana	Sheet	Madhur	Snigdha, Laghu	Kaphaghna, Rasayan, Pittashamak, antioxidant
3	Musta (Cyperus Rotundus)	Katu, Tikta Kashay	Sheet	Katu	Ruksh Laghu	Lekhana, Krimighna, Kaphaghna, Mutral
4	Guggul (Commiphora mukul)	Tikta, Katu	Ushna	Katu	Laghu, Ruksha, Tikshna, Vishada, Sukshma, Snigdha	Vrishya, Balya, Rasayana, Dipana, Medohara, Krimighna
5	Tila Taila	Madhura	Ushna	Guru, Snigdha	Madhura	Vata Shamaka

Probable mode of action Karnpuran:

Abhayanga:

Before Karnapoorana, **Abhyanga** is specifically done in Murdha Pradesha which causes vasodilatation in the skin and muscles by stimulating receptors of the sympathetic nervous system. Vasodilatation increases blood flow and helps to remove the toxic products.

Dalhana has explained in detail about absorption of Sneha. The Abhyang is done for sufficient time; the oil reaches to the different Dhatu. Hence it is clear that potency of drug used in oil is absorbed into the skin. Dalhana also mention that when Snehana reaches to the particular Dhatu it subsides the disease of that particular Dhatu.[35]

Acharya Charkhas described that Vayu dominates in the Sparshnendriya and its site

isTvaka. The Abhyang is exceedingly beneficial to the skin.[36] So it is useful in the diseaseKarnanad and badhirya which caused by vitiated Vata.

Swedana:

Acharya Charaka[37]has described mechanism of **Swedana Karma** as given below: It helps to dissolve Shleshma.

It makes the channels soft, by which Vatadi Doshas and other contents can flow throughin their normal directions.

It increases the secretion of vitiated Shleshma thorough the channel.

So, due to Ushna Guna of Swedana, Kapha Dosha gets liquefied. When lukewarm oilenters into the Shabdavaha Strotas, network of Strotas carry the Taila towards the desired sites and cleanses the channel. By its Shodhana property of its ingredients, probably it removes the Ama at the celluler level and pacifies the vitiated Vata and Kapha Dosha.

Karnpuran:

Due to Stroto Shodhana and Vata Kapha Shamana, Avaranaand Sanga of Vata & KaphaDosha is removed and nutrition is brought to the respective sites.

So, after breaking Aavarna and Sanga by Abhyangand Swedana, Karnapoorana has been carried out in deafness – Karnbadhirya patients in the present study. It is hypothesized that **Asthimajjapachak tail** helps in the absorption through epithelial tissue of external ear canal and tympanic membrane that can maintain normal function of hearing and equilibrium.

Spread of the drug in to the deeper tissues through (Rasa &Rakta) Shabdavaha Sira.

According to _Kedarikulya Nyaya', Karnapoorana will improve the blood supply of ear first.

As the result of Karnapoorana, Kapha and Vata- Shamana takes place which will Corrects the microcirculation, then maintains the normal function of hearing corrects Karnbadhirya.

SUMMARY AND CONCLUSION

The dissertation entitled **"Comparative Clinical Study of Asthimajjapachak Kashay (Dhatri, Musta, Amruta) Guggulwati Abhyantertah and Siddha Tail as Karnpuran in Karnbadhirya (Noise Induced Sudden Sensory Neural Hearing Loss)"** has been divided into five sections:

- Introduction
- Review of Literature
- Research Methodology
- Analysis and Interpretation
- Summary and Conclusion

Introduction:

This section describes importance of Shalakya in Ashtanga Ayurveda, importance of Sushruta Samhita in Shalakya Tantra, selection of the problem, selection of the drugs, aims and objectives, plan of study and review of the previous works.

Modern science does not have promising results to cure Deafness and Tinnitus. hence it only highlights as to reduce the ill effects of tinnitus rather than getting relief from it. Whereas, Ayurveda states that this disease is sadhya i.e. curable if timely observed dinacharya, aahar and vihar. So the present clinical study has been taken to found the safe solution or management with the help of Ayurveda.

Review of Literature:

This is the second section of the dissertation work which has been further divided intothree sub sections:

- Ayurvedic Review
- Modern review
- Drug review

Ayurvedic Review: This section contains the historical background of Karna with detailed anatomical aspects of the structures of the ear. Physiology of the process of hearing is also dealt in this section. Importance of Vayu mainly Udanavayu in Karnaroga,detailed description of diseases Karnanad & Karnbadhirya with details of

Karnpuran procedure have been described.

Modern review: Anatomy and physiology of ear is included in this section, detailed description of Deafness and Tinnitus starting with history, definition, causes, epidemiology, prevention& treatment.

Karnbadhirya and deafness in modern medical literature are similar conditions.

Being a very distressing invisible condition Ayurveda has coated it as a separate disease. In Ayurveda, Karnbadhirya is Vataja- kasht Sadhya, whereas in modern Science Deafness i.e. hearing loss can be permanent conditions irreversible damage.

Drug Review: Detailed description of contents of Asthimajjapachak Kashay (Dhatri, Musta, Amruta) included in this section. Latin name and family, synonyms, Ayurvedic properties, Karma, uses, pharmacological actions etc. are written under this heading.

This section is further divided into sub-sections, such as – Pharmacognostical study on Drug preparation of Analytical study.

Asthimajjapachak Kashay Guggulwati and Asthimajjapachak Kashay siddha tail both have Vata Shamaka and Rasayana properties. Thus, this treatment protocol will be capable of modify the disease pathology; with this hypothesis these two drugs are selected for present clinical trial.

Research Methodology:

This section, clinical study deals with plan of study in detail, aims and objectives, materials and methods, criteria for selection and exclusion of patients, sampling, treatment schedule, symptom scoring and method of assessment. Observations of 242 patients have been described with due importance in this section.

A total number of 142 patients who completed the treatment, recording of gradations of subjective and objective improvement in these patients with statistical analysis of results have been explained in clinical study.

Group A: Asthimajjapachak Kashay Guggulwati (Abhyantertah)

Group B: Asthimajjapachak Kashay siddha tail Karnpuran

Dose and Duration:

Duration – 3 months

Doses – wati 250 mg bid for one month, tail Karnpuran 100 matra for one month

Follow up: 45 days

Majority of the patients 58.26 % were reported in the age group of 31 – 40 years followed by 29.75 % in the age group of 21 – 30 years, 94.21 % patients were males, 91.75 % patients were Hindu, 73.55 % were married, 79.75 % patients were labour, 54.13 % patients were having pulse rate in between 71 to 80 beats per minute, 38.43 % patients were having systolic blood pressure in between 111 to 120 mm of Hg, 78.10 % patients were having diastolic blood pressure in between 71 to 80 mm of Hg, Maximum i.e. 56.61 % patients were belonging to Poor class, 40.91 % patients were studied up to H.S.C., all 100 % patients were having sensory neural type of hearing loss, all 100 % patients were having moderate degree of hearing loss in right and left ear.

Majority 51.24 % patients were of having duration to exposure in between 1 to 10 years, 60.33 % patients were using Protective Aid, all 100 % patients were having Exposure to noise as an etiological factor, 38.43 % patients were having normal sleep, 35.12 % patients were having normal emotional make-up, 23.55 % patients were having vata-pitta prakruti, 28.10 % patients were having addiction of Alcohol, and 77.27 % patients were having mixed type of diet.

Analysis and Interpretation:

In this, the logical interpretation of the literary review, observations and effects of therapy obtained, probable mode of action of the trial drugs have been discussed.

Asthimajjapachak Kashay Guggulwati (orally) and Asthimajjapachak Kashay siddha tail Karnpuran both have Vata – Kapha Shamaka and Rasayana properties. Thus both these drugs do the shaman of Vata Dosha, which is main vitiated dosha for the disease Karnbadhirya.

Present clinical study shows that group B (Asthimajjapachak Kashay siddha tail Karnpuran) is more effective than Asthimajjapachak Kashay Guggulwati (Group A) for Karnbadhirya (Deafness) on Audiometry.

In the present clinical study both the drugs showed significant ($p<0.05$) relief in Karnbadhirya, this indicates towards the Vata- Kapha Shamaka and Rasayana properties of the selected drugs. Hence it disintegrates the pathology of the disease Karnbadhirya.

Summary and Conclusion:

In this section, the conclusion is drawn after logical interpretation of previous sections has been summarized. The entire work is summarized in this section.

CONCLUSION:

- Detailed and practical description of Karnbadhirya is mentioned in classics of Ayurveda.
- The effect of Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant ($p<0.05$) than Asthimajjapachak Kashay Guggulwati (Group A) for Karnbadhirya (Deafness) Right Ear and Left Ear of Karnbadhirya (noise induced sudden sensory neural hearing loss).
- The effect of Asthimajjapachak Kashay siddha tail Karnpuran (Group B) is significant ($p<0.05$) than Asthimajjapachak Kashay Guggulwati (Group A) for Audiometry – Right Ear and Left Ear at Frequencies 500, 1000 and 2000 of Karnbadhirya (noise induced sudden sensory neural hearing loss).
- Deafness, in modern medical literature is a similar condition of Karnbadhirya.
- Deafness is more common worldwide disorder affecting any age group of both sexes. More often in middle age with sensory-neural deafness in people who are working in a noisy industry.
- Vat kaph prakruti people are more prone to this disease.
- Deafness was observed more in the age group 31 – 40 years.
- Deafness was observed more in the Labour than the office staff of the industry.
- Controlling noise level and using protective aid while doing work are very much helpful in coping and delaying Karnbadhirya i.e. deafness.
- Karnpuran is an effective local treatment / procedure in Karnagata Roga.
- Asthimajjapachak Kashay siddha tail Karnpuran and Asthimajjapachak Kashay Guggulwati have not shown any side effect so it should be used.
- Karnpuran can be observed as dinacharya as preventive treatment for people exposed to noise when there is no ear drum perforation.

RECOMMENDATIONS:

- Longer duration of treatment may enhance the results.
- One can try this medicine for post covid sudden sensory neural hearing loss (Karnbadhirya) because it is asthimajjagata awastha of Jwar.
- Sarvanga Snehana with Basti Karma procedures may be added in treatment protocol which may produce better result.

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ANNEXURE

RESEARCH PROFORMA for Ph.D. (Ayu.) THESIS

DEPARTMENT OF SHALAKYA TANTRA
TILAK MAHARASHTRA VIDHYAPEETH, PUNE.

TITLE: Comparative Clinical Study of Asthimajjapachak Kashay (Dhatri, Musta, Amruta) Guggulwati Abhyantertah and Siddha Tail as Karnpuran in Karnbadhirya (Noise Induced Sudden Sensory Neural Hearing Loss)

SCHOLAR: Dr. NEELMA AMRUTE, Ph. D. Sch. M.S. and D.O.R.L. (Shalakya Tantra), M.B.A., D.H.L.S.	**YEAR:**2017-18
GUIDE: Dr. PRASHANT SURU, M.D. (Ayu.), Shalakya Tantra	

PARTICULARS OF PATIENT:

Name			
Address			
Age (years)		Sr No	
Sex	M/F	OPD No	
Group	A/B	General Exam	
Religion	H / M / Ch / Si / O	Pulse	
Marital Status	U / M / W / D	BP	
Education	Un / P / M / HS / G / PG	Temp	
Economic St	VP / P / LM / UM / R / VR		
Occupation	St. / L / S / B / HW		

CHIEF COMPLAINT (VedanaVishesh)

HISTORY OF PRESENT ILLNESS (VartamanVyadhiVritant)

BADHIRATA (Hearing loss): YES / NO
a) Unilateral / Bilateral
b) Continuous / Intermittent
c) Severe / Moderate / Mild
d) Increases at morning / noon /evening / night / after bath

PAST HISTROY (Poorvotpannayadhi)

	Duration
Ototoxic drugs-Quinine/ Aspirin/ Salicylates/ Antibiotics/B-blockers, anti-tubercular drugs, any other drugs	
Diabetes, hypertension, thyroid disorders, anemia, renal failure etc.	
Other habits	
Medical / Surgical History for Ear, Nose, Throat, Neck etc.	

FAMILY HISTORY (Kulavruntanta)

NIDANA/SEVAN ITIHAS:

H/O Exposure to Causative/Predisposing/ Precipitating factors.

Avashyaya	
Jalakrida	
Karnakanduyana	
MarutSevana	
ShashtraMithyayoga	
Shabdaatiyoga, heena yoga and Mithyayoga	
Shrama	
Kshaya	
SheetambuSevana	
RukshaBhojanaSevana	
Kashaya BhojanaSevana	

1)Appetite	Poor / Moderate / Good	
2)Sleep	Normal / Delayed / Disturbed / Excess / Poor	
3)Bowel	Regular / Irregular /Constipated	Frequency:
4)Micturation	Excess / Normal / Less	Frequency:
5)Emotional Makeup	Normal / Anxiety / Tension / Depression / Jolly / Sentimental	
6)Exercise	No / Less / proper / Excess / Irregular	
7)Diet	Veg. /Non-Veg./ Mixed	
8)Dominant Rasa in Diet	M / A / L / K / T / Ks	
9)Dominant Guna in Diet	Ruksha / Snigdha /Ushna / Sheeta / Guru / Laghu	
10)Addiction	Smoking /Tobacco / Snuffing / Alcohol / Sleeping pills / Others	

OCCUPATION HISTORY: Working in Sound polluted area?:YES/NO

GENRAL EXAMINATION:

1) Prakruti	
a) Sharira:	V / P / K / VP / VK / PK / VPK
b) Manasa:	
2) Sara	T / R / M / Md / A / Mj / S / O
3) Samhanana	P / M / A
4) Satvata	P / M / A
5) Satmaya	P / M / A
6) Aharshakti	
a) Abhyavahrana shakti	P / M / A
b) Jaranshakti	P / M / A
c) Agni	Sama / Vishama / Manda / Tikshna
7) Vyayamshakti	P / M / A
8) Vaya	Bala / Yuva / Vriddha

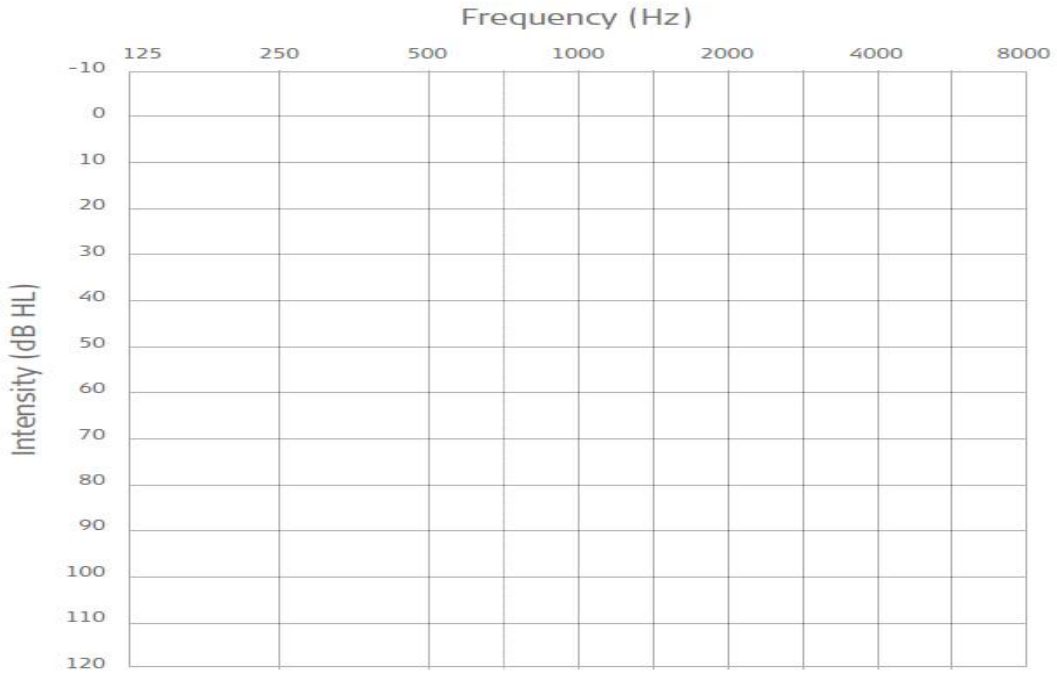
CLINICAL EXAMINATION: Ear, Nose, Throat:

LOCAL EXAMINATION:

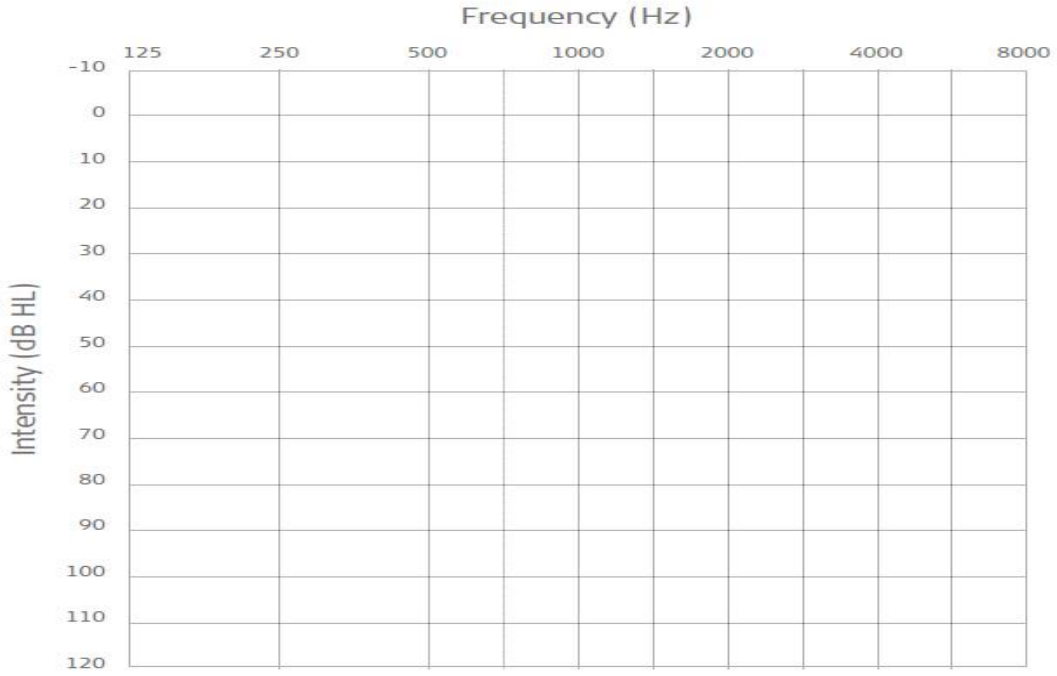
	B. T.		A. T.	
	Right	Left	Right	Left
Pinna				
Post aural region				
External auditory canal				
Tympanic membrane				
Cone of light				
Tuning fork:				
a) Rinne test				
b) Weber test				

AUDIOMETRY - PURE TONE AUDIOMETRY

BEFORE (DAY 0)

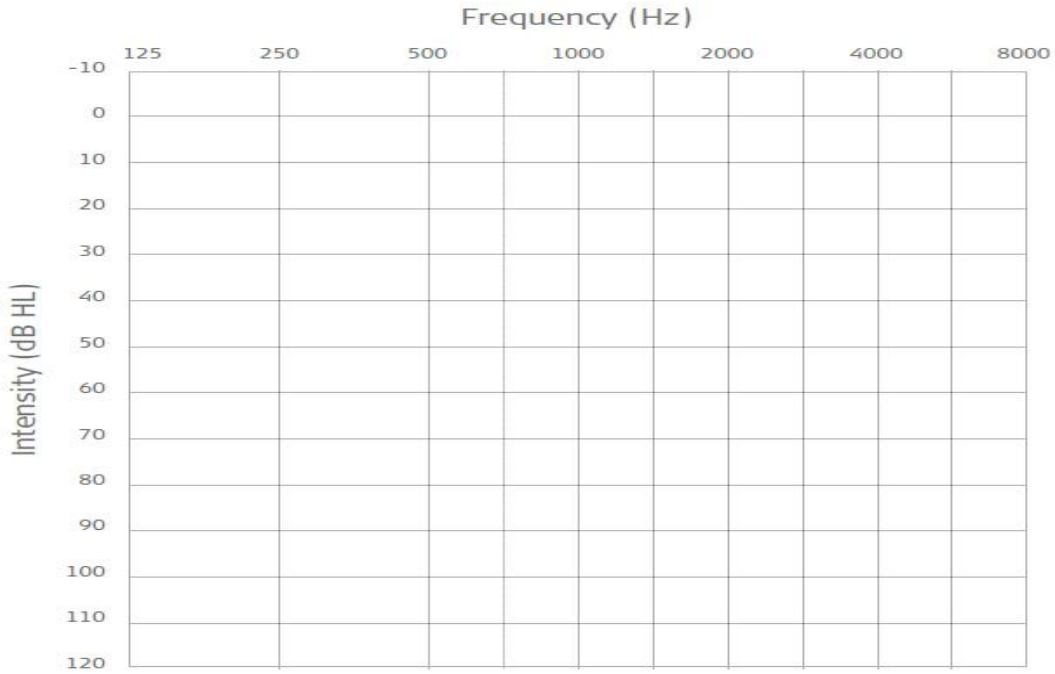


AFTER 45 DAYS



AUDIOMETRY - PURE TONE AUDIOMETRY

AFTER 90 DAYS



Subjective parameters	**Signs and symptoms**	No of days **Day 0**	**Day 15**	**Day 45**	**Day 90**
1] Karnnad (Tinnitus) [Yes / No]	(Grade 0-tinnitus Grade1-incontinuous tolerable Grade2-continuous tolerable Grade 3-continuous intolerable)				
2]Deafness / Karnabadhirya [Yes / No]	(Grade 0-normal 10-25 db Grade 1-mild hearing loss 26-40db Grade 2-modarate 41-55db Grade3- moderately severe 56-70db Grade4-severe 71-90db Grade5-91+ db)				
3] Blocking of the ear [Yes / No]	(Grade 0-absent Grade 1-occasional Grade 2-persistent, doesn't disturb routine Grade 3-disturbing routine work				

DIAGNOSIS:

TREATMENT:
Group: A – Dose: asthimajjapachak kashay guggulwati abhyantertah 250 BID for 30 days
Group: B – Dose: asthimajjapachak kashay guggul siddha tail karnpuran OD for 30 days

Assessment:
Cured / Markedly Improved / Moderate improved / Mild Improved / Unchanged

SCHOLAR'S SIGN **GUIDE'S SIGN**

CONSENT FORM

The title of my research is **Comparative Clinical study of asthimajjapachak kashay (dhatri, musta, amruta) guggulwati abhyantertah and siddha tail as karnpuran in karnbadhirya (noise induced sudden sensory neural hearing loss)**

1. I confirm that I have read and understood the information sheet dated for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my medical care or legal rights being affected.
3. I understand that individuals may look at relevant sections of my medical notes and data collected during the study. I give permission for these individuals to have access to my records both in respect of the current study and in respect of any further research that may be conducted in relation to it, even if I withdraw from the trial. However, I understand that my Identity will not be revealed in any information released to third parties or published.
4. I agree not to restrict the use of any data or results that arise from this study provided such a use be only for scientific purpose(s) impression. You may refuse to participate or withdraw from the research at any time. This will not affect in any way the medical treatment that you are receiving. If you agree to participate in this research, we will collect relevant information from your hospital records. We will do your physical examination. Data from the research will be used for research purposes only. The research results are of no significance to your medical care.
5. There will be no direct benefit to you other than the satisfaction of participating in this research for the possible benefits of future generations. Your participation will give us insights into the problems faced by the patients like yourself and will help us in improving our services. This information concerning your participation in the research will be kept confidential to the full extent permitted by law and used only for scientific purpose. I have read the explanation about this research and understood the same. So, I am giving my consent to take part in the research.

DATE
NAME OF PATIENT SIGNATURE / THUMB IMPRESSION OF PATIENT

संमतीपत्र

संशोधनाचे शीर्षक: Comparative Clinical study of asthimajjapachak kashay (dhatri, musta, amruta) guggulwati abhyantertah and siddha tail as karnpuran in karnbadhirya (noise induced sudden sensory neural hearing loss)

1. या संशोधनात माहिती पत्रिका मी पूर्णपणे वाचली असुन मला असलेल्या सर्व प्रश्नांची समाधानकारक उत्तरे मिळाली आहेत.
2. संशोधनातील माझा सहभाग पूर्णपणे ऐच्छिक असुन मी कुठल्याही वेळी कुठलेही कारण न देता माघार घेऊ शकतो ज्याचा माझ्या वैद्यकीय सुविधा व कायदेशीर बाबीवर काहिही परिणाम होणार नाही.
3. मला जाणीव आहे की, जरी मी अभ्यासातुन माघार घेतली तरी अभ्यासा दरम्यान गोळा करण्यात आलेली सर्व माहिती पडताळण्यास मी परवानगी देत आहे. माझी ओळख कोणत्याही स्वरुपात प्रकाशित किंवा तिसऱ्या व्यक्तिस देणार नाही, याची मला जाणीव आहे.
4. संशोधना दरम्यान गोळा केलेली माझी सर्व माहिती कोणत्याही संशोधनात वापरण्यासाठी माझी हरकत नाही.
5. मी या संशोधनात भाग घेण्यास तयार आहे.

दिनांक

रुग्ण सही/डाव्या अंगठ्याच ठसा

Certificates of Authentication of Drug

Agasti Pharmaceuticals,
Pune.

Date : 6th April 2022

To,
Dr. Neelima Amrute,
Chinchwad, Pune-411019

Respected Madam,

We certify that item supplied by us to you from our distributor, Sanchomee Herboveda Pvt.ltd.,Chinchwad is authentic and genuine product and is in original nature.

Sr.No.	Name	Pack Size	Batch No.	Expiry Date
01	Dhatryadi Guggul	1000 Tab	20227	Nov./2025

Thanking You,
For Agasti Pharmaceuticals,Pune

Head Off.: 37/5, Samarth Complex, Dhankawadi, Pune - 411043.
Factory: At Post Nandoshi, Tal. Haveli, Dist. Pune - 411024.
Telefax: (O) 020-2436 6363. **Email:** agastiayurved@yahoo.co.in

Agasti Pharmaceuticals,
Pune.

Date : 4thSep 2021.

To,
Dr Neelima Amrute,
Chinchwad, Pune 411019

Sub: Permission to conduct PhD research using our drug asthimajjapachak kashay (Dhatrayadi Guggulwati).

Title of research work: Comparative Clinical study of asthimajjapachak kashay (dhatri, musta, amruta) guggulwati abhyantertah and siddha tail as karnpuran in karnbadhirya (noise induced sudden sensory neural hearing loss).

Dear Madam,

This has reference to your letter requesting permission to conduct your PhD research using our drug.

We hereby grant you the permission to use our drug asthimajjapachak kashay (Dhatrayadi Guggulwati) in your research work.

Attaching drug related information as requested by you.

Yours truly,
For Agasti Pharmaceuticals,Pune

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Factory: At Post Nandoshi, Tal. Haveli, Dist. Pune - 411024.
Telefax: (O) 020-2436 6363. **Email:** agastiayurved@yahoo.co.in

Drug Lab Reports

Anushka Food and Water Testing Laboratories

LAB services offered :-

- Food Quality Testing
- Seed Testing
- Training Programmes for Food Handlers
- Food party & Wellness analysis
- Water Quality Testing
- Kitchen Hygiene Audit
- FSSAI & ISO Consulting / Licensing

Test Report No. 7920

TEST REPORT

Report Date :- 30/12/2021

Client Name & Address :-	Page :- 1 of 1
Dr. Nilima Avinash	W.O. No./Code No. :-
DY Patil College, Pune	Sample collection Date :- 11/12/2021
	Date& Time of sample receipt in lab :- 11/12/2021 at 12:30 pm
	Sample collected by :- Customer

a)Type of Sample :- Oil	e)Duration of Analysis :- 11/12/2021 - 16/12/2021
b)Sample Identification :- Oil	f)Packing :- Pet+ Plastic Bottle
c)Mfg & MFD :- Not Mentioned	g)Sample Location/Source :-
d)Quantity :- Approx. 50 ml	h)Condition of Sample when received in lab :- Good

Microbiological Analysis :-

Sr. No.	Test Parameters	Results	Units	Test Methods Ref.
1.	Yeast & mould	Absent	Cfu / ml	IS 5403:Rev 2013

Cfu/ml - colony forming unit per ml

End of the Report

Checked By :-

Authorized Signatory :-

Vidhi Patwekar (Technical Manager)

Pune 411 030

Anushka Food and Water Testing Laboratories

Shop No.10, Shiv Nagar, Near Rly Gate, Survey No.112/1, Opposite: IIMT Sinhagad Institute, Wadgaon Bk, Pune - 411041

Cell: +91 94220 06717, 998 1180630 | Email: anushkafoodlab@gmail.com | Website: www.anushkafoodlab.com

SHEETAL
ANALYTICAL LABORATORY
JANAPATH, FLAT NO. 5, 4th FLOOR,
227, SADASHIV PETH, LOKMANYANAGAR,
OPP. S. P. COLLEGE GROUND BACK GATE, PUNE - 411 030.
Ph. : 24331443/24321963 • 0-9823, : sheetallab@gmail.com

Date:15.07.2021

CERTIFICATE OF ANALYSIS

Report No. A.M.-154/01-21 Page 1 of 1

Name & Address :- Dr. Nilima Avinash. (Ph.D Scholar)
BMDT's Ayurved College & Research Centre,
Vishwashantidham, Bonanzal Road, Wagholi,
Pune- 412207(MH).

Sample Name:- Guduchi (Tinospora Cordifolia)

SR.NO.	Parameter	Results
1.	Microscopic Identification	Stem show 2-3 layers of cork following by 4-5 layered phellogen, outer most layer of cork is rectangular, tan color, rest of thick walled brownish and compressed cell comes in wide parenchymatous zone contain large calcarous type cell. Most wide medullary flanked cells of outer zone smaller than the inner one within opening of bicentric groups of sclerotic consisting of 2-3 cell flanked to thin vessel.
	Macroscopic Identification	Guduchi (Tinospora Cordifolia) plant belongs to the family menispermaceae, fresh part of leaves, stem show UV 254 Short1 showed greenish green with smooth surfaces & swelling at nodes dry stem show light brown surface marked with many granulomatous. Dry stem is cut into the suitable pieces, groups of sclerenchymatous consisting maximum 8 cells found in this regions outer zone of cortex consists of 2-4 rows of irregularly arranged from is characterized by presence of fusiformed vascular bundles with wedge shaped strips of xylem externally surrounded by greenish fibres, wide medullary ray 10-20 cells wide containing vascular bundles. Powder of stem is cream to greenish brown colour, taste bitter, odour characteristic.

Prepared by :- Authorized Signatory :-

[Mrs. Anita Navare] End of Report [Mrs. Madhura Barve]

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Report No. A.M.-154/01-21 Page 1 of 1

Name & Address :- Dr. Nilima Avinash. (Ph.D Scholar)
BMDT's Ayurved College & Research Centre,
Vishwashantidham, Bonanzal Road, Wagholi,
Pune- 412207(MH).

Sample Name:- Guduchi (Tinospora Cordifolia)

SR. NO.	Parameter	Results
1.	Description	Greenish Brown Colour , Taste Bitter , Odour Characteristic.
2.	Loss on drying @ 110°C	4.58 %
3.	Total Ash Content	7.34 %
4.	Acid Insoluble Ash	0.33 %
5.	Water Soluble Extract	12.67 %
6.	Alcohol Soluble Extract	8.52 %

Prepared by :- Authorized Signatory :-

[Mrs. Anita Navare] End of Report [Mrs. Madhura Barve]

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Date: 15.07.21

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Report No. A.M.-154/02-21 Page 1 of 1

Name & Address :- Dr. Nilima Avinash. (Ph.D Scholar)
BMDT's Ayurved College & Research Centre,
Vishwashantidham, Bonanzal Road, Wagholi,
Pune- 412207(MH).

Sample Name:- Musta (Cyperus rotundus Linn)

SR. NO.	Parameter	Results
1.	Microscopic Identification	Rhizome shows a line of demarcation of endodermis separating cortical portion from the central ground tissues, rhizome shows single layered epidermis with brown colour internally parts pale thickness and flask walled. Trichomes & wounded in elongated parenchyma with lenses.
	Macroscopic Identification	Musta (Cyperus rotundus Linn) Plant belongs to the family cyperaceae, its Rhizomes are cylindrical which rhizomes roots are cleaned this are attached one another each rhizomes or tuberous, varies size & shapes measures covered forming a fairly to small, covering size of rhizome is 1.5-2 cm & Diameter is 0.5 - 1 cm of elongated shape is 3-4 cm & 1-2 cm rhizome externally dark brown colour, internally creamish yellow color . Powder of dried rhizome is dark brownish color, odour slight, bitterish taste & pungent.

Prepared by :- Authorized Signatory :-

[Mrs. Anita Navare] End of Report [Mrs. Madhura Barve]

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Name & Address :- Dr. Nilima Avinash. (Ph.D Scholar)
BMDT's Ayurved College & Research Centre,
Vishwashantidham, Bonanzal Road, Wagholi,
Pune- 412207(MH).

Sample Name:- Musta (Cyperus rotundus Linn)

SR. NO.	Parameter	Results
1.	Description	Greenish Brown Colour , Taste Bitter , Odour Characteristic.
2.	Loss on drying @ 110°C	7.77 %
3.	Total Ash Content	13.36 %
4.	Acid Insoluble Ash	6.08 %
5.	Water Soluble Extract	10.36 %
6.	Alcohol Soluble Extract	12.09 %

Prepared by :- Authorized Signatory :-

[Mrs. Anita Navare] End of Report [Mrs. Madhura Barve]

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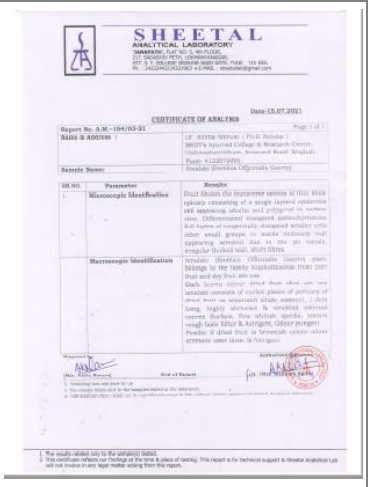

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Report No. A.M.-154/03-21 Page 1 of 1

Name & Address :- Dr. Nilima Avinash. (Ph.D Scholar)
BMDT's Ayurved College & Research Centre,
Vishwashantidham, Bonanzal Road, Wagholi,
Pune- 412207(MH).

Sample Name:- Amalaki (Emblica Officinalis Gaertn)

SR.NO.	Parameter	Results
1.	Microscopic Identification	Dust shows the transverse section of fruit skin epicarp consisting of a single layered epidermis cell appearing tabular and polygonal in surface view. Differentiated elongated parenchymatous with layers of tangentially elongated smaller cells other small groups in wards endocarp cell appearing arranged due to the pit canals, irregular thicked wall, short fibres.
	Macroscopic Identification	Amalaki (Emblica Officinalis Gaertn) plant belongs to the family euphorbiaceae (tree) fruit and dry fruit are use. Dark brown colour dried fruit skin are use amalaki consists of curled pieces of pericarp of dried fruit as separated whole segment, 1-2cm long, highly sclerized & sevalated, external uneven surface, fine whitish specks, texture rough taste bitter & astringent, Odour pungent. Powder of dried fruit is brownish colour, odour strenuous taste bitter & astringent.

Prepared by :- Authorized Signatory :-

[Mrs. Anita Navare] End of Report [Mrs. Madhura Barve]

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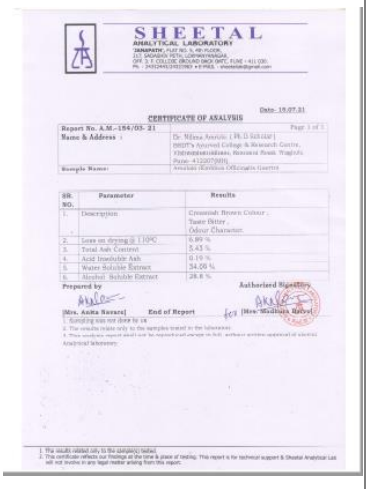

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Date: 15.07.21

CERTIFICATE OF ANALYSIS

Report No. A.M.-154/03- 21 Page 1 of 1

Name & Address :- Dr. Nilima Avinash. (Ph.D Scholar)
BMDT's Ayurved College & Research Centre,
Vishwashantidham, Bonanzal Road, Wagholi,
Pune- 412207(MH).

Sample Name:- Amalaki (Emblica Officinalis Gaertn)

SR. NO.	Parameter	Results
1.	Description	Greenish Brown Colour , Taste Bitter , Odour Characteristic.
2.	Loss on drying @ 110°C	6.89 %
3.	Total Ash Content	5.43 %
4.	Acid Insoluble Ash	0.19 %
5.	Water Soluble Extract	34.09 %
6.	Alcohol Soluble Extract	28.8 %

Prepared by :- Authorized Signatory :-

[Mrs. Anita Navare] End of Report [Mrs. Madhura Barve]

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Date:15.07.2021

CERTIFICATE OF ANALYSIS

Report No. A.M.-154/04-21 Page 1 of 1

Name & Address :- Dr. Nilima Avinash. (Ph.D Scholar)
BMDT's Ayurved College & Research Centre,
Vishwashantidham, Bonanzal Road, Wagholi,
Pune- 412207(MH).

Sample Name:- Guggul (Commiphora Mukul)

SR.NO.	Parameter	Results
1.	Microscopic Identification	Irregular resin cavities, cavities in regular intervals, cortical cells are globular and tangentially elongated, phloem contains sclerenchymatous crystals sphere towards solitary or in pairs, with reticulate striation, sclereids are heterogeneous, resin ducts are circular.
	Macroscopic Identification	Guggul (Commiphora Mukul) plant belongs to the family Burseraceae plants gum resin of (3-5)m in size. Guggul gum cubic mixture in variegation piece of yellow & brownish colour external mass, fresh gum are mixed with golden yellow or light orange brown colour irregular shape pieces of gum, gum resin is often mixed with pieces of stem bark which help to secure guggul. Powder of gum is dark brownish black colour, odour sweet, taste aromatic, characteristic.

Prepared by :- Authorized Signatory :-

[Mrs. Anita Navare] End of Report [Mrs. Madhura Barve]

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Date: 15.07.21

CERTIFICATE OF ANALYSIS

Report No. A.M.-154/04- 21 Page 1 of 1

Name & Address :- Dr. Nilima Avinash. (Ph.D Scholar)
BMDT's Ayurved College & Research Centre,
Vishwashantidham, Bonanzal Road, Wagholi,
Pune- 412207(MH).

Sample Name:- Guggul (Commiphora Mukul)

SR. NO.	Parameter	Results
1.	Description	Greenish Brown Colour , Taste Bitter , Odour Characteristic.
2.	Loss on drying @ 110°C	30.05 %
3.	Total Ash Content	6.44 %
4.	Acid Insoluble Ash	Nil
5.	Water Soluble Extract	14.56 %
6.	Alcohol Soluble Extract	10.70 %

Prepared by :- Authorized Signatory :-

[Mrs. Anita Navare] End of Report [Mrs. Madhura Barve]

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'JANAPATH', FLAT NO. 5, 4th FLOOR,

Date:- 23.07.2021

CERTIFICATE OF ANALYSIS

Report No. A.M.-149/01-21	Page 1 of 1
Name & Address :	Dr. Nilima Amrute. (Ph.D Scholar) BSDT's Ayurved College & Research Centre, Vishwashantidham, Kesnand Road, Wagholi, Pune- 412207(MH).
Sample Name:	[illegible]

SR. NO.	Parameter	Results
1.	Description	Brownish yellow Colour viscous Liquid. Odour pungent, [illegible]
2.	Moisture Content @110°C	0.05 %
3.	Sp. Gravity	0.9218 gm/ml
4.	Acid Value	3.47
5.	Iodine Value	7.05
6.	Saponification Value	219.8
7.	Refractive Index	1.462

Prepared by **Authorized Signatory**

[Mrs. Anita Navare] **End of Report** for **[Mrs. Madhura Barve]**

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'JANAPATH', FLAT NO. 5, 4th FLOOR,

Date-23.07.2021

CERTIFICATE OF ANALYSIS

Report No. A.M.-149/02- 21	Page 1 of 1
Name & Address :	Dr. Nilima Amrute. (Ph.D Scholar) BSDT's Ayurved College & Research Centre, Vishwashantidham, Kesnand Road, Wagholi, Pune- 412207(MH).
Sample Name:	Asthimajjapachak Guggul Vati. (Dhutryadi Guggul Vati)

SR. NO.	Parameter	Results
1.	Description	Faint Brownish Colour rounded vati yog. , Taste Bitter & Astrigent, Odour Faint Pungent.
2.	pH 5 %	4.38
3.	Moisture Content @ 110°C	7.43 %
4.	Total Ash Content	8.04 %
5.	Water Soluble Extract	30.97 %
6.	Average Weight	0.254 gm
7.	Average Diameter	0.301 Cm2
8.	Hardness	1.92 kg/cm²
9.	Disintegration Time	15 min 15 sec .
10.	Friability Test	0.001 %

Prepared by **Authorized Signatory**

[Mrs. Anita Navare] **End of Report** for **[Mrs. Madhura Barve]**

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Master Chart – Group A – 1(a)

Sr. No.	Code No.	Reg No.	Age	Gender	Religion	Marital Status	Occupation	Pulse	BP	
									Systolic	Diastolic
1	1	2057	22	M	Hindu	Unmarried	Labour	78	120	78
2	3	2058	23	M	Hindu	Unmarried	Labour	80	130	80
3	5	2059	35	M	Christian	Married	Labour	84	140	84
4	9	2060	38	M	Hindu	Married	Service	80	134	80
5	11	2062	34	M	Hindu	Married	Labour	90	140	90
6	13	2064	26	M	Hindu	Unmarried	Labour	72	120	80
7	15	2065	38	M	Muslim	Married	Labour	72	120	80
8	19	2069	33	M	Sikh	Unmarried	Service	86	140	80
9	23	2071	32	M	Hindu	Married	Labour	90	130	80
10	25	2123	31	M	Hindu	Married	Labour	90	140	80
11	29	2124	41	M	Hindu	Married	Labour	88	110	80
12	31	2125	38	M	Hindu	Married	Labour	88	130	84
13	33	2126	32	M	Hindu	Married	Service	80	120	80
14	35	2127	39	M	Hindu	Married	Service	80	120	80
15	37	2129	24	M	Hindu	Unmarried	Service	84	130	80
16	39	2130	29	M	Hindu	Married	Labour	86	130	80
17	41	2131	36	M	Hindu	Married	Service	80	130	86
18	43	2132	35	M	Hindu	Married	Labour	76	130	80
19	45	2133	32	M	Hindu	Married	Labour	76	130	80
20	47	2134	39	M	Hindu	Married	Labour	88	130	84
21	49	2135	33	F	Hindu	Married	Service	80	130	80

Sr. No.	Code No.	Reg No.	Age	Gender	Religion	Marital Status	Occupation	Pulse	BP	
									Systolic	Diastolic
22	51	2137	26	M	Hindu	Unmarried	Service	82	130	80
23	53	2144	22	M	Hindu	Unmarried	Labour	90	140	90
24	57	2146	25	M	Hindu	Unmarried	Labour	74	140	80
25	59	2147	26	M	Hindu	Married	Labour	78	142	88
26	61	2148	28	M	Hindu	Unmarried	Service	80	130	80
27	63	2149	27	M	Hindu	Unmarried	Labour	80	140	84
28	65	2150	25	M	Hindu	Unmarried	Labour	84	132	80
29	67	2151	38	M	Hindu	Married	Service	72	116	76
30	69	2152	37	M	Hindu	Married	Labour	80	130	80
31	71	2154	32	M	Hindu	Married	Labour	78	130	80
32	73	2155	37	M	Hindu	Married	Labour	84	136	84
33	75	2156	33	M	Hindu	Married	Labour	78	130	80
34	77	2165	31	M	Hindu	Married	Service	88	124	80
35	79	2166	39	M	Hindu	Married	Service	90	140	80
36	81	2167	28	M	Hindu	Married	Service	74	130	80
37	83	2168	36	M	Hindu	Married	Labour	76	130	80
38	85	2169	38	M	Hindu	Married	Labour	80	136	84
39	89	2170	26	M	Hindu	Married	Labour	72	138	80
40	91	2172	26	M	Hindu	Unmarried	Labour	74	130	82
41	93	2173	33	M	Hindu	Married	Service	80	140	88
42	95	2175	32	M	Hindu	Married	Labour	78	136	80
43	97	2208	29	M	Hindu	Married	Labour	86	140	80
44	99	2212	31	M	Christian	Married	Service	88	140	80

Sr. No.	Code No.	Reg No.	Age	Gender	Religion	Marital Status	Occupation	Pulse	BP	
									Systolic	Diastolic
45	101	2214	34	M	Hindu	Married	Labour	90	130	80
46	103	2216	39	M	Hindu	Married	Labour	78	120	80
47	105	2219	36	M	Hindu	Married	Labour	84	140	86
48	107	2221	34	M	Hindu	Married	Labour	80	130	80
49	109	2223	28	M	Hindu	Unmarried	Labour	80	130	80
50	111	2224	34	M	Hindu	Married	Service	86	130	80
51	113	2226	29	M	Hindu	Married	Labour	84	138	84
52	115	2227	35	M	Hindu	Married	Service	88	130	80
53	117	2249	40	M	Hindu	Married	Labour	86	130	80
54	119	2251	36	M	Hindu	Married	Labour	90	150	88
55	121	2255	43	M	Hindu	Married	Labour	80	120	78
56	123	2256	39	M	Sikh	Married	Labour	84	120	80
57	125	2257	25	M	Hindu	Unmarried	Labour	90	136	80
58	129	2258	23	M	Hindu	Unmarried	Labour	78	130	80
59	131	2259	29	M	Hindu	Married	Labour	80	120	80
60	133	2252	21	M	Hindu	Unmarried	Labour	76	120	80
61	135	2261	37	M	Muslim	Married	Labour	88	130	80
62	137	2262	39	M	Hindu	Married	Labour	86	130	82
63	141	2269	22	M	Hindu	Unmarried	Labour	90	138	80
64	143	2265	38	M	Hindu	Married	Labour	80	120	80
65	145	2266	46	M	Hindu	Married	Labour	88	130	80
66	147	2267	31	M	Hindu	Married	Labour	72	120	80
67	149	2278	41	M	Hindu	Married	Labour	88	124	80

Sr. No.	Code No.	Reg No.	Age	Gender	Religion	Marital Status	Occupation	Pulse	BP	
									Systolic	Diastolic
68	151	2279	31	M	Hindu	Married	Labour	80	120	80
69	153	2280	31	M	Hindu	Married	Labour	80	130	80
70	155	2282	26	M	Hindu	Married	Service	84	130	80
71	157	2281	30	M	Hindu	Married	Service	80	120	78
72	159	2284	45	M	Hindu	Married	Labour	78	136	80
73	161	2285	33	M	Hindu	Married	Labour	76	138	82
74	163	2286	29	M	Hindu	Married	Labour	80	120	76
75	165	2297	37	M	Hindu	Married	Labour	86	120	80
76	167	2299	26	M	Hindu	Unmarried	Labour	84	120	78
77	169	2301	34	M	Hindu	Unmarried	Labour	88	120	82
78	171	2303	33	M	Hindu	Married	Labour	82	126	80
79	173	2304	46	M	Hindu	Married	Service	76	130	80
80	175	2307	41	M	Hindu	Married	Labour	86	136	86
81	177	2309	29	M	Hindu	Unmarried	Labour	80	120	80
82	179	2317	34	M	Hindu	Married	Labour	86	120	80
83	181	2314	35	M	Hindu	Married	Labour	90	120	84
84	183	2319	27	M	Hindu	Married	Labour	86	130	90
85	185	2320	29	M	Hindu	Married	Labour	80	130	80
86	187	2321	22	M	Hindu	Unmarried	Labour	80	150	90
87	189	2322	24	M	Hindu	Unmarried	Service	76	130	80
88	191	2330	38	M	Hindu	Married	Labour	80	126	84
89	193	2343	41	M	Hindu	Married	Labour	84	120	80
90	195	2346	27	M	Hindu	Married	Labour	90	140	86

Sr. No.	Code No.	Reg No.	Age	Gender	Religion	Marital Status	Occupation	Pulse	BP	
									Systolic	Diastolic
91	197	2352	37	M	Hindu	Married	Service	80	120	80
92	199	2357	33	M	Hindu	Married	Service	84	120	80
93	203	2446	31	M	Hindu	Unmarried	Labour	90	120	78
94	205	2447	43	M	Hindu	Married	Labour	84	140	86
95	209	2448	32	M	Hindu	Married	Service	80	144	84
96	211	2449	29	M	Hindu	Married	Labour	80	136	80
97	213	2450	28	M	Christian	Unmarried	Labour	74	140	86
98	215	2451	27	M	Hindu	Married	Labour	76	140	80
99	219	2452	31	M	Hindu	Married	Service	82	130	80
100	221	2453	22	M	Hindu	Unmarried	Labour	84	130	80
101	223	2454	25	M	Hindu	Married	Labour	80	130	80
102	227	2455	29	F	Hindu	Married	Labour	86	130	82
103	229	2456	33	M	Hindu	Married	Labour	84	120	80
104	231	2457	31	M	Hindu	Married	Labour	78	120	80
105	233	2459	32	M	Hindu	Married	Labour	82	120	80
106	235	2503	36	M	Hindu	Married	Labour	80	120	80
107	237	2460	42	M	Hindu	Married	Service	72	120	80
108	239	2494	34	M	Hindu	Married	Service	78	124	80
109	241	2495	38	M	Hindu	Married	Labour	80	110	70
110	243	2496	39	M	Hindu	Married	Labour	80	120	80
111	245	2461	26	M	Hindu	Unmarried	Labour	84	120	78
112	247	2497	31	M	Hindu	Married	Labour	90	120	80
113	249	2499	28	M	Hindu	Unmarried	Labour	86	130	80

Sr. No.	Code No.	Reg No.	Age	Gender	Religion	Marital Status	Occupation	Pulse	BP	
									Systolic	Diastolic
114	251	2500	27	M	Hindu	Unmarried	Labour	78	120	80
115	253	2502	36	M	Hindu	Married	Labour	80	120	80
116	255	2529	22	F	Hindu	Unmarried	Service	90	140	84
117	257	2530	23	F	Hindu	Unmarried	Labour	86	140	80
118	261	2531	35	M	Christian	Married	Labour	86	130	86
119	263	2534	38	M	Hindu	Married	Labour	80	136	82
120	265	2536	23	M	Hindu	Unmarried	Labour	86	130	80
121	267	2539	26	F	Hindu	Married	Labour	82	140	86
122	269	2541	38	F	Hindu	Married	Service	72	120	80
123	271	2543	30	M	Hindu	Married	Labour	82	120	80
124	273	2565	33	M	Muslim	Married	Labour	90	130	80
125	277	2566	41	M	Hindu	Married	Labour	86	130	82
126	279	2568	32	M	Hindu	Married	Labour	84	120	80
127	283	2570	31	M	Hindu	Married	Labour	78	130	80
128	285	2572	41	F	Hindu	Married	Labour	74	116	76
129	289	2575	32	M	Hindu	Married	Labour	80	120	80
130	293	2577	39	M	Hindu	Married	Labour	74	130	80
131	295	2579	31	M	Hindu	Married	Labour	76	120	80
132	297	2586	36	F	Hindu	Married	Labour	72	120	80
133	299	2590	39	M	Hindu	Married	Labour	80	120	80
134	301	2593	33	M	Hindu	Married	Service	86	120	80
135	303	2596	26	M	Hindu	Married	Service	90	130	82
136	305	2599	26	M	Hindu	Married	Labour	84	120	80

Sr. No.	Code No.	Reg No.	Age	Gender	Religion	Marital Status	Occupation	Pulse	BP	
									Systolic	Diastolic
137	307	2603	27	F	Hindu	Unmarried	Service	80	134	80
138	311	2605	32	M	Hindu	Married	Labour	88	140	86
139	313	2609	38	M	Hindu	Married	Service	76	120	80
140	315	2614	32	M	Hindu	Married	Labour	72	140	88
141	317	2617	33	M	Hindu	Married	Labour	80	138	80
142	321	2620	28	M	Hindu	Married	Labour	74	120	80

Master Chart – Group A – 1(b)

Sr. No.	Age	Economic Status	Education	Type of H.L.	Degree of H.L.		Duration to exposure	Using Any aid
					Right Ear	Left Ear		
1	22	Poor Class	S.S.C.	Sensory	Moderate	Moderate	2	No Protective Aid
2	23	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	2	No Protective Aid
3	35	Poor Class	S.S.C.	Sensory	Moderate	Moderate	15	No Protective Aid
4	38	Lower Middle Class	Graduate	Sensory	Moderate	Moderate	12	No Protective Aid
5	34	Poor Class	S.S.C.	Sensory	Moderate	Moderate	12	No Protective Aid
6	26	Poor Class	H.S.C.	Sensory	Moderate	Moderate	5	Protective Aid
7	38	Poor Class	S.S.C.	Sensory	Moderate	Moderate	13	No Protective Aid
8	33	Lower Middle Class	Graduate	Sensory	Moderate	Moderate	9	No Protective Aid
9	32	Poor Class	S.S.C.	Sensory	Moderate	Moderate	10	Protective Aid
10	31	Poor Class	H.S.C.	Sensory	Moderate	Moderate	9	Protective Aid
11	41	Lower Middle Class	S.S.C.	Sensory	Moderate	Moderate	10	Protective Aid
12	38	Poor Class	H.S.C.	Sensory	Moderate	Moderate	7	No Protective Aid
13	32	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	10	Protective Aid
14	39	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	15	Protective Aid
15	24	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	3	No Protective Aid
16	29	Poor Class	S.S.C.	Sensory	Moderate	Moderate	8	No Protective Aid
17	36	Lower Middle Class	Graduate	Sensory	Moderate	Moderate	12	No Protective Aid
18	35	Poor Class	S.S.C.	Sensory	Moderate	Moderate	11	No Protective Aid
19	32	Poor Class	S.S.C.	Sensory	Moderate	Moderate	8	No Protective Aid
20	39	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	14	No Protective Aid
21	33	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	9	Protective Aid

Sr. No.	Age	Economic Status	Education	Type of H.L.	Degree of H.L.		Duration to exposure	Using Any aid
					Right Ear	Left Ear		
22	26	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	4	No Protective Aid
23	22	Poor Class	H.S.C.	Sensory	Moderate	Moderate	2	No Protective Aid
24	25	Poor Class	H.S.C.	Sensory	Moderate	Moderate	5	No Protective Aid
25	26	Poor Class	S.S.C.	Sensory	Moderate	Moderate	4	No Protective Aid
26	28	Lower Middle Class	Graduate	Sensory	Moderate	Moderate	6	No Protective Aid
27	27	Poor Class	S.S.C.	Sensory	Moderate	Moderate	5	No Protective Aid
28	25	Poor Class	S.S.C.	Sensory	Moderate	Moderate	4	Protective Aid
29	38	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	13	Protective Aid
30	37	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	13	No Protective Aid
31	32	Poor Class	H.S.C.	Sensory	Moderate	Moderate	11	No Protective Aid
32	37	Poor Class	H.S.C.	Sensory	Moderate	Moderate	12	No Protective Aid
33	33	Poor Class	S.S.C.	Sensory	Moderate	Moderate	11	Protective Aid
34	31	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	8	No Protective Aid
35	39	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	12	No Protective Aid
36	28	Lower Middle Class	Graduate	Sensory	Moderate	Moderate	5	No Protective Aid
37	36	Lower Middle Class	S.S.C.	Sensory	Moderate	Moderate	12	Protective Aid
38	38	Lower Middle Class	S.S.C.	Sensory	Moderate	Moderate	13	No Protective Aid
39	26	Poor Class	S.S.C.	Sensory	Moderate	Moderate	5	No Protective Aid
40	26	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	4	Protective Aid
41	33	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	11	Protective Aid
42	32	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	10	Protective Aid
43	29	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	8	No Protective Aid
44	31	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	8	Protective Aid

Sr. No.	Age	Economic Status	Education	Type of H.L.	Degree of H.L.		Duration to exposure	Using Any aid
					Right Ear	Left Ear		
45	34	Poor Class	H.S.C.	Sensory	Moderate	Moderate	11	No Protective Aid
46	39	Poor Class	H.S.C.	Sensory	Moderate	Moderate	15	Protective Aid
47	36	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	11	No Protective Aid
48	34	Poor Class	H.S.C.	Sensory	Moderate	Moderate	7	No Protective Aid
49	28	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	5	No Protective Aid
50	34	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	10	No Protective Aid
51	29	Poor Class	H.S.C.	Sensory	Moderate	Moderate	5	Protective Aid
52	35	Lower Middle Class	Graduate	Sensory	Moderate	Moderate	12	No Protective Aid
53	40	Lower Middle Class	S.S.C.	Sensory	Moderate	Moderate	13	No Protective Aid
54	36	Poor Class	S.S.C.	Sensory	Moderate	Moderate	12	No Protective Aid
55	43	Lower Middle Class	S.S.C.	Sensory	Moderate	Moderate	17	Protective Aid
56	39	Poor Class	S.S.C.	Sensory	Moderate	Moderate	12	Protective Aid
57	25	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	4	No Protective Aid
58	23	Poor Class	H.S.C.	Sensory	Moderate	Moderate	2	No Protective Aid
59	29	Poor Class	H.S.C.	Sensory	Moderate	Moderate	7	Protective Aid
60	21	Poor Class	S.S.C.	Sensory	Moderate	Moderate	1	Protective Aid
61	37	Poor Class	H.S.C.	Sensory	Moderate	Moderate	15	Protective Aid
62	39	Poor Class	H.S.C.	Sensory	Moderate	Moderate	15	Protective Aid
63	22	Poor Class	H.S.C.	Sensory	Moderate	Moderate	2	Protective Aid
64	38	Poor Class	H.S.C.	Sensory	Moderate	Moderate	16	Protective Aid
65	46	Poor Class	S.S.C.	Sensory	Moderate	Moderate	21	Protective Aid
66	31	Poor Class	S.S.C.	Sensory	Moderate	Moderate	8	No Protective Aid
67	41	Poor Class	H.S.C.	Sensory	Moderate	Moderate	16	Protective Aid

Sr. No.	Age	Economic Status	Education	Type of H.L.	Degree of H.L.		Duration to exposure	Using Any aid
					Right Ear	Left Ear		
68	31	Poor Class	H.S.C.	Sensory	Moderate	Moderate	8	No Protective Aid
69	31	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	9	No Protective Aid
70	26	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	4	Protective Aid
71	30	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	8	Protective Aid
72	45	Poor Class	Illiterate	Sensory	Moderate	Moderate	18	No Protective Aid
73	33	Poor Class	S.S.C.	Sensory	Moderate	Moderate	11	No Protective Aid
74	29	Poor Class	H.S.C.	Sensory	Moderate	Moderate	8	Protective Aid
75	37	Poor Class	S.S.C.	Sensory	Moderate	Moderate	14	Protective Aid
76	26	Poor Class	H.S.C.	Sensory	Moderate	Moderate	4	No Protective Aid
77	34	Poor Class	S.S.C.	Sensory	Moderate	Moderate	11	No Protective Aid
78	33	Poor Class	H.S.C.	Sensory	Moderate	Moderate	11	Protective Aid
79	46	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	19	No Protective Aid
80	41	Poor Class	H.S.C.	Sensory	Moderate	Moderate	17	Protective Aid
81	29	Poor Class	H.S.C.	Sensory	Moderate	Moderate	6	No Protective Aid
82	34	Poor Class	H.S.C.	Sensory	Moderate	Moderate	11	Protective Aid
83	35	Poor Class	H.S.C.	Sensory	Moderate	Moderate	13	No Protective Aid
84	27	Poor Class	H.S.C.	Sensory	Moderate	Moderate	6	Protective Aid
85	29	Poor Class	S.S.C.	Sensory	Moderate	Moderate	8	No Protective Aid
86	22	Poor Class	H.S.C.	Sensory	Moderate	Moderate	1	No Protective Aid
87	24	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	2	No Protective Aid
88	38	Poor Class	S.S.C.	Sensory	Moderate	Moderate	15	No Protective Aid
89	41	Poor Class	H.S.C.	Sensory	Moderate	Moderate	20	No Protective Aid
90	27	Poor Class	H.S.C.	Sensory	Moderate	Moderate	5	No Protective Aid

Sr. No.	Age	Economic Status	Education	Type of H.L.	Degree of H.L.		Duration to exposure	Using Any aid
					Right Ear	Left Ear		
91	37	Lower Middle Class	Graduate	Sensory	Moderate	Moderate	12	No Protective Aid
92	33	Lower Middle Class	Graduate	Sensory	Moderate	Moderate	11	No Protective Aid
93	31	Poor Class	H.S.C.	Sensory	Moderate	Moderate	9	Protective Aid
94	43	Poor Class	H.S.C.	Sensory	Moderate	Moderate	22	No Protective Aid
95	32	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	11	No Protective Aid
96	29	Poor Class	H.S.C.	Sensory	Moderate	Moderate	7	Protective Aid
97	28	Poor Class	S.S.C.	Sensory	Moderate	Moderate	5	No Protective Aid
98	27	Lower Middle Class	S.S.C.	Sensory	Moderate	Moderate	5	No Protective Aid
99	31	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	9	No Protective Aid
100	22	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	2	No Protective Aid
101	25	Poor Class	H.S.C.	Sensory	Moderate	Moderate	4	Protective Aid
102	29	Poor Class	S.S.C.	Sensory	Moderate	Moderate	8	No Protective Aid
103	33	Poor Class	S.S.C.	Sensory	Moderate	Moderate	11	No Protective Aid
104	31	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	9	No Protective Aid
105	32	Lower Middle Class	S.S.C.	Sensory	Moderate	Moderate	10	Protective Aid
106	36	Poor Class	S.S.C.	Sensory	Moderate	Moderate	14	Protective Aid
107	42	Upper Middle Class	Illiterate	Sensory	Moderate	Moderate	21	Protective Aid
108	34	Lower Middle Class	Graduate	Sensory	Moderate	Moderate	12	Protective Aid
109	38	Poor Class	S.S.C.	Sensory	Moderate	Moderate	16	Protective Aid
110	39	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	18	No Protective Aid
111	26	Lower Middle Class	S.S.C.	Sensory	Moderate	Moderate	4	Protective Aid
112	31	Poor Class	S.S.C.	Sensory	Moderate	Moderate	10	Protective Aid
113	28	Poor Class	S.S.C.	Sensory	Moderate	Moderate	6	Protective Aid

Sr. No.	Age	Economic Status	Education	Type of H.L.	Degree of H.L.		Duration to exposure	Using Any aid
					Right Ear	Left Ear		
114	27	Poor Class	S.S.C.	Sensory	Moderate	Moderate	5	Protective Aid
115	36	Poor Class	H.S.C.	Sensory	Moderate	Moderate	13	No Protective Aid
116	22	Lower Middle Class	Graduate	Sensory	Moderate	Moderate	1	No Protective Aid
117	23	Poor Class	H.S.C.	Sensory	Moderate	Moderate	2	No Protective Aid
118	35	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	14	No Protective Aid
119	38	Poor Class	H.S.C.	Sensory	Moderate	Moderate	16	No Protective Aid
120	23	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	2	Protective Aid
121	26	Poor Class	H.S.C.	Sensory	Moderate	Moderate	6	No Protective Aid
122	38	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	16	Protective Aid
123	30	Poor Class	H.S.C.	Sensory	Moderate	Moderate	8	No Protective Aid
124	33	Poor Class	S.S.C.	Sensory	Moderate	Moderate	11	No Protective Aid
125	41	Poor Class	H.S.C.	Sensory	Moderate	Moderate	16	No Protective Aid
126	32	Poor Class	H.S.C.	Sensory	Moderate	Moderate	8	Protective Aid
127	31	Poor Class	S.S.C.	Sensory	Moderate	Moderate	7	No Protective Aid
128	41	Poor Class	Graduate	Sensory	Moderate	Moderate	17	No Protective Aid
129	32	Lower Middle Class	S.S.C.	Sensory	Moderate	Moderate	8	Protective Aid
130	39	Poor Class	S.S.C.	Sensory	Moderate	Moderate	15	No Protective Aid
131	31	Poor Class	S.S.C.	Sensory	Moderate	Moderate	8	No Protective Aid
132	36	Lower Middle Class	S.S.C.	Sensory	Moderate	Moderate	13	Protective Aid
133	39	Poor Class	S.S.C.	Sensory	Moderate	Moderate	15	Protective Aid
134	33	Lower Middle Class	Graduate	Sensory	Moderate	Moderate	11	Protective Aid
135	26	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	6	No Protective Aid
136	26	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	4	Protective Aid

Sr. No.	Age	Economic Status	Education	Type of H.L.	Degree of H.L.		Duration to exposure	Using Any aid
					Right Ear	Left Ear		
137	27	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	5	Protective Aid
138	32	Poor Class	S.S.C.	Sensory	Moderate	Moderate	10	Protective Aid
139	38	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	14	Protective Aid
140	32	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	9	No Protective Aid
141	33	Poor Class	S.S.C.	Sensory	Moderate	Moderate	11	No Protective Aid
142	28	Poor Class	S.S.C.	Sensory	Moderate	Moderate	7	Protective Aid

Master Chart – Group A – 1(c)

Sr. No.	Age	Etiological factor / Hetu	Sleep	Emotional Make-up	Prakruti	Addiction	Diet	Karnapatal	Karnanad	Blocking of Ear
1	22	Exposure To Noise	Normal	Normal	PV	Smoking	Mixed	Normal	No	No
2	23	Exposure To Noise	Normal	Jolly	VP	Alcohol	Mixed	Normal	No	No
3	35	Exposure To Noise	Normal	Anxiety	VP	Smoking	Mixed	Normal	No	No
4	38	Exposure To Noise	Delayed	Anxiety	VP	Smoking	Mixed	Normal	No	No
5	34	Exposure To Noise	Disturbed	Jolly	VK	No	Mixed	Normal	No	No
6	26	Exposure To Noise	Normal	Jolly	KV	Tobacco	Mixed	Normal	No	No
7	38	Exposure To Noise	Delayed	Normal	KP	Smoking	Mixed	Normal	No	No
8	33	Exposure To Noise	Normal	Anxiety	VP	Alcohol	Mixed	Normal	No	No
9	32	Exposure To Noise	Normal	Normal	KP	No	Mixed	Normal	No	No
10	31	Exposure To Noise	Normal	Depression	VP	Tobacco	Mixed	Normal	No	No
11	41	Exposure To Noise	Normal	Normal	PV	Tobacco	Mixed	Normal	No	No
12	38	Exposure To Noise	Disturbed	Jolly	VP	Smoking	Mixed	Normal	No	No
13	32	Exposure To Noise	Delayed	Anxiety	PK	Tobacco	Pure Veg	Normal	No	No
14	39	Exposure To Noise	Delayed	Normal	KP	Smoking	Pure Veg	Normal	No	No
15	24	Exposure To Noise	Delayed	Anxiety	VP	Alcohol	Mixed	Normal	No	No
16	29	Exposure To Noise	Delayed	Depression	PV	Alcohol	Mixed	Normal	No	No
17	36	Exposure To Noise	Disturbed	Jolly	PV	Smoking	Pure Veg	Normal	No	No
18	35	Exposure To Noise	Disturbed	Jolly	VP	Smoking	Mixed	Normal	No	No
19	32	Exposure To Noise	Disturbed	Jolly	PV	Alcohol	Mixed	Normal	No	No
20	39	Exposure To Noise	Delayed	Anxiety	KP	Alcohol	Mixed	Normal	No	No
21	33	Exposure To Noise	Delayed	Depression	KP	No	Mixed	Normal	No	No

Sr. No.	Age	Etiological factor / Hetu	Sleep	Emotional Make-up	Prakruti	Addiction	Diet	Karnapatal	Karnanad	Blocking of Ear
22	26	Exposure To Noise	Delayed	Depression	KV	Tobacco	Pure Veg	Normal	No	No
23	22	Exposure To Noise	Disturbed	Depression	VK	Alcohol	Mixed	Normal	No	No
24	25	Exposure To Noise	Disturbed	Anxiety	VP	Smoking	Pure Veg	Normal	No	No
25	26	Exposure To Noise	Disturbed	Jolly	VP	Tobacco	Mixed	Normal	No	No
26	28	Exposure To Noise	Delayed	Normal	PK	Tobacco	Pure Veg	Normal	No	No
27	27	Exposure To Noise	Delayed	Normal	VK	Alcohol	Pure Veg	Normal	No	No
28	25	Exposure To Noise	Normal	Anxiety	VK	No	Mixed	Normal	No	No
29	38	Exposure To Noise	Delayed	Jolly	VP	No	Mixed	Normal	No	No
30	37	Exposure To Noise	Disturbed	Anxiety	PV	Alcohol	Pure Veg	Normal	No	No
31	32	Exposure To Noise	Delayed	Normal	VP	Alcohol	Pure Veg	Normal	No	No
32	37	Exposure To Noise	Disturbed	Jolly	PK	Tobacco	Mixed	Normal	No	No
33	33	Exposure To Noise	Normal	Depression	PK	Tobacco	Pure Veg	Normal	No	No
34	31	Exposure To Noise	Normal	Normal	PV	No	Mixed	Normal	No	No
35	39	Exposure To Noise	Delayed	Normal	VP	Alcohol	Mixed	Normal	No	No
36	28	Exposure To Noise	Disturbed	Jolly	VP	Alcohol	Pure Veg	Normal	No	No
37	36	Exposure To Noise	Disturbed	Jolly	VP	Tobacco	Mixed	Normal	No	No
38	38	Exposure To Noise	Disturbed	Jolly	VK	Alcohol	Mixed	Normal	No	No
39	26	Exposure To Noise	Disturbed	Depression	VP	No	Mixed	Normal	No	No
40	26	Exposure To Noise	Delayed	Anxiety	VP	Smoking	Mixed	Normal	No	No
41	33	Exposure To Noise	Normal	Depression	VP	Smoking	Mixed	Normal	No	No
42	32	Exposure To Noise	Disturbed	Normal	KP	Smoking	Mixed	Normal	No	No
43	29	Exposure To Noise	Delayed	Jolly	VP	Smoking	Mixed	Normal	No	No
44	31	Exposure To Noise	Normal	Jolly	VP	Alcohol	Mixed	Normal	No	No

Sr. No.	Age	Etiological factor / Hetu	Sleep	Emotional Make-up	Prakruti	Addiction	Diet	Karnapatal	Karnanad	Blocking of Ear
45	34	Exposure To Noise	Disturbed	Normal	VK	Alcohol	Mixed	Normal	No	No
46	39	Exposure To Noise	Normal	Anxiety	KP	Tobacco	Mixed	Normal	No	No
47	36	Exposure To Noise	Delayed	Anxiety	VP	Smoking	Mixed	Normal	No	No
48	34	Exposure To Noise	Delayed	Depression	PK	Tobacco	Pure Veg	Normal	No	No
49	28	Exposure To Noise	Disturbed	Depression	VP	Tobacco	Mixed	Normal	No	No
50	34	Exposure To Noise	Delayed	Normal	PK	Tobacco	Pure Veg	Normal	No	No
51	29	Exposure To Noise	Normal	Jolly	PK	Alcohol	Mixed	Normal	No	No
52	35	Exposure To Noise	Normal	Normal	VK	Alcohol	Mixed	Normal	No	No
53	40	Exposure To Noise	Delayed	Jolly	VK	Tobacco	Pure Veg	Normal	No	No
54	36	Exposure To Noise	Disturbed	Anxiety	VP	Smoking	Mixed	Normal	No	No
55	43	Exposure To Noise	Delayed	Anxiety	VP	Smoking	Pure Veg	Normal	No	No
56	39	Exposure To Noise	Normal	Depression	KP	Tobacco	Mixed	Normal	No	No
57	25	Exposure To Noise	Delayed	Depression	KV	Alcohol	Mixed	Normal	No	No
58	23	Exposure To Noise	Delayed	Anxiety	KP	No	Pure Veg	Normal	No	No
59	29	Exposure To Noise	Normal	Anxiety	KP	Tobacco	Pure Veg	Normal	No	No
60	21	Exposure To Noise	Delayed	Normal	KP	Tobacco	Mixed	Normal	No	No
61	37	Exposure To Noise	Normal	Jolly	KV	Alcohol	Mixed	Normal	No	No
62	39	Exposure To Noise	Normal	Normal	PK	Smoking	Mixed	Normal	No	No
63	22	Exposure To Noise	Normal	Jolly	VK	Alcohol	Mixed	Normal	No	No
64	38	Exposure To Noise	Normal	Normal	PK	Tobacco	Mixed	Normal	No	No
65	46	Exposure To Noise	Delayed	Normal	PV	Alcohol	Mixed	Normal	No	No
66	31	Exposure To Noise	Delayed	Normal	PV	No	Mixed	Normal	No	No
67	41	Exposure To Noise	Delayed	Anxiety	PK	Smoking	Mixed	Normal	No	No

Sr. No.	Age	Etiological factor / Hetu	Sleep	Emotional Make-up	Prakruti	Addiction	Diet	Karnapatal	Karnanad	Blocking of Ear
68	31	Exposure To Noise	Normal	Jolly	PV	Smoking	Mixed	Normal	No	No
69	31	Exposure To Noise	Disturbed	Normal	KP	No	Mixed	Normal	No	No
70	26	Exposure To Noise	Normal	Jolly	KV	Tobacco	Mixed	Normal	No	No
71	30	Exposure To Noise	Normal	Normal	KP	Tobacco	Mixed	Normal	No	No
72	45	Exposure To Noise	Delayed	Anxiety	PK	Alcohol	Mixed	Normal	No	No
73	33	Exposure To Noise	Normal	Anxiety	KP	Alcohol	Mixed	Normal	No	No
74	29	Exposure To Noise	Delayed	Anxiety	KV	Tobacco	Mixed	Normal	No	No
75	37	Exposure To Noise	Normal	Anxiety	PK	Smoking	Mixed	Normal	No	No
76	26	Exposure To Noise	Normal	Jolly	KP	Tobacco	Pure Veg	Normal	No	No
77	34	Exposure To Noise	Delayed	Anxiety	KP	Alcohol	Mixed	Normal	No	No
78	33	Exposure To Noise	Normal	Normal	VK	No	Mixed	Normal	No	No
79	46	Exposure To Noise	Disturbed	Anxiety	PK	Alcohol	Mixed	Normal	No	No
80	41	Exposure To Noise	Normal	Depression	PK	Alcohol	Mixed	Normal	No	No
81	29	Exposure To Noise	Delayed	Anxiety	KP	Alcohol	Pure Veg	Normal	No	No
82	34	Exposure To Noise	Normal	Normal	VK	Alcohol	Mixed	Normal	No	No
83	35	Exposure To Noise	Delayed	Normal	PK	Alcohol	Pure Veg	Normal	No	No
84	27	Exposure To Noise	Normal	Normal	PK	No	Pure Veg	Normal	No	No
85	29	Exposure To Noise	Disturbed	Depression	KV	No	Pure Veg	Normal	No	No
86	22	Exposure To Noise	Disturbed	Normal	KP	Alcohol	Mixed	Normal	No	No
87	24	Exposure To Noise	Delayed	Jolly	KP	Alcohol	Mixed	Normal	No	No
88	38	Exposure To Noise	Delayed	Anxiety	KV	Alcohol	Pure Veg	Normal	No	No
89	41	Exposure To Noise	Normal	Jolly	VK	Alcohol	Pure Veg	Normal	No	No
90	27	Exposure To Noise	Normal	Jolly	VP	Tobacco	Mixed	Normal	No	No

Sr. No.	Age	Etiological factor / Hetu	Sleep	Emotional Make-up	Prakruti	Addiction	Diet	Karnapatal	Karnanad	Blocking of Ear
91	37	Exposure To Noise	Delayed	Depression	KP	No	Pure Veg	Normal	No	No
92	33	Exposure To Noise	Delayed	Normal	KV	Alcohol	Mixed	Normal	No	No
93	31	Exposure To Noise	Delayed	Normal	VK	No	Pure Veg	Normal	No	No
94	43	Exposure To Noise	Disturbed	Anxiety	KP	Alcohol	Mixed	Normal	No	No
95	32	Exposure To Noise	Delayed	Jolly	KV	No	Pure Veg	Normal	No	No
96	29	Exposure To Noise	Normal	Depression	VK	No	Mixed	Normal	No	No
97	28	Exposure To Noise	Delayed	Jolly	KV	No	Mixed	Normal	No	No
98	27	Exposure To Noise	Delayed	Anxiety	KP	Alcohol	Mixed	Normal	No	No
99	31	Exposure To Noise	Disturbed	Anxiety	KV	Alcohol	Mixed	Normal	No	No
100	22	Exposure To Noise	Normal	Normal	KP	No	Mixed	Normal	No	No
101	25	Exposure To Noise	Normal	Normal	PK	No	Pure Veg	Normal	No	No
102	29	Exposure To Noise	Disturbed	Anxiety	VK	No	Mixed	Normal	No	No
103	33	Exposure To Noise	Disturbed	Anxiety	KV	No	Mixed	Normal	No	No
104	31	Exposure To Noise	Delayed	Depression	KP	Alcohol	Pure Veg	Normal	No	No
105	32	Exposure To Noise	Normal	Normal	KV	Smoking	Mixed	Normal	No	No
106	36	Exposure To Noise	Normal	Jolly	KP	Tobacco	Mixed	Normal	No	No
107	42	Exposure To Noise	Delayed	Normal	PK	Alcohol	Mixed	Normal	No	No
108	34	Exposure To Noise	Normal	Anxiety	PK	No	Pure Veg	Normal	No	No
109	38	Exposure To Noise	Normal	Depression	KP	Alcohol	Pure Veg	Normal	No	No
110	39	Exposure To Noise	Normal	Normal	VK	Tobacco	Mixed	Normal	No	No
111	26	Exposure To Noise	Delayed	Normal	KV	No	Mixed	Normal	No	No
112	31	Exposure To Noise	Normal	Jolly	PK	No	Pure Veg	Normal	No	No
113	28	Exposure To Noise	Normal	Normal	PK	Smoking	Mixed	Normal	No	No

Sr. No.	Age	Etiological factor / Hetu	Sleep	Emotional Make-up	Prakruti	Addiction	Diet	Karnapatal	Karnanad	Blocking of Ear
114	27	Exposure To Noise	Normal	Jolly	PK	Tobacco	Mixed	Normal	No	No
115	36	Exposure To Noise	Delayed	Normal	KV	Smoking	Mixed	Normal	No	No
116	22	Exposure To Noise	Disturbed	Normal	PK	No	Mixed	Normal	No	No
117	23	Exposure To Noise	Disturbed	Anxiety	VP	No	Mixed	Normal	No	No
118	35	Exposure To Noise	Delayed	Normal	KP	Alcohol	Mixed	Normal	No	No
119	38	Exposure To Noise	Delayed	Normal	VP	Smoking	Mixed	Normal	No	No
120	23	Exposure To Noise	Normal	Normal	PK	Alcohol	Mixed	Normal	No	No
121	26	Exposure To Noise	Disturbed	Normal	PK	No	Pure Veg	Normal	No	No
122	38	Exposure To Noise	Normal	Anxiety	VP	No	Mixed	Normal	No	No
123	30	Exposure To Noise	Disturbed	Anxiety	VP	Alcohol	Pure Veg	Normal	No	No
124	33	Exposure To Noise	Disturbed	Normal	VK	Alcohol	Mixed	Normal	No	No
125	41	Exposure To Noise	Delayed	Normal	PV	Tobacco	Mixed	Normal	No	No
126	32	Exposure To Noise	Normal	Normal	KV	Tobacco	Mixed	Normal	No	No
127	31	Exposure To Noise	Delayed	Anxiety	PV	Tobacco	Mixed	Normal	No	No
128	41	Exposure To Noise	Delayed	Anxiety	PV	No	Mixed	Normal	No	No
129	32	Exposure To Noise	Normal	Depression	PV	Alcohol	Mixed	Normal	No	No
130	39	Exposure To Noise	Normal	Normal	PV	Alcohol	Mixed	Normal	No	No
131	31	Exposure To Noise	Delayed	Normal	KP	Smoking	Mixed	Normal	No	No
132	36	Exposure To Noise	Normal	Jolly	KP	No	Mixed	Normal	No	No
133	39	Exposure To Noise	Delayed	Normal	PV	Tobacco	Mixed	Normal	No	No
134	33	Exposure To Noise	Delayed	Normal	PK	No	Pure Veg	Normal	No	No
135	26	Exposure To Noise	Disturbed	Normal	PV	Alcohol	Mixed	Normal	No	No
136	26	Exposure To Noise	Delayed	Anxiety	PV	Alcohol	Mixed	Normal	No	No

Sr. No.	Age	Etiological factor / Hetu	Sleep	Emotional Make-up	Prakruti	Addiction	Diet	Karnapatal	Karnanad	Blocking of Ear
137	27	Exposure To Noise	Disturbed	Normal	VP	No	Mixed	Normal	No	No
138	32	Exposure To Noise	Delayed	Depression	KP	Alcohol	Mixed	Normal	No	No
139	38	Exposure To Noise	Delayed	Normal	VP	No	Mixed	Normal	No	No
140	32	Exposure To Noise	Disturbed	Jolly	PV	Tobacco	Pure Veg	Normal	No	No
141	33	Exposure To Noise	Delayed	Normal	PV	Tobacco	Mixed	Normal	No	No
142	28	Exposure To Noise	Delayed	Jolly	VP	Tobacco	Mixed	Normal	No	No

Master Chart – Group B – 1(a)

Sr. No.	Code No.	Reg No.	Age	Gender	Religion	Marital Status	Occupation	Pulse	BP	
									Systolic	Diastolic
1	2	2021-3244	21	M	Hindu	Unmarried	Labour	80	120	80
2	4	2021-3246	40	F	Hindu	Married	Labour	84	130	80
3	8	2021-3250	50	M	Hindu	Married	Service	90	140	80
4	14	2021-3256	36	M	Hindu	Married	Labour	76	120	80
5	16	2021-3258	35	M	Hindu	Unmarried	Labour	78	120	80
6	20	2021-3262	38	M	Hindu	Married	Service	84	130	80
7	22	2021-3264	39	M	Hindu	Married	Labour	78	130	80
8	26	2021-3268	25	M	Hindu	Unmarried	Labour	88	120	80
9	28	2021-3270	23	M	Hindu	Unmarried	Labour	80	120	80
10	30	2021-3272	22	M	Hindu	Unmarried	Labour	84	110	70
11	32	2021-3274	39	M	Hindu	Married	Labour	80	120	80
12	34	2021-3276	21	M	Hindu	Unmarried	Labour	84	120	80
13	36	2021-3278	33	M	Hindu	Married	Labour	90	120	80
14	38	2021-3280	35	M	Hindu	Married	Labour	76	120	80
15	42	2021-3949	35	M	Hindu	Married	Service	78	140	86
16	44	2021-3950	49	M	Muslim	Married	Labour	90	136	84
17	46	2021-3952	48	M	Hindu	Married	Service	80	140	80
18	48	2021-3954	46	M	Hindu	Married	Service	78	140	82
19	50	2021-3956	31	M	Hindu	Unmarried	Service	82	130	80
20	58	2021-3964	40	M	Hindu	Married	Service	76	130	80
21	60	2021-3966	40	M	Hindu	Married	Service	84	128	80

Sr. No.	Code No.	Reg No.	Age	Gender	Religion	Marital Status	Occupation	Pulse	BP	
									Systolic	Diastolic
22	66	2021-3972	22	M	Hindu	Unmarried	Labour	72	120	80
23	68	2021-3974	45	M	Hindu	Married	Service	80	140	86
24	72	2021-3978	31	M	Hindu	Married	Labour	76	130	80
25	74	2021-3980	29	M	Hindu	Unmarried	Labour	74	120	80
26	76	2021-3982	32	M	Hindu	Married	Labour	80	120	80
27	78	2021-3984	35	M	Hindu	Married	Labour	84	130	80
28	86	2021-3790	37	M	Hindu	Married	Labour	84	140	84
29	92	2021-3784	36	M	Hindu	Married	Labour	82	130	80
30	94	2021-3782	49	M	Hindu	Married	Service	80	130	80
31	96	2021-3780	33	M	Hindu	Married	Labour	78	140	82
32	100	2021-3824	33	M	Hindu	Married	Labour	88	136	80
33	102	2021-3822	39	M	Hindu	Married	Labour	90	130	80
34	108	2021-3816	49	M	Hindu	Married	Labour	88	140	84
35	110	2021-3814	41	M	Hindu	Married	Labour	86	120	80
36	112	2021-3812	31	M	Hindu	Unmarried	Labour	84	120	80
37	114	2021-3810	32	M	Muslim	Married	Labour	86	130	80
38	116	2021-3808	48	M	Hindu	Married	Labour	88	130	80
39	118	2021-3805	32	M	Hindu	Unmarried	Labour	72	112	76
40	122	2021-3801	36	M	Hindu	Married	Labour	86	140	80
41	124	2021-3799	38	M	Hindu	Married	Labour	78	120	80
42	128	2021-3959	34	M	Hindu	Married	Service	88	140	82
43	130	2021-3961	33	M	Hindu	Married	Labour	86	120	80
44	132	2021-3963	36	M	Hindu	Married	Labour	80	120	80

Sr. No.	Code No.	Reg No.	Age	Gender	Religion	Marital Status	Occupation	Pulse	BP	
									Systolic	Diastolic
45	134	2021-3965	37	M	Christian	Married	Labour	82	120	80
46	138	2021-3969	39	M	Sikh	Married	Labour	84	130	80
47	140	2021-3971	31	M	Hindu	Unmarried	Labour	74	120	78
48	144	2021-3975	47	M	Hindu	Married	Labour	88	126	80
49	146	2021-3977	24	M	Sikh	Unmarried	Labour	76	120	80
50	148	2021-3979	44	M	Hindu	Married	Service	84	130	80
51	150	2021-3981	31	M	Christian	Unmarried	Labour	72	124	80
52	154	2021-3985	40	M	Hindu	Married	Labour	80	130	80
53	174	2021-4248	31	M	Hindu	Unmarried	Labour	86	140	80
54	176	2021-4256	50	M	Hindu	Married	Labour	92	140	80
55	180	2021-4250	40	F	Hindu	Married	Labour	86	138	82
56	182	2021-4277	40	M	Hindu	Married	Labour	78	130	80
57	184	2021-4273	34	M	Christian	Married	Labour	76	134	80
58	190	2021-4263	45	M	Hindu	Married	Labour	76	130	80
59	196	2021-4289	35	F	Hindu	Married	Labour	82	120	80
60	200	2021-4293	31	M	Hindu	Unmarried	Labour	86	140	80
61	202	2021-4297	34	M	Hindu	Married	Labour	80	120	80
62	204	2021-4301	40	M	Hindu	Married	Labour	78	120	80
63	208	2021-4306	35	M	Christian	Married	Service	80	130	80
64	210	2021-4308	40	M	Hindu	Married	Labour	88	120	80
65	212	2021-4310	35	F	Hindu	Married	Labour	80	120	80
66	214	2021-4312	31	M	Hindu	Married	Labour	78	120	80
67	224	2021-4322	41	M	Hindu	Married	Labour	86	130	80

Sr. No.	Code No.	Reg No.	Age	Gender	Religion	Marital Status	Occupation	Pulse	BP	
									Systolic	Diastolic
68	226	2021-4324	38	M	Hindu	Married	Service	94	150	90
69	228	2021-4326	38	M	Hindu	Married	Labour	80	150	84
70	232	2121-4320	37	M	Hindu	Married	Labour	90	150	88
71	234	2021-4335	25	M	Hindu	Unmarried	Labour	76	120	80
72	236	2021-4340	21	F	Hindu	Unmarried	Labour	76	116	78
73	238	2021-4342	21	M	Hindu	Unmarried	Labour	78	130	84
74	240	2021-4344	25	M	Hindu	Unmarried	Labour	72	126	80
75	242	2021-4347	23	M	Hindu	Unmarried	Labour	76	120	80
76	244	2021-4349	35	M	Hindu	Married	Labour	74	130	80
77	246	2021-4352	40	M	Christian	Married	Labour	80	120	80
78	248	2021-4354	34	M	Muslim	Married	Labour	78	120	80
79	250	2021-4356	30	M	Hindu	Unmarried	Labour	76	120	80
80	252	2021-4358	23	M	Hindu	Unmarried	Labour	72	120	80
81	254	2021-4360	25	M	Hindu	Unmarried	Labour	76	120	80
82	260	2021-4366	36	M	Hindu	Married	Labour	80	140	82
83	262	2021-4368	24	M	Hindu	Unmarried	Labour	74	124	82
84	264	2021-4370	35	M	Hindu	Married	Labour	76	130	80
85	270	2021-4376	49	M	Hindu	Married	Labour	82	140	80
86	272	2021-4380	29	M	Hindu	Unmarried	Labour	74	120	80
87	276	2021-4377	37	M	Hindu	Unmarried	Labour	84	124	80
88	278	2021-4379	36	M	Muslim	Married	Labour	80	120	80
89	280	2021-4393	21	M	Hindu	Unmarried	Labour	72	120	78
90	284	2021-4395	34	M	Hindu	Married	Labour	78	130	80

Sr. No.	Code No.	Reg No.	Age	Gender	Religion	Marital Status	Occupation	Pulse	BP	
									Systolic	Diastolic
91	288	2021-4389	22	M	Hindu	Unmarried	Labour	76	120	78
92	292	2021-4402	43	M	Hindu	Married	Labour	80	130	80
93	294	2021-4404	40	M	Hindu	Married	Labour	86	130	80
94	296	2021-4406	40	M	Hindu	Married	Labour	84	120	80
95	298	2021-4408	34	M	Hindu	Married	Labour	76	120	80
96	302	2021-4411	21	M	Hindu	Unmarried	Labour	72	120	76
97	308	2021-4415	31	M	Hindu	Married	Service	82	120	80
98	310	2021-4417	39	M	Hindu	Married	Service	80	140	80
99	312	2021-4419	32	M	Hindu	Unmarried	Labour	78	120	80
100	320	2021-4426	22	M	Hindu	Unmarried	Labour	80	120	78

Master Chart – Group B – 1(b)

Sr. No.	Age	Economic Status	Education	Type of H.L.	Degree of H.L.		Duration to exposure	Using Any aid
					Right Ear	Left Ear		
1	21	Lower Middle Class	S.S.C.	Sensory	Moderate	Moderate	1	Protective Aid
2	40	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	18	Protective Aid
3	50	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	17	No Protective Aid
4	36	Poor Class	H.S.C.	Sensory	Moderate	Moderate	8	Protective Aid
5	35	Poor Class	H.S.C.	Sensory	Moderate	Moderate	12	Protective Aid
6	38	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	17	Protective Aid
7	39	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	17	Protective Aid
8	25	Poor Class	H.S.C.	Sensory	Moderate	Moderate	7	Protective Aid
9	23	Poor Class	H.S.C.	Sensory	Moderate	Moderate	5	Protective Aid
10	22	Poor Class	S.S.C.	Sensory	Moderate	Moderate	2	Protective Aid
11	39	Poor Class	S.S.C.	Sensory	Moderate	Moderate	18	Protective Aid
12	21	Poor Class	S.S.C.	Sensory	Moderate	Moderate	2	Protective Aid
13	33	Poor Class	S.S.C.	Sensory	Moderate	Moderate	9	Protective Aid
14	35	Poor Class	H.S.C.	Sensory	Moderate	Moderate	12	Protective Aid
15	35	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	11	No Protective Aid
16	49	Lower Middle Class	Illiterate	Sensory	Moderate	Moderate	25	No Protective Aid
17	48	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	25	No Protective Aid
18	46	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	18	No Protective Aid
19	31	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	8	Protective Aid
20	40	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	17	No Protective Aid
21	40	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	18	Protective Aid

Sr. No.	Age	Economic Status	Education	Type of H.L.	Degree of H.L.		Duration to exposure	Using Any aid
					Right Ear	Left Ear		
22	22	Poor Class	S.S.C.	Sensory	Moderate	Moderate	4	Protective Aid
23	45	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	19	No Protective Aid
24	31	Poor Class	H.S.C.	Sensory	Moderate	Moderate	8	Protective Aid
25	29	Poor Class	H.S.C.	Sensory	Moderate	Moderate	9	Protective Aid
26	32	Poor Class	H.S.C.	Sensory	Moderate	Moderate	8	No Protective Aid
27	35	Lower Middle Class	S.S.C.	Sensory	Moderate	Moderate	14	No Protective Aid
28	37	Upper Middle Class	Illiterate	Sensory	Moderate	Moderate	15	No Protective Aid
29	36	Lower Middle Class	S.S.C.	Sensory	Moderate	Moderate	14	Protective Aid
30	49	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	26	No Protective Aid
31	33	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	8	No Protective Aid
32	33	Lower Middle Class	S.S.C.	Sensory	Moderate	Moderate	10	No Protective Aid
33	39	Poor Class	S.S.C.	Sensory	Moderate	Moderate	15	Protective Aid
34	49	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	17	No Protective Aid
35	41	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	20	No Protective Aid
36	31	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	10	Protective Aid
37	32	Upper Middle Class	H.S.C.	Sensory	Moderate	Moderate	10	Protective Aid
38	48	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	27	No Protective Aid
39	32	Poor Class	S.S.C.	Sensory	Moderate	Moderate	8	Protective Aid
40	36	Upper Middle Class	S.S.C.	Sensory	Moderate	Moderate	14	Protective Aid
41	38	Lower Middle Class	S.S.C.	Sensory	Moderate	Moderate	14	Protective Aid
42	34	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	14	Protective Aid
43	33	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	13	Protective Aid
44	36	Poor Class	H.S.C.	Sensory	Moderate	Moderate	14	Protective Aid

Sr. No.	Age	Economic Status	Education	Type of H.L.	Degree of H.L.		Duration to exposure	Using Any aid
					Right Ear	Left Ear		
45	37	Poor Class	S.S.C.	Sensory	Moderate	Moderate	15	Protective Aid
46	39	Lower Middle Class	S.S.C.	Sensory	Moderate	Moderate	19	Protective Aid
47	31	Poor Class	S.S.C.	Sensory	Moderate	Moderate	9	Protective Aid
48	47	Poor Class	H.S.C.	Sensory	Moderate	Moderate	25	No Protective Aid
49	24	Poor Class	H.S.C.	Sensory	Moderate	Moderate	5	Protective Aid
50	44	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	18	No Protective Aid
51	31	Poor Class	S.S.C.	Sensory	Moderate	Moderate	8	Protective Aid
52	40	Poor Class	H.S.C.	Sensory	Moderate	Moderate	13	Protective Aid
53	31	Poor Class	H.S.C.	Sensory	Moderate	Moderate	9	No Protective Aid
54	50	Lower Middle Class	Illiterate	Sensory	Moderate	Moderate	24	No Protective Aid
55	40	Poor Class	S.S.C.	Sensory	Moderate	Moderate	19	Protective Aid
56	40	Poor Class	S.S.C.	Sensory	Moderate	Moderate	15	Protective Aid
57	34	Lower Middle Class	S.S.C.	Sensory	Moderate	Moderate	9	No Protective Aid
58	45	Lower Middle Class	S.S.C.	Sensory	Moderate	Moderate	19	No Protective Aid
59	35	Poor Class	H.S.C.	Sensory	Moderate	Moderate	13	Protective Aid
60	31	Poor Class	H.S.C.	Sensory	Moderate	Moderate	9	No Protective Aid
61	34	Poor Class	H.S.C.	Sensory	Moderate	Moderate	14	Protective Aid
62	40	Poor Class	H.S.C.	Sensory	Moderate	Moderate	19	Protective Aid
63	35	Lower Middle Class	Graduate	Sensory	Moderate	Moderate	9	Protective Aid
64	40	Poor Class	S.S.C.	Sensory	Moderate	Moderate	20	Protective Aid
65	35	Poor Class	H.S.C.	Sensory	Moderate	Moderate	15	Protective Aid
66	31	Poor Class	S.S.C.	Sensory	Moderate	Moderate	10	Protective Aid
67	41	Poor Class	H.S.C.	Sensory	Moderate	Moderate	19	Protective Aid

Sr. No.	Age	Economic Status	Education	Type of H.L.	Degree of H.L.		Duration to exposure	Using Any aid
					Right Ear	Left Ear		
68	38	Poor Class	Illiterate	Sensory	Moderate	Moderate	14	No Protective Aid
69	38	Upper Middle Class	H.S.C.	Sensory	Moderate	Moderate	13	No Protective Aid
70	37	Lower Middle Class	Illiterate	Sensory	Moderate	Moderate	12	No Protective Aid
71	25	Poor Class	H.S.C.	Sensory	Moderate	Moderate	5	Protective Aid
72	21	Poor Class	S.S.C.	Sensory	Moderate	Moderate	1	Protective Aid
73	21	Poor Class	S.S.C.	Sensory	Moderate	Moderate	1	Protective Aid
74	25	Poor Class	H.S.C.	Sensory	Moderate	Moderate	4	Protective Aid
75	23	Poor Class	S.S.C.	Sensory	Moderate	Moderate	4	Protective Aid
76	35	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	7	Protective Aid
77	40	Lower Middle Class	S.S.C.	Sensory	Moderate	Moderate	9	Protective Aid
78	34	Poor Class	H.S.C.	Sensory	Moderate	Moderate	13	Protective Aid
79	30	Poor Class	H.S.C.	Sensory	Moderate	Moderate	10	Protective Aid
80	23	Poor Class	S.S.C.	Sensory	Moderate	Moderate	4	Protective Aid
81	25	Poor Class	S.S.C.	Sensory	Moderate	Moderate	5	Protective Aid
82	36	Poor Class	H.S.C.	Sensory	Moderate	Moderate	14	Protective Aid
83	24	Lower Middle Class	S.S.C.	Sensory	Moderate	Moderate	4	Protective Aid
84	35	Lower Middle Class	H.S.C.	Sensory	Moderate	Moderate	13	Protective Aid
85	49	Lower Middle Class	S.S.C.	Sensory	Moderate	Moderate	27	No Protective Aid
86	29	Poor Class	H.S.C.	Sensory	Moderate	Moderate	9	Protective Aid
87	37	Poor Class	S.S.C.	Sensory	Moderate	Moderate	7	Protective Aid
88	36	Poor Class	H.S.C.	Sensory	Moderate	Moderate	12	Protective Aid
89	21	Poor Class	S.S.C.	Sensory	Moderate	Moderate	1	Protective Aid
90	34	Poor Class	S.S.C.	Sensory	Moderate	Moderate	12	No Protective Aid

Sr. No.	Age	Economic Status	Education	Type of H.L.	Degree of H.L.		Duration to exposure	Using Any aid
					Right Ear	Left Ear		
91	22	Poor Class	S.S.C.	Sensory	Moderate	Moderate	2	Protective Aid
92	43	Lower Middle Class	S.S.C.	Sensory	Moderate	Moderate	18	No Protective Aid
93	40	Poor Class	H.S.C.	Sensory	Moderate	Moderate	19	Protective Aid
94	40	Poor Class	H.S.C.	Sensory	Moderate	Moderate	8	No Protective Aid
95	34	Poor Class	S.S.C.	Sensory	Moderate	Moderate	10	Protective Aid
96	21	Poor Class	S.S.C.	Sensory	Moderate	Moderate	1	Protective Aid
97	31	Lower Middle Class	Graduate	Sensory	Moderate	Moderate	8	Protective Aid
98	39	Upper Middle Class	Graduate	Sensory	Moderate	Moderate	11	No Protective Aid
99	32	Lower Middle Class	S.S.C.	Sensory	Moderate	Moderate	8	Protective Aid
100	22	Poor Class	H.S.C.	Sensory	Moderate	Moderate	2	Protective Aid

Master Chart – Group B – 1(c)

Sr. No.	Age	Etiological factor / Hetu	Sleep	Emotional Make-up	Prakruti	Addiction	Diet	Karnapatal	Karnanad	Blocking of Ear
1	21	Exposure To Noise	Normal	Normal	PV	No	Mixed	Normal	No	No
2	40	Exposure To Noise	Normal	Jolly	VP	No	Pure Veg	Normal	No	No
3	50	Exposure To Noise	Normal	Anxiety	VP	Tobacco	Mixed	Normal	No	No
4	36	Exposure To Noise	Delayed	Anxiety	VP	Alcohol	Mixed	Normal	No	No
5	35	Exposure To Noise	Disturbed	Jolly	VK	Alcohol	Mixed	Normal	No	No
6	38	Exposure To Noise	Normal	Jolly	KV	Smoking	Pure Veg	Normal	No	No
7	39	Exposure To Noise	Delayed	Normal	KP	Alcohol	Pure Veg	Normal	No	No
8	25	Exposure To Noise	Normal	Anxiety	VP	Smoking	Mixed	Normal	No	No
9	23	Exposure To Noise	Normal	Normal	KP	Alcohol	Mixed	Normal	No	No
10	22	Exposure To Noise	Normal	Depression	VP	No	Mixed	Normal	No	No
11	39	Exposure To Noise	Normal	Normal	PV	No	Mixed	Normal	No	No
12	21	Exposure To Noise	Disturbed	Jolly	VP	No	Mixed	Normal	No	No
13	33	Exposure To Noise	Delayed	Anxiety	PK	Alcohol	Mixed	Normal	No	No
14	35	Exposure To Noise	Delayed	Normal	KP	Smoking	Mixed	Normal	No	No
15	35	Exposure To Noise	Delayed	Anxiety	VP	Smoking	Mixed	Normal	No	No
16	49	Exposure To Noise	Delayed	Depression	PV	Smoking	Mixed	Normal	No	No
17	48	Exposure To Noise	Disturbed	Jolly	PV	Alcohol	Pure Veg	Normal	No	No
18	46	Exposure To Noise	Disturbed	Jolly	VP	Tobacco	Mixed	Normal	No	No
19	31	Exposure To Noise	Disturbed	Jolly	PV	Tobacco	Mixed	Normal	No	No
20	40	Exposure To Noise	Delayed	Anxiety	KP	Tobacco	Mixed	Normal	No	No
21	40	Exposure To Noise	Delayed	Depression	KP	Smoking	Mixed	Normal	No	No

Sr. No.	Age	Etiological factor / Hetu	Sleep	Emotional Make-up	Prakruti	Addiction	Diet	Karnapatal	Karnanad	Blocking of Ear
22	22	Exposure To Noise	Delayed	Depression	KV	No	Mixed	Normal	No	No
23	45	Exposure To Noise	Disturbed	Depression	VK	Tobacco	Pure Veg	Normal	No	No
24	31	Exposure To Noise	Disturbed	Anxiety	VP	Smoking	Mixed	Normal	No	No
25	29	Exposure To Noise	Disturbed	Jolly	VP	Tobacco	Mixed	Normal	No	No
26	32	Exposure To Noise	Delayed	Normal	PK	Tobacco	Mixed	Normal	No	No
27	35	Exposure To Noise	Delayed	Normal	VK	Tobacco	Mixed	Normal	No	No
28	37	Exposure To Noise	Normal	Anxiety	VK	No	Mixed	Normal	No	No
29	36	Exposure To Noise	Delayed	Jolly	VP	Alcohol	Mixed	Normal	No	No
30	49	Exposure To Noise	Disturbed	Anxiety	PV	Tobacco	Pure Veg	Normal	No	No
31	33	Exposure To Noise	Delayed	Normal	VP	Tobacco	Mixed	Normal	No	No
32	33	Exposure To Noise	Disturbed	Jolly	PK	Tobacco	Mixed	Normal	No	No
33	39	Exposure To Noise	Normal	Depression	PK	Alcohol	Mixed	Normal	No	No
34	49	Exposure To Noise	Normal	Normal	PV	Alcohol	Mixed	Normal	No	No
35	41	Exposure To Noise	Delayed	Normal	VP	Smoking	Pure Veg	Normal	No	No
36	31	Exposure To Noise	Disturbed	Jolly	VP	Smoking	Mixed	Normal	No	No
37	32	Exposure To Noise	Disturbed	Jolly	VP	Tobacco	Mixed	Normal	No	No
38	48	Exposure To Noise	Disturbed	Jolly	VK	Tobacco	Mixed	Normal	No	No
39	32	Exposure To Noise	Disturbed	Depression	VP	No	Mixed	Normal	No	No
40	36	Exposure To Noise	Delayed	Anxiety	VP	Tobacco	Pure Veg	Normal	No	No
41	38	Exposure To Noise	Normal	Depression	VP	Alcohol	Pure Veg	Normal	No	No
42	34	Exposure To Noise	Disturbed	Normal	KP	No	Mixed	Normal	No	No
43	33	Exposure To Noise	Delayed	Jolly	VP	No	Mixed	Normal	No	No
44	36	Exposure To Noise	Normal	Jolly	VP	Smoking	Mixed	Normal	No	No

Sr. No.	Age	Etiological factor / Hetu	Sleep	Emotional Make-up	Prakruti	Addiction	Diet	Karnapatal	Karnanad	Blocking of Ear
45	37	Exposure To Noise	Disturbed	Normal	VK	Smoking	Mixed	Normal	No	No
46	39	Exposure To Noise	Normal	Anxiety	KP	Tobacco	Mixed	Normal	No	No
47	31	Exposure To Noise	Delayed	Anxiety	VP	Tobacco	Pure Veg	Normal	No	No
48	47	Exposure To Noise	Delayed	Depression	PK	Tobacco	Pure Veg	Normal	No	No
49	24	Exposure To Noise	Disturbed	Depression	VP	Tobacco	Mixed	Normal	No	No
50	44	Exposure To Noise	Delayed	Normal	PK	Alcohol	Mixed	Normal	No	No
51	31	Exposure To Noise	Normal	Jolly	PK	Alcohol	Mixed	Normal	No	No
52	40	Exposure To Noise	Normal	Normal	VK	Tobacco	Mixed	Normal	No	No
53	31	Exposure To Noise	Delayed	Jolly	VK	Tobacco	Pure Veg	Normal	No	No
54	50	Exposure To Noise	Disturbed	Anxiety	VP	Tobacco	Pure Veg	Normal	No	No
55	40	Exposure To Noise	Delayed	Anxiety	VP	No	Mixed	Normal	No	No
56	40	Exposure To Noise	Normal	Depression	KP	No	Pure Veg	Normal	No	No
57	34	Exposure To Noise	Delayed	Depression	KV	No	Mixed	Normal	No	No
58	45	Exposure To Noise	Delayed	Anxiety	KP	Alcohol	Mixed	Normal	No	No
59	35	Exposure To Noise	Normal	Anxiety	KP	No	Mixed	Normal	No	No
60	31	Exposure To Noise	Delayed	Normal	KP	Alcohol	Mixed	Normal	No	No
61	34	Exposure To Noise	Normal	Jolly	KV	No	Mixed	Normal	No	No
62	40	Exposure To Noise	Normal	Normal	PK	Alcohol	Mixed	Normal	No	No
63	35	Exposure To Noise	Normal	Jolly	VK	No	Mixed	Normal	No	No
64	40	Exposure To Noise	Normal	Normal	PK	No	Pure Veg	Normal	No	No
65	35	Exposure To Noise	Delayed	Normal	PV	No	Mixed	Normal	No	No
66	31	Exposure To Noise	Delayed	Normal	PV	No	Mixed	Normal	No	No
67	41	Exposure To Noise	Delayed	Anxiety	PK	No	Mixed	Normal	No	No

Sr. No.	Age	Etiological factor / Hetu	Sleep	Emotional Make-up	Prakruti	Addiction	Diet	Karnapatal	Karnanad	Blocking of Ear
68	38	Exposure To Noise	Normal	Jolly	PV	Tobacco	Pure Veg	Normal	No	No
69	38	Exposure To Noise	Disturbed	Normal	KP	No	Mixed	Normal	No	No
70	37	Exposure To Noise	Normal	Jolly	KV	Tobacco	Pure Veg	Normal	No	No
71	25	Exposure To Noise	Normal	Normal	KP	Smoking	Mixed	Normal	No	No
72	21	Exposure To Noise	Delayed	Anxiety	PK	No	Mixed	Normal	No	No
73	21	Exposure To Noise	Normal	Anxiety	KP	Alcohol	Mixed	Normal	No	No
74	25	Exposure To Noise	Delayed	Anxiety	KV	No	Mixed	Normal	No	No
75	23	Exposure To Noise	Normal	Anxiety	PK	No	Mixed	Normal	No	No
76	35	Exposure To Noise	Normal	Jolly	KP	No	Mixed	Normal	No	No
77	40	Exposure To Noise	Delayed	Anxiety	KP	Smoking	Mixed	Normal	No	No
78	34	Exposure To Noise	Normal	Normal	VK	Tobacco	Mixed	Normal	No	No
79	30	Exposure To Noise	Disturbed	Anxiety	PK	Tobacco	Mixed	Normal	No	No
80	23	Exposure To Noise	Normal	Depression	PK	Tobacco	Mixed	Normal	No	No
81	25	Exposure To Noise	Delayed	Anxiety	KP	Tobacco	Mixed	Normal	No	No
82	36	Exposure To Noise	Normal	Normal	VK	Alcohol	Mixed	Normal	No	No
83	24	Exposure To Noise	Delayed	Normal	PK	Smoking	Mixed	Normal	No	No
84	35	Exposure To Noise	Normal	Normal	PK	Smoking	Mixed	Normal	No	No
85	49	Exposure To Noise	Disturbed	Depression	KV	Alcohol	Mixed	Normal	No	No
86	29	Exposure To Noise	Disturbed	Normal	KP	Alcohol	Mixed	Normal	No	No
87	37	Exposure To Noise	Delayed	Jolly	KP	No	Pure Veg	Normal	No	No
88	36	Exposure To Noise	Delayed	Anxiety	KV	No	Mixed	Normal	No	No
89	21	Exposure To Noise	Normal	Jolly	VK	No	Mixed	Normal	No	No
90	34	Exposure To Noise	Normal	Jolly	VP	Smoking	Mixed	Normal	No	No

Sr. No.	Age	Etiological factor / Hetu	Sleep	Emotional Make-up	Prakruti	Addiction	Diet	Karnapatal	Karnanad	Blocking of Ear
91	22	Exposure To Noise	Delayed	Depression	KP	No	Mixed	Normal	No	No
92	43	Exposure To Noise	Delayed	Normal	KV	Smoking	Mixed	Normal	No	No
93	40	Exposure To Noise	Delayed	Normal	VK	Tobacco	Mixed	Normal	No	No
94	40	Exposure To Noise	Disturbed	Anxiety	KP	Tobacco	Mixed	Normal	No	No
95	34	Exposure To Noise	Delayed	Jolly	KV	Smoking	Mixed	Normal	No	No
96	21	Exposure To Noise	Normal	Depression	VK	No	Mixed	Normal	No	No
97	31	Exposure To Noise	Delayed	Jolly	KV	Smoking	Mixed	Normal	No	No
98	39	Exposure To Noise	Delayed	Anxiety	KP	Tobacco	Pure Veg	Normal	No	No
99	32	Exposure To Noise	Disturbed	Anxiety	KV	Tobacco	Mixed	Normal	No	No
100	22	Exposure To Noise	Normal	Normal	KP	Smoking	Mixed	Normal	No	No

Master Chart – Group A – 2(a)

Sr. No.	Age	Karnabadhirya (Deafness) Right Ear		Karnabadhirya (Deafness) Left Ear		Karnabadhirya (Deafness) Right Ear		Karnabadhirya (Deafness) Left Ear		% Relief
		BT	AT	BT	AT	BT	AT	BT	AT	
1	22	Moderate	No	Moderate	No	2	0	2	0	100
2	23	Moderate	Mild	Moderate	Mild	2	1	2	1	50
3	35	Moderate	Mild	Moderate	Mild	2	1	2	1	50
4	38	Moderate	Mild	Moderate	No	2	1	2	0	75
5	34	Moderate	Mild	Moderate	Mild	2	1	2	1	50
6	26	Moderate	No	Moderate	Mild	2	0	2	1	75
7	38	Moderate	Mild	Moderate	Mild	2	1	2	1	50
8	33	Moderate	Mild	Moderate	Mild	2	1	2	1	50
9	32	Moderate	Mild	Moderate	Mild	2	1	2	1	50
10	31	Moderate	Mild	Moderate	No	2	1	2	0	75
11	41	Moderate	No	Moderate	No	2	0	2	0	100
12	38	Moderate	Mild	Moderate	Mild	2	1	2	1	50
13	32	Moderate	Mild	Moderate	Mild	2	1	2	1	50
14	39	Moderate	Mild	Moderate	Mild	2	1	2	1	50
15	24	Moderate	Mild	Moderate	Mild	2	1	2	1	50
16	29	Moderate	Mild	Moderate	Mild	2	1	2	1	50
17	36	Moderate	Mild	Moderate	No	2	1	2	0	75
18	35	Moderate	Mild	Moderate	Mild	2	1	2	1	50
19	32	Moderate	Mild	Moderate	Mild	2	1	2	1	50
20	39	Moderate	Mild	Moderate	Mild	2	1	2	1	50

Sr. No.	Age	Karnabadhirya (Deafness) Right Ear		Karnabadhirya (Deafness) Left Ear		Karnabadhirya (Deafness) Right Ear		Karnabadhirya (Deafness) Left Ear		% Relief
		BT	AT	BT	AT	BT	AT	BT	AT	
21	33	Moderate	Mild	Moderate	Mild	2	1	2	1	50
22	26	Moderate	No	Moderate	Mild	2	0	2	1	75
23	22	Moderate	Mild	Moderate	No	2	1	2	0	75
24	25	Moderate	Mild	Moderate	Mild	2	1	2	1	50
25	26	Moderate	Mild	Moderate	No	2	1	2	0	75
26	28	Moderate	Mild	Moderate	Mild	2	1	2	1	50
27	27	Moderate	Mild	Moderate	Mild	2	1	2	1	50
28	25	Moderate	Mild	Moderate	Mild	2	1	2	1	50
29	38	Moderate	Mild	Moderate	No	2	1	2	0	75
30	37	Moderate	Mild	Moderate	No	2	1	2	0	75
31	32	Moderate	Mild	Moderate	Mild	2	1	2	1	50
32	37	Moderate	Mild	Moderate	Mild	2	1	2	1	50
33	33	Moderate	No	Moderate	Mild	2	0	2	1	75
34	31	Moderate	Mild	Moderate	Mild	2	1	2	1	50
35	39	Moderate	Mild	Moderate	Mild	2	1	2	1	50
36	28	Moderate	Mild	Moderate	Mild	2	1	2	1	50
37	36	Moderate	Mild	Moderate	Mild	2	1	2	1	50
38	38	Moderate	Mild	Moderate	No	2	1	2	0	75
39	26	Moderate	Mild	Moderate	Mild	2	1	2	1	50
40	26	Moderate	Mild	Moderate	Mild	2	1	2	1	50
41	33	Moderate	Mild	Moderate	No	2	1	2	0	75
42	32	Moderate	No	Moderate	Mild	2	0	2	1	75

Sr. No.	Age	Karnabadhirya (Deafness) Right Ear		Karnabadhirya (Deafness) Left Ear		Karnabadhirya (Deafness) Right Ear		Karnabadhirya (Deafness) Left Ear		% Relief
		BT	AT	BT	AT	BT	AT	BT	AT	
43	29	Moderate	Mild	Moderate	Mild	2	1	2	1	50
44	31	Moderate	Mild	Moderate	Mild	2	1	2	1	50
45	34	Moderate	No	Moderate	Mild	2	0	2	1	75
46	39	Moderate	Mild	Moderate	Mild	2	1	2	1	50
47	36	Moderate	No	Moderate	Mild	2	0	2	1	75
48	34	Moderate	Mild	Moderate	No	2	1	2	0	75
49	28	Moderate	No	Moderate	No	2	0	2	0	100
50	34	Moderate	Mild	Moderate	Mild	2	1	2	1	50
51	29	Moderate	No	Moderate	No	2	0	2	0	100
52	35	Moderate	No	Moderate	Mild	2	0	2	1	75
53	40	Moderate	Mild	Moderate	Mild	2	1	2	1	50
54	36	Moderate	Mild	Moderate	Mild	2	1	2	1	50
55	43	Moderate	Mild	Moderate	Mild	2	1	2	1	50
56	39	Moderate	Mild	Moderate	Mild	2	1	2	1	50
57	25	Moderate	No	Moderate	Mild	2	0	2	1	75
58	23	Moderate	Mild	Moderate	Mild	2	1	2	1	50
59	29	Moderate	Mild	Moderate	Mild	2	1	2	1	50
60	21	Moderate	Mild	Moderate	Mild	2	1	2	1	50
61	37	Moderate	No	Moderate	Mild	2	0	2	1	75
62	39	Moderate	Mild	Moderate	No	2	1	2	0	75
63	22	Moderate	No	Moderate	Mild	2	0	2	1	75
64	38	Moderate	No	Moderate	Mild	2	0	2	1	75

Sr. No.	Age	Karnabadhirya (Deafness) Right Ear		Karnabadhirya (Deafness) Left Ear		Karnabadhirya (Deafness) Right Ear		Karnabadhirya (Deafness) Left Ear		% Relief
		BT	AT	BT	AT	BT	AT	BT	AT	
65	46	Moderate	Mild	Moderate	No	2	1	2	0	75
66	31	Moderate	Mild	Moderate	No	2	1	2	0	75
67	41	Moderate	Mild	Moderate	Mild	2	1	2	1	50
68	31	Moderate	Mild	Moderate	Mild	2	1	2	1	50
69	31	Moderate	Mild	Moderate	Mild	2	1	2	1	50
70	26	Moderate	Mild	Moderate	Mild	2	1	2	1	50
71	30	Moderate	Mild	Moderate	Mild	2	1	2	1	50
72	45	Moderate	Mild	Moderate	Mild	2	1	2	1	50
73	33	Moderate	No	Moderate	Mild	2	0	2	1	75
74	29	Moderate	Mild	Moderate	Mild	2	1	2	1	50
75	37	Moderate	Mild	Moderate	No	2	1	2	0	75
76	26	Moderate	Mild	Moderate	Mild	2	1	2	1	50
77	34	Moderate	Mild	Moderate	Mild	2	1	2	1	50
78	33	Moderate	Mild	Moderate	No	2	1	2	0	75
79	46	Moderate	Mild	Moderate	Mild	2	1	2	1	50
80	41	Moderate	Mild	Moderate	No	2	1	2	0	75
81	29	Moderate	Mild	Moderate	Mild	2	1	2	1	50
82	34	Moderate	Mild	Moderate	Mild	2	1	2	1	50
83	35	Moderate	Mild	Moderate	Mild	2	1	2	1	50
84	27	Moderate	No	Moderate	Mild	2	0	2	1	75
85	29	Moderate	Mild	Moderate	Mild	2	1	2	1	50
86	22	Moderate	Mild	Moderate	Mild	2	1	2	1	50

Sr. No.	Age	Karnabadhirya (Deafness) Right Ear		Karnabadhirya (Deafness) Left Ear		Karnabadhirya (Deafness) Right Ear		Karnabadhirya (Deafness) Left Ear		% Relief
		BT	AT	BT	AT	BT	AT	BT	AT	
87	24	Moderate	Mild	Moderate	Mild	2	1	2	1	50
88	38	Moderate	Mild	Moderate	Mild	2	1	2	1	50
89	41	Moderate	Mild	Moderate	No	2	1	2	0	75
90	27	Moderate	No	Moderate	Mild	2	0	2	1	75
91	37	Moderate	Mild	Moderate	Mild	2	1	2	1	50
92	33	Moderate	Mild	Moderate	Mild	2	1	2	1	50
93	31	Moderate	No	Moderate	Mild	2	0	2	1	75
94	43	Moderate	Mild	Moderate	Mild	2	1	2	1	50
95	32	Moderate	Mild	Moderate	No	2	1	2	0	75
96	29	Moderate	No	Moderate	Mild	2	0	2	1	75
97	28	Moderate	Mild	Moderate	Mild	2	1	2	1	50
98	27	Moderate	Mild	Moderate	Mild	2	1	2	1	50
99	31	Moderate	Mild	Moderate	Mild	2	1	2	1	50
100	22	Moderate	No	Moderate	Mild	2	0	2	1	75
101	25	Moderate	Mild	Moderate	Mild	2	1	2	1	50
102	29	Moderate	Mild	Moderate	Mild	2	1	2	1	50
103	33	Moderate	Mild	Moderate	Mild	2	1	2	1	50
104	31	Moderate	Mild	Moderate	Mild	2	1	2	1	50
105	32	Moderate	Mild	Moderate	Mild	2	1	2	1	50
106	36	Moderate	Mild	Moderate	Mild	2	1	2	1	50
107	42	Moderate	Mild	Moderate	Mild	2	1	2	1	50
108	34	Moderate	No	Moderate	Mild	2	0	2	1	75

Sr. No.	Age	Karnabadhirya (Deafness) Right Ear		Karnabadhirya (Deafness) Left Ear		Karnabadhirya (Deafness) Right Ear		Karnabadhirya (Deafness) Left Ear		% Relief
		BT	AT	BT	AT	BT	AT	BT	AT	
109	38	Moderate	Mild	Moderate	Mild	2	1	2	1	50
110	39	Moderate	No	Moderate	Mild	2	0	2	1	75
111	26	Moderate	Mild	Moderate	Mild	2	1	2	1	50
112	31	Moderate	Mild	Moderate	No	2	1	2	0	75
113	28	Moderate	Mild	Moderate	No	2	1	2	0	75
114	27	Moderate	Mild	Moderate	Mild	2	1	2	1	50
115	36	Moderate	No	Moderate	Mild	2	0	2	1	75
116	22	Moderate	Mild	Moderate	Mild	2	1	2	1	50
117	23	Moderate	Mild	Moderate	Mild	2	1	2	1	50
118	35	Moderate	No	Moderate	Mild	2	0	2	1	75
119	38	Moderate	Mild	Moderate	Mild	2	1	2	1	50
120	23	Moderate	Mild	Moderate	Mild	2	1	2	1	50
121	26	Moderate	Mild	Moderate	Mild	2	1	2	1	50
122	38	Moderate	Mild	Moderate	Mild	2	1	2	1	50
123	30	Moderate	Mild	Moderate	Mild	2	1	2	1	50
124	33	Moderate	Mild	Moderate	Mild	2	1	2	1	50
125	41	Moderate	Mild	Moderate	Mild	2	1	2	1	50
126	32	Moderate	Mild	Moderate	Mild	2	1	2	1	50
127	31	Moderate	Mild	Moderate	Mild	2	1	2	1	50
128	41	Moderate	Mild	Moderate	No	2	1	2	0	75
129	32	Moderate	Mild	Moderate	Mild	2	1	2	1	50
130	39	Moderate	Mild	Moderate	Mild	2	1	2	1	50

Sr. No.	Age	Karnabadhirya (Deafness) Right Ear		Karnabadhirya (Deafness) Left Ear		Karnabadhirya (Deafness) Right Ear		Karnabadhirya (Deafness) Left Ear		% Relief
		BT	AT	BT	AT	BT	AT	BT	AT	
131	31	Moderate	Mild	Moderate	No	2	1	2	0	75
132	36	Moderate	Mild	Moderate	Mild	2	1	2	1	50
133	39	Moderate	Mild	Moderate	No	2	1	2	0	75
134	33	Moderate	Mild	Moderate	Mild	2	1	2	1	50
135	26	Moderate	Mild	Moderate	Mild	2	1	2	1	50
136	26	Moderate	Mild	Moderate	Mild	2	1	2	1	50
137	27	Moderate	No	Moderate	Mild	2	0	2	1	75
138	32	Moderate	Mild	Moderate	Mild	2	1	2	1	50
139	38	Moderate	Mild	Moderate	No	2	1	2	0	75
140	32	Moderate	No	Moderate	Mild	2	0	2	1	75
141	33	Moderate	Mild	Moderate	Mild	2	1	2	1	50
142	28	Moderate	Mild	Moderate	Mild	2	1	2	1	50

Master Chart – Group A – 2(b)

Sr. No.	Age	Audiometry								
		Frequencies (Right Ear)								
		500			1000			2000		
		BT	AT	F up	BT	AT	F up	BT	AT	F up
1	22	40	20	20	40	20	20	45	25	25
2	23	40	30	30	40	25	25	40	25	25
3	35	40	30	30	40	30	30	45	35	35
4	38	40	30	30	40	25	30	40	20	25
5	34	45	30	30	40	30	30	50	25	25
6	26	45	20	20	45	30	30	45	20	30
7	38	45	20	20	45	25	25	40	30	30
8	33	45	15	15	50	35	25	50	35	35
9	32	40	35	40	50	30	30	45	30	30
10	31	40	30	30	45	25	25	40	30	30
11	41	40	25	25	40	20	25	45	25	25
12	38	45	30	30	45	35	35	50	30	30
13	32	45	30	30	50	35	35	40	25	25
14	39	45	25	35	40	25	35	45	25	25
15	24	45	25	25	45	30	30	55	35	35
16	29	40	30	30	55	25	25	40	35	35
17	36	45	25	25	50	35	45	40	30	35
18	35	55	30	30	50	40	40	50	35	35
19	32	45	30	30	45	35	35	40	25	25

Sr. No.	Age	Audiometry								
		Frequencies (Right Ear)								
		500			1000			2000		
		BT	AT	F up	BT	AT	F up	BT	AT	F up
20	39	50	25	25	55	30	30	40	20	20
21	33	55	25	25	50	25	25	40	30	30
22	26	40	25	25	45	25	25	40	20	20
23	22	50	30	30	40	25	25	45	30	30
24	25	45	25	25	50	30	30	45	35	35
25	26	40	25	25	40	25	25	40	30	30
26	28	45	20	25	45	30	30	40	30	30
27	27	40	35	40	40	25	25	40	25	30
28	25	50	25	35	55	30	30	55	25	25
29	38	50	25	25	50	30	30	45	35	35
30	37	55	30	30	40	20	20	50	30	30
31	32	55	35	35	45	20	20	55	35	35
32	37	40	30	30	55	35	35	55	30	30
33	33	40	25	25	40	30	30	40	15	15
34	31	50	25	25	55	35	35	40	25	25
35	39	55	30	30	50	35	35	40	25	25
36	28	40	25	25	45	30	30	40	30	30
37	36	55	25	25	50	30	40	50	25	25
38	38	50	20	20	40	25	25	45	35	35
39	26	40	30	30	45	35	35	45	30	30
40	26	50	25	35	50	40	40	40	25	25

Sr. No.	Age	Audiometry								
		Frequencies (Right Ear)								
		500			1000			2000		
		BT	AT	F up	BT	AT	F up	BT	AT	F up
41	33	50	25	25	40	25	35	40	25	25
42	32	40	30	30	40	15	15	40	20	20
43	29	45	25	25	40	25	25	40	30	30
44	31	50	30	30	40	25	25	50	20	20
45	34	45	20	20	50	30	30	45	20	20
46	39	55	25	25	40	25	35	50	35	35
47	36	40	20	20	50	35	35	50	20	20
48	34	50	25	25	40	30	30	40	30	30
49	28	45	15	25	40	30	35	40	25	30
50	34	40	30	30	50	35	35	40	15	15
51	29	45	20	20	40	25	25	50	25	25
52	35	40	25	25	40	25	25	50	20	20
53	40	50	20	20	40	30	30	55	30	30
54	36	50	30	30	40	25	25	50	35	35
55	43	55	30	40	55	40	40	40	30	30
56	39	40	30	30	40	20	20	45	30	30
57	25	40	25	25	40	20	20	40	20	20
58	23	55	20	20	55	30	30	45	35	35
59	29	40	30	35	50	25	25	45	30	35
60	21	40	25	25	40	20	20	50	35	35
61	37	40	25	25	40	20	20	50	20	20

Sr. No.	Age	Audiometry								
		Frequencies (Right Ear)								
		500			1000			2000		
		BT	AT	F up	BT	AT	F up	BT	AT	F up
62	39	50	20	20	50	30	30	50	25	25
63	22	40	30	35	40	25	25	40	15	15
64	38	45	20	20	45	25	25	45	25	25
65	46	40	15	15	40	25	25	55	35	35
66	31	50	25	25	40	25	25	40	25	25
67	41	55	35	45	45	20	30	50	30	30
68	31	40	30	30	40	30	30	45	25	25
69	31	40	30	30	40	25	25	50	25	25
70	26	50	30	30	55	45	45	40	25	25
71	30	45	30	30	45	30	30	50	20	20
72	45	40	30	30	45	35	35	45	30	30
73	33	40	25	25	40	15	15	50	30	30
74	29	40	25	25	50	35	35	45	35	40
75	37	40	35	35	45	25	25	45	35	35
76	26	45	25	25	40	25	25	40	25	25
77	34	45	30	30	40	25	25	40	25	25
78	33	40	30	30	45	35	35	40	30	30
79	46	40	30	35	40	25	25	45	25	25
80	41	40	25	25	45	35	35	40	25	25
81	29	45	30	30	40	30	30	40	30	30
82	34	55	30	40	40	25	25	40	20	20

Sr. No.	Age	Audiometry								
		Frequencies (Right Ear)								
		500			1000			2000		
		BT	AT	F up	BT	AT	F up	BT	AT	F up
83	35	40	25	35	45	25	35	40	30	35
84	27	45	10	10	40	25	25	40	30	30
85	29	45	30	30	50	30	30	40	25	25
86	22	40	30	30	50	40	45	40	30	30
87	24	40	30	30	40	20	20	45	30	30
88	38	45	30	30	40	25	25	40	20	20
89	41	40	35	35	40	25	25	45	30	30
90	27	40	25	25	40	25	25	40	15	15
91	37	45	35	35	40	30	30	50	25	25
92	33	50	30	30	40	25	25	55	30	30
93	31	45	10	10	50	35	35	45	25	25
94	43	40	30	30	40	30	30	40	30	30
95	32	40	20	30	45	30	30	40	25	25
96	29	40	30	30	40	20	20	45	20	20
97	28	40	25	25	50	35	35	40	30	30
98	27	55	30	30	55	35	35	50	30	30
99	31	50	30	30	40	25	25	40	25	25
100	22	45	10	10	45	25	25	40	20	20
101	25	45	30	35	40	20	20	40	30	35
102	29	45	35	35	40	25	25	40	20	20
103	33	40	25	25	45	25	35	40	30	35

Sr. No.	Age	Audiometry								
		Frequencies (Right Ear)								
		500			1000			2000		
		BT	AT	F up	BT	AT	F up	BT	AT	F up
104	31	40	30	30	40	25	25	40	30	30
105	32	45	30	30	50	30	30	40	25	25
106	36	40	30	30	50	40	40	40	30	30
107	42	40	30	30	40	20	30	45	30	40
108	34	40	25	25	40	20	20	50	20	30
109	38	50	20	20	50	30	40	50	25	25
110	39	40	30	30	40	25	25	40	15	15
111	26	45	20	20	45	25	25	45	30	30
112	31	40	15	15	40	25	25	55	35	35
113	28	50	35	35	40	25	25	40	25	25
114	27	55	35	35	45	20	20	50	30	30
115	36	40	30	30	40	15	15	40	20	20
116	22	45	25	25	40	25	25	40	30	30
117	23	50	35	35	35	25	25	50	30	30
118	35	45	20	20	50	30	30	45	20	20
119	38	55	25	35	40	25	25	50	35	40
120	23	40	20	20	50	35	35	50	25	25
121	26	55	35	35	45	20	35	55	35	35
122	38	40	30	30	55	35	35	55	40	40
123	30	45	35	35	40	30	30	40	15	15
124	33	50	25	35	55	40	40	40	25	25

Sr. No.	Age	Audiometry								
		Frequencies (Right Ear)								
		500			1000			2000		
		BT	AT	F up	BT	AT	F up	BT	AT	F up
125	41	55	30	30	50	35	40	40	25	25
126	32	40	25	25	45	30	30	40	30	30
127	31	55	25	25	50	35	35	50	25	25
128	41	50	20	20	40	25	25	45	35	35
129	32	40	30	30	45	35	35	45	30	30
130	39	45	30	30	40	25	25	40	25	25
131	31	40	30	30	45	35	35	40	30	30
132	36	40	30	30	40	25	25	45	25	25
133	39	40	25	25	45	25	25	40	25	25
134	33	45	30	30	40	20	30	40	30	30
135	26	55	30	30	40	25	30	40	20	30
136	26	40	25	25	45	25	25	40	30	30
137	27	45	10	25	40	25	25	40	30	35
138	32	45	30	30	40	25	25	40	20	20
139	38	40	35	35	40	25	25	45	30	30
140	32	40	25	25	40	25	25	40	15	25
141	33	45	35	35	40	30	30	50	25	25
142	28	50	30	30	40	25	25	55	30	30

Master Chart – Group A – 2(c)

Sr. No.	Age	Audiometry								
		Frequencies (Left Ear)								
		500			1000			2000		
		BT	AT	F up	BT	AT	F up	BT	AT	F up
1	22	40	25	25	40	25	25	40	20	20
2	23	40	25	25	45	35	35	40	30	30
3	35	40	25	25	45	35	35	55	40	40
4	38	45	20	25	50	30	30	40	20	20
5	34	40	30	30	40	30	30	45	35	35
6	26	40	30	30	45	30	35	45	30	30
7	38	40	30	30	40	20	20	45	25	25
8	33	45	35	35	50	30	30	40	25	25
9	32	40	25	25	45	25	25	50	30	40
10	31	40	20	20	45	25	25	40	25	25
11	41	45	20	20	40	20	20	45	30	30
12	38	40	25	35	40	25	25	40	25	25
13	32	50	35	35	40	25	25	40	30	30
14	39	40	30	30	40	20	30	40	25	25
15	24	55	40	40	45	25	25	40	25	25
16	29	50	35	35	45	30	30	45	35	35
17	36	40	20	20	45	25	25	45	25	25
18	35	55	40	45	55	30	40	45	35	40
19	32	40	30	30	45	35	35	40	25	25
20	39	40	25	25	40	30	30	50	35	40
21	33	50	25	25	40	30	30	40	30	30

Sr. No.	Age	Audiometry								
		Frequencies (Left Ear)								
		500			1000			2000		
		BT	AT	F up	BT	AT	F up	BT	AT	F up
22	26	40	25	25	50	35	35	50	35	35
23	22	45	25	35	45	20	20	40	25	25
24	25	40	30	30	40	25	25	40	30	30
25	26	40	20	20	45	20	20	50	30	40
26	28	40	30	30	50	35	45	45	35	35
27	27	40	25	30	40	25	25	40	25	25
28	25	40	30	30	50	35	35	40	25	25
29	38	40	20	20	40	20	20	40	25	35
30	37	45	20	20	45	25	25	40	25	25
31	32	40	30	30	40	25	25	40	30	30
32	37	40	30	30	50	40	40	55	35	35
33	33	55	30	30	55	35	35	50	40	40
34	31	40	20	20	55	40	40	55	35	35
35	39	40	30	30	40	30	30	45	35	35
36	28	50	35	35	40	25	25	40	30	30
37	36	40	30	30	40	25	25	40	25	25
38	38	40	20	20	40	20	20	45	30	30
39	26	45	30	30	40	30	30	40	25	25
40	26	45	30	30	45	25	25	55	40	40
41	33	40	25	25	40	20	20	40	25	25
42	32	40	30	30	40	30	30	40	25	25

Sr. No.	Age	Audiometry								
		Frequencies (Left Ear)								
		500			1000			2000		
		BT	AT	F up	BT	AT	F up	BT	AT	F up
43	29	40	30	30	50	35	40	45	30	30
44	31	40	25	25	40	25	30	40	25	25
45	34	45	35	35	40	25	25	40	25	25
46	39	50	30	30	40	30	30	45	30	35
47	36	45	25	25	40	30	30	40	30	30
48	34	40	20	25	40	25	35	40	25	25
49	28	40	20	20	40	20	30	45	30	30
50	34	50	35	35	55	45	45	40	25	25
51	29	45	25	25	45	25	25	40	20	20
52	35	50	30	40	45	30	30	50	40	40
53	40	50	35	35	50	35	35	55	35	35
54	36	50	25	25	55	40	40	55	30	30
55	43	55	35	35	50	30	30	40	30	30
56	39	50	30	30	50	35	35	55	35	35
57	25	40	25	25	40	30	30	40	25	25
58	23	40	30	30	50	40	40	40	30	30
59	29	45	25	25	55	35	35	45	30	35
60	21	55	40	45	50	40	40	50	35	35
61	37	55	40	40	40	25	25	50	35	40
62	39	50	30	30	40	20	20	40	20	20
63	22	40	25	25	45	30	35	40	30	30

Sr. No.	Age	Audiometry								
		Frequencies (Left Ear)								
		500			1000			2000		
		BT	AT	F up	BT	AT	F up	BT	AT	F up
64	38	40	30	30	45	35	35	55	40	40
65	46	40	20	20	45	30	30	40	20	25
66	31	40	20	20	40	20	20	40	25	25
67	41	55	45	45	45	30	30	40	25	25
68	31	55	30	30	55	40	40	50	40	40
69	31	55	35	35	40	25	25	55	35	35
70	26	40	25	25	50	35	45	40	25	30
71	30	40	25	25	45	35	35	50	40	40
72	45	55	40	40	40	25	25	50	35	35
73	33	40	30	30	45	35	35	55	40	40
74	29	40	25	25	45	30	30	45	30	30
75	37	40	20	20	45	25	25	40	20	20
76	26	40	30	30	50	35	35	40	30	30
77	34	40	25	25	50	40	40	40	30	30
78	33	40	20	30	40	25	25	40	25	25
79	46	40	30	35	40	20	20	45	35	35
80	41	40	20	20	40	25	25	40	25	25
81	29	40	20	20	40	30	30	45	35	35
82	34	40	25	25	40	25	25	55	35	45
83	35	45	30	30	45	35	35	45	35	35
84	27	45	25	25	45	25	25	40	25	25

Sr. No.	Age	Audiometry								
		Frequencies (Left Ear)								
		500			1000			2000		
		BT	AT	F up	BT	AT	F up	BT	AT	F up
85	29	40	25	25	40	30	30	40	30	30
86	22	40	25	25	55	35	35	40	30	30
87	24	40	25	25	50	30	40	45	35	35
88	38	40	25	25	45	30	30	45	30	40
89	41	40	25	25	45	25	25	40	20	20
90	27	55	45	45	50	30	40	50	40	40
91	37	50	35	35	45	30	30	45	25	25
92	33	50	30	30	40	20	20	50	40	40
93	31	40	25	30	45	35	35	40	30	30
94	43	40	20	20	40	25	25	40	30	30
95	32	40	20	20	40	25	25	40	25	30
96	29	40	20	20	40	25	25	40	30	30
97	28	40	20	20	45	30	30	40	25	25
98	27	45	25	25	40	30	30	50	35	35
99	31	45	30	30	50	40	40	45	30	30
100	22	40	25	25	40	20	20	45	30	30
101	25	40	20	20	40	30	30	45	35	35
102	29	40	25	25	40	25	25	55	35	35
103	33	45	30	35	45	35	35	45	35	35
104	31	45	25	30	45	25	25	40	25	25
105	32	40	25	30	40	30	30	40	30	30

Sr. No.	Age	Audiometry								
		Frequencies (Left Ear)								
		500			1000			2000		
		BT	AT	F up	BT	AT	F up	BT	AT	F up
106	36	40	25	25	55	35	35	40	30	30
107	42	40	25	25	50	30	40	45	35	35
108	34	55	40	40	40	25	25	50	35	45
109	38	50	35	35	40	20	30	40	20	20
110	39	40	25	25	45	30	30	40	30	30
111	26	40	30	30	45	35	35	50	40	45
112	31	40	20	20	45	30	30	40	20	30
113	28	40	20	20	40	20	20	40	25	25
114	27	55	45	45	45	30	30	40	25	25
115	36	40	30	30	40	30	30	40	25	25
116	22	40	30	30	50	30	30	45	30	30
117	23	40	25	25	40	25	25	40	25	25
118	35	45	30	30	40	25	25	40	25	25
119	38	50	30	35	40	30	30	45	30	30
120	23	45	25	25	40	30	30	40	30	30
121	26	40	30	30	40	25	25	40	30	30
122	38	40	30	30	50	40	40	55	35	35
123	30	55	30	30	55	35	35	50	40	40
124	33	45	25	35	55	40	40	55	35	40
125	41	40	30	30	40	30	30	45	35	35
126	32	45	35	35	40	25	25	40	30	30

Sr. No.	Age	Audiometry								
		Frequencies (Left Ear)								
		500			1000			2000		
		BT	AT	F up	BT	AT	F up	BT	AT	F up
127	31	40	30	35	40	25	25	40	25	25
128	41	40	20	20	40	20	20	45	30	30
129	32	45	30	30	40	30	30	35	25	25
130	39	40	25	25	50	40	40	40	30	30
131	31	40	20	20	40	25	25	40	25	25
132	36	40	30	30	40	20	20	45	35	35
133	39	40	20	20	40	25	25	40	25	25
134	33	40	20	20	40	30	35	45	35	35
135	26	40	25	25	40	25	25	55	35	45
136	26	45	30	30	45	35	35	45	35	40
137	27	45	25	35	45	25	35	40	25	25
138	32	40	25	25	45	30	30	45	30	30
139	38	40	25	25	45	25	35	40	20	30
140	32	55	45	50	50	30	40	50	40	40
141	33	50	35	35	45	30	30	45	25	25
142	28	50	30	30	40	20	20	50	40	40

Master Chart – Group B – 2(a)

Sr. No.	Age	Karnabadhirya (Deafness) Right Ear		Karnabadhirya (Deafness) Left Ear		Karnabadhirya (Deafness) Right Ear		Karnabadhirya (Deafness) Left Ear		% Relief
		BT	AT	BT	AT	BT	AT	BT	AT	
1	21	Moderate	No	Moderate	No	2	0	2	0	100
2	40	Moderate	Mild	Moderate	No	2	1	2	0	75
3	50	Moderate	Mild	Moderate	Mild	2	1	2	1	50
4	36	Moderate	No	Moderate	Mild	2	0	2	1	75
5	35	Moderate	Mild	Moderate	Mild	2	1	2	1	50
6	38	Moderate	No	Moderate	No	2	0	2	0	100
7	39	Moderate	No	Moderate	Mild	2	0	2	1	75
8	25	Moderate	No	Moderate	Mild	2	0	2	1	75
9	23	Moderate	Mild	Moderate	Mild	2	1	2	1	50
10	22	Moderate	No	Moderate	Mild	2	0	2	1	75
11	39	Moderate	No	Moderate	No	2	0	2	0	100
12	21	Moderate	Mild	Moderate	Mild	2	1	2	1	50
13	33	Moderate	Mild	Moderate	No	2	1	2	0	75
14	35	Moderate	Mild	Moderate	Mild	2	1	2	1	50
15	35	Moderate	No	Moderate	Mild	2	0	2	1	75
16	49	Moderate	Mild	Moderate	No	2	1	2	0	75
17	48	Moderate	Mild	Moderate	No	2	1	2	0	75
18	46	Moderate	Mild	Moderate	Mild	2	1	2	1	50
19	31	Moderate	Mild	Moderate	Mild	2	1	2	1	50
20	40	Moderate	No	Moderate	Mild	2	0	2	1	75

Sr. No.	Age	Karnabadhirya (Deafness) Right Ear		Karnabadhirya (Deafness) Left Ear		Karnabadhirya (Deafness) Right Ear		Karnabadhirya (Deafness) Left Ear		% Relief
		BT	AT	BT	AT	BT	AT	BT	AT	
21	40	Moderate	Mild	Moderate	Mild	2	1	2	1	50
22	22	Moderate	No	Moderate	No	2	0	2	0	100
23	45	Moderate	Mild	Moderate	Mild	2	1	2	1	50
24	31	Moderate	Mild	Moderate	Mild	2	1	2	1	50
25	29	Moderate	Mild	Moderate	Mild	2	1	2	1	50
26	32	Moderate	Mild	Moderate	Mild	2	1	2	1	50
27	35	Moderate	Mild	Moderate	Mild	2	1	2	1	50
28	37	Moderate	No	Moderate	Mild	2	0	2	1	75
29	36	Moderate	No	Moderate	No	2	0	2	0	100
30	49	Moderate	Mild	Moderate	Mild	2	1	2	1	50
31	33	Moderate	No	Moderate	Mild	2	0	2	1	75
32	33	Moderate	Mild	Moderate	No	2	1	2	0	75
33	39	Moderate	No	Moderate	Mild	2	0	2	1	75
34	49	Moderate	Mild	Moderate	No	2	1	2	0	75
35	41	Moderate	Mild	Moderate	Mild	2	1	2	1	50
36	31	Moderate	Mild	Moderate	Mild	2	1	2	1	50
37	32	Moderate	No	Moderate	No	2	0	2	0	100
38	48	Moderate	Mild	Moderate	No	2	1	2	0	75
39	32	Moderate	Mild	Moderate	Mild	2	1	2	1	50
40	36	Moderate	No	Moderate	No	2	0	2	0	100
41	38	Moderate	No	Moderate	No	2	0	2	0	100
42	34	Moderate	No	Moderate	Mild	2	0	2	1	75

Sr. No.	Age	Karnabadhirya (Deafness) Right Ear		Karnabadhirya (Deafness) Left Ear		Karnabadhirya (Deafness) Right Ear		Karnabadhirya (Deafness) Left Ear		% Relief
		BT	AT	BT	AT	BT	AT	BT	AT	
43	33	Moderate	Mild	Moderate	Mild	2	1	2	1	50
44	36	Moderate	No	Moderate	No	2	0	2	0	100
45	37	Moderate	No	Moderate	Mild	2	0	2	1	75
46	39	Moderate	No	Moderate	No	2	0	2	0	100
47	31	Moderate	No	Moderate	No	2	0	2	0	100
48	47	Moderate	No	Moderate	No	2	0	2	0	100
49	24	Moderate	No	Moderate	Mild	2	0	2	1	75
50	44	Moderate	No	Moderate	Mild	2	0	2	1	75
51	31	Moderate	No	Moderate	No	2	0	2	0	100
52	40	Moderate	No	Moderate	Mild	2	0	2	1	75
53	31	Moderate	Mild	Moderate	No	2	1	2	0	75
54	50	Moderate	Mild	Moderate	Mild	2	1	2	1	50
55	40	Moderate	No	Moderate	No	2	0	2	0	100
56	40	Moderate	No	Moderate	No	2	0	2	0	100
57	34	Moderate	No	Moderate	Mild	2	0	2	1	75
58	45	Moderate	No	Moderate	Mild	2	0	2	1	75
59	35	Moderate	No	Moderate	Mild	2	0	2	1	75
60	31	Moderate	No	Moderate	No	2	0	2	0	100
61	34	Moderate	No	Moderate	Mild	2	0	2	1	75
62	40	Moderate	No	Moderate	No	2	0	2	0	100
63	35	Moderate	No	Moderate	Mild	2	0	2	1	75
64	40	Moderate	No	Moderate	No	2	0	2	0	100

Sr. No.	Age	Karnabadhirya (Deafness) Right Ear		Karnabadhirya (Deafness) Left Ear		Karnabadhirya (Deafness) Right Ear		Karnabadhirya (Deafness) Left Ear		% Relief
		BT	AT	BT	AT	BT	AT	BT	AT	
65	35	Moderate	Mild	Moderate	No	2	1	2	0	75
66	31	Moderate	No	Moderate	No	2	0	2	0	100
67	41	Moderate	No	Moderate	No	2	0	2	0	100
68	38	Moderate	Mild	Moderate	No	2	1	2	0	75
69	38	Moderate	No	Moderate	Mild	2	0	2	1	75
70	37	Moderate	Mild	Moderate	No	2	1	2	0	75
71	25	Moderate	Mild	Moderate	No	2	1	2	0	75
72	21	Moderate	No	Moderate	No	2	0	2	0	100
73	21	Moderate	No	Moderate	No	2	0	2	0	100
74	25	Moderate	Mild	Moderate	No	2	1	2	0	75
75	23	Moderate	No	Moderate	No	2	0	2	0	100
76	35	Moderate	Mild	Moderate	No	2	1	2	0	75
77	40	Moderate	No	Moderate	No	2	0	2	0	100
78	34	Moderate	No	Moderate	No	2	0	2	0	100
79	30	Moderate	Mild	Moderate	Mild	2	1	2	1	50
80	23	Moderate	No	Moderate	Mild	2	0	2	1	75
81	25	Moderate	Mild	Moderate	Mild	2	1	2	1	50
82	36	Moderate	No	Moderate	No	2	0	2	0	100
83	24	Moderate	Mild	Moderate	No	2	1	2	0	75
84	35	Moderate	No	Moderate	No	2	0	2	0	100
85	49	Moderate	No	Moderate	Mild	2	0	2	1	75
86	29	Moderate	Mild	Moderate	Mild	2	1	2	1	50

Sr. No.	Age	Karnabadhirya (Deafness) Right Ear		Karnabadhirya (Deafness) Left Ear		Karnabadhirya (Deafness) Right Ear		Karnabadhirya (Deafness) Left Ear		% Relief
		BT	AT	BT	AT	BT	AT	BT	AT	
87	37	Moderate	No	Moderate	No	2	0	2	0	100
88	36	Moderate	No	Moderate	Mild	2	0	2	1	75
89	21	Moderate	Mild	Moderate	No	2	1	2	0	75
90	34	Moderate	No	Moderate	No	2	0	2	0	100
91	22	Moderate	Mild	Moderate	No	2	1	2	0	75
92	43	Moderate	No	Moderate	No	2	0	2	0	100
93	40	Moderate	No	Moderate	Mild	2	0	2	1	75
94	40	Moderate	Mild	Moderate	Mild	2	1	2	1	50
95	34	Moderate	No	Moderate	Mild	2	0	2	1	75
96	21	Moderate	No	Moderate	No	2	0	2	0	100
97	31	Moderate	Mild	Moderate	No	2	1	2	0	75
98	39	Moderate	Mild	Moderate	Mild	2	1	2	1	50
99	32	Moderate	No	Moderate	Mild	2	0	2	1	75
100	22	Moderate	No	Moderate	Mild	2	0	2	1	75

Master Chart – Group B – 2(b)

Sr. No.	Age	Audiometry								
		Frequencies (Right Ear)								
		500			1000			2000		
		BT	AT	F up	BT	AT	F up	BT	AT	F up
1	21	40	20	20	45	10	10	40	15	15
2	40	45	30	30	40	25	25	40	25	25
3	50	50	30	35	40	30	30	50	35	40
4	36	40	30	30	40	20	20	40	20	20
5	35	40	30	30	40	30	30	45	15	25
6	38	45	20	30	45	30	30	45	20	20
7	39	40	20	20	40	25	25	40	10	10
8	25	50	15	35	50	20	30	40	15	15
9	23	50	35	35	40	30	30	50	30	30
10	22	40	30	30	40	25	25	40	15	30
11	39	40	20	30	45	20	20	40	15	15
12	21	55	30	35	55	25	35	50	30	30
13	33	50	30	30	40	25	25	50	35	35
14	35	45	25	25	45	30	30	45	25	25
15	35	40	25	25	40	20	20	40	25	25
16	49	50	30	30	40	25	25	50	35	45
17	48	50	25	35	40	30	30	50	30	30
18	46	40	30	30	40	25	25	45	30	30
19	31	50	30	30	40	30	35	40	25	25

Sr. No.	Age	Audiometry								
		Frequencies (Right Ear)								
		500			1000			2000		
		BT	AT	F up	BT	AT	F up	BT	AT	F up
20	40	45	25	25	40	20	20	40	20	20
21	40	45	25	25	40	25	25	45	30	30
22	22	40	20	20	40	25	25	40	20	30
23	45	50	30	30	40	30	30	40	20	20
24	31	50	25	25	40	25	25	50	35	35
25	29	40	20	20	50	25	25	55	40	40
26	32	40	20	20	40	30	30	55	30	30
27	35	50	25	25	40	20	20	50	35	45
28	37	40	15	15	40	20	20	45	25	25
29	36	50	25	35	40	25	25	40	20	20
30	49	50	30	30	55	15	25	50	30	40
31	33	40	20	30	45	20	20	40	15	15
32	33	45	30	30	40	25	25	40	20	20
33	39	40	25	25	40	30	30	40	15	15
34	49	40	25	25	40	35	35	40	20	20
35	41	40	30	30	40	30	30	45	25	25
36	31	40	25	25	50	25	35	45	25	25
37	32	40	25	25	40	30	30	40	15	25
38	48	40	20	20	45	25	25	55	35	35
39	32	55	35	35	55	45	45	50	30	30
40	36	40	25	25	40	15	15	40	15	30

Sr. No.	Age	Audiometry								
		Frequencies (Right Ear)								
		500			1000			2000		
		BT	AT	F up	BT	AT	F up	BT	AT	F up
41	38	45	25	25	45	10	10	40	15	30
42	34	45	30	30	40	15	15	45	20	20
43	33	50	25	35	40	15	15	55	35	35
44	36	45	30	30	40	25	25	40	15	15
45	37	40	20	20	40	20	20	45	20	20
46	39	50	25	35	40	15	15	40	15	15
47	31	40	20	20	40	25	25	40	20	20
48	47	50	25	25	40	30	30	40	15	15
49	24	40	15	25	40	30	30	45	25	25
50	44	50	20	20	50	35	45	40	15	15
51	31	40	20	20	40	30	30	40	10	10
52	40	50	25	25	40	25	25	40	20	20
53	31	40	20	20	45	30	30	55	30	40
54	50	55	30	30	55	25	25	50	30	35
55	40	40	15	15	40	15	15	40	15	15
56	40	45	20	20	45	10	10	40	15	15
57	34	40	25	25	45	10	25	40	20	20
58	45	50	20	20	40	20	20	50	25	25
59	35	40	20	25	40	20	20	50	30	30
60	31	45	10	10	40	15	15	45	15	15
61	34	45	10	20	45	10	30	45	20	20

Sr. No.	Age	Audiometry								
		Frequencies (Right Ear)								
		500			1000			2000		
		BT	AT	F up	BT	AT	F up	BT	AT	F up
62	40	45	20	30	40	30	30	40	15	15
63	35	45	30	30	40	25	25	40	15	30
64	40	45	20	20	40	15	15	45	15	15
65	35	40	15	15	50	45	45	50	20	30
66	31	50	25	25	45	10	10	45	25	25
67	41	40	20	20	40	15	15	45	30	30
68	38	40	15	15	50	45	45	45	25	25
69	38	40	20	20	40	20	20	40	25	25
70	37	50	30	40	50	45	45	45	20	20
71	25	50	30	30	50	45	45	40	20	20
72	21	40	15	20	40	10	25	55	25	25
73	21	50	25	25	40	15	15	45	15	30
74	25	55	25	25	50	35	35	40	20	20
75	23	40	20	20	40	20	20	50	25	25
76	35	50	25	25	50	45	45	45	15	15
77	40	40	30	30	40	15	15	50	25	25
78	34	40	10	10	50	40	40	40	20	20
79	30	50	30	30	55	45	45	40	25	25
80	23	45	10	10	45	10	10	45	15	15
81	25	40	30	30	40	20	20	50	30	30
82	36	40	15	15	45	10	10	40	10	25

Sr. No.	Age	Audiometry								
		Frequencies (Right Ear)								
		500			1000			2000		
		BT	AT	F up	BT	AT	F up	BT	AT	F up
83	24	50	25	25	50	45	45	45	25	25
84	35	45	10	25	45	10	20	45	30	30
85	49	50	30	30	40	15	15	40	25	25
86	29	55	40	40	55	45	45	55	35	35
87	37	50	30	30	45	10	10	50	30	30
88	36	50	30	30	40	25	25	40	15	15
89	21	40	25	25	50	45	45	45	20	20
90	34	40	20	20	40	25	25	40	15	15
91	22	50	35	35	40	30	30	50	25	25
92	43	40	15	15	40	25	25	55	30	30
93	40	45	10	10	45	10	10	45	20	30
94	40	40	30	30	50	30	30	55	30	30
95	34	40	20	20	45	30	30	40	15	25
96	21	45	25	25	40	25	25	40	20	20
97	31	40	25	25	40	25	35	40	30	30
98	39	50	30	30	40	30	30	50	30	30
99	32	45	10	25	40	15	20	45	20	20
100	22	40	10	10	45	10	10	45	20	20

Master Chart – Group B – 2 (c)

Sr. No.	Age	Audiometry								
		Frequencies (Left Ear)								
		500			1000			2000		
		BT	AT	F up	BT	AT	F up	BT	AT	F up
1	21	45	15	15	40	15	15	50	25	25
2	40	40	15	25	45	15	15	50	30	30
3	50	50	35	35	50	35	35	50	25	25
4	36	40	25	25	40	25	25	50	40	40
5	35	50	30	30	50	30	35	50	35	35
6	38	50	30	35	50	25	25	40	15	25
7	39	50	30	30	45	20	20	50	25	25
8	25	50	25	25	50	30	40	45	25	25
9	23	40	25	25	40	25	25	50	30	30
10	22	50	35	35	40	15	15	40	30	30
11	39	45	20	30	45	20	20	40	15	30
12	21	50	25	25	50	40	40	50	25	25
13	33	45	15	15	45	25	25	45	10	30
14	35	50	30	30	45	20	20	50	35	35
15	35	50	30	30	40	20	30	40	30	30
16	49	45	15	30	40	30	30	50	25	25
17	48	40	20	20	45	25	25	50	25	25
18	46	40	20	20	40	20	20	50	40	40
19	31	50	30	35	45	20	30	40	30	30
20	40	50	25	25	45	20	20	50	35	35
21	40	40	15	15	50	30	30	50	30	30

Sr. No.	Age	Audiometry								
		Frequencies (Left Ear)								
		500			1000			2000		
		BT	AT	F up	BT	AT	F up	BT	AT	F up
22	22	50	25	25	45	20	20	50	25	25
23	45	40	25	25	50	25	30	50	25	25
24	31	50	30	40	50	25	35	50	30	30
25	29	40	30	30	50	30	30	45	25	25
26	32	40	30	30	40	20	20	55	40	40
27	35	50	25	35	40	25	25	50	25	25
28	37	40	25	25	45	20	20	40	30	30
29	36	40	15	15	40	15	25	40	15	30
30	49	55	45	45	40	25	25	40	30	30
31	33	45	35	35	50	25	25	50	25	25
32	33	40	20	20	50	25	30	40	10	25
33	39	40	20	20	40	25	25	40	30	30
34	49	40	15	30	40	15	15	40	15	25
35	41	55	40	40	50	25	35	45	30	30
36	31	45	15	15	40	20	20	55	45	45
37	32	45	10	25	45	25	25	40	15	15
38	48	40	15	15	45	20	20	50	30	30
39	32	55	30	30	55	40	40	50	25	25
40	36	45	10	10	45	20	20	45	20	20
41	38	45	30	30	40	20	20	45	20	20
42	34	45	30	30	40	25	30	50	25	25

Sr. No.	Age	Audiometry								
		Frequencies (Left Ear)								
		500			1000			2000		
		BT	AT	F up	BT	AT	F up	BT	AT	F up
43	33	50	30	30	50	25	25	45	30	30
44	36	40	15	15	40	15	15	40	20	30
45	37	55	35	35	45	20	20	45	25	25
46	39	45	15	15	45	25	25	40	15	15
47	31	40	20	20	40	20	20	40	30	30
48	47	40	20	20	50	25	25	40	25	25
49	24	55	40	40	45	25	25	45	25	25
50	44	45	15	15	40	25	25	55	40	40
51	31	40	10	10	45	20	20	45	10	10
52	40	40	25	25	50	30	30	40	30	30
53	31	40	15	15	40	20	20	50	25	25
54	50	50	25	25	50	30	35	40	25	25
55	40	45	15	35	45	20	20	45	15	25
56	40	45	20	20	40	15	15	40	20	20
57	34	45	25	25	40	30	30	40	25	25
58	45	50	25	25	50	30	30	40	25	25
59	35	40	20	20	40	30	30	50	30	30
60	31	50	30	30	45	20	20	40	15	30
61	34	50	25	25	50	20	20	50	35	35
62	40	40	15	25	45	15	35	45	20	20
63	35	40	25	25	40	20	20	50	30	30

Sr. No.	Age	Audiometry								
		Frequencies (Left Ear)								
		500			1000			2000		
		BT	AT	F up	BT	AT	F up	BT	AT	F up
64	40	50	30	30	50	20	20	40	10	25
65	35	40	10	30	40	15	15	45	10	10
66	31	45	20	20	40	15	15	45	15	15
67	41	40	20	20	45	30	30	45	20	20
68	38	40	15	25	40	15	15	40	20	20
69	38	45	30	30	45	25	25	45	25	25
70	37	40	15	25	40	15	15	45	10	10
71	25	45	15	30	45	15	30	45	20	20
72	21	50	25	25	50	20	20	50	25	25
73	21	50	30	30	40	15	15	40	15	15
74	25	40	15	15	45	20	20	40	15	15
75	23	50	25	25	50	25	25	40	15	25
76	35	45	15	15	45	20	20	40	15	15
77	40	45	15	25	45	25	25	40	15	15
78	34	40	15	15	40	15	14	40	20	20
79	30	40	20	20	50	20	20	50	35	35
80	23	50	30	30	40	25	25	40	30	30
81	25	50	20	30	50	25	25	50	30	30
82	36	50	25	30	50	20	20	40	15	15
83	24	45	15	15	50	20	20	50	35	35
84	35	40	15	15	50	20	30	40	15	15

Sr. No.	Age	Audiometry								
		Frequencies (Left Ear)								
		500			1000			2000		
		BT	AT	F up	BT	AT	F up	BT	AT	F up
85	49	55	45	45	40	30	30	50	40	40
86	29	50	25	25	40	15	15	55	45	45
87	37	40	20	20	50	25	25	45	25	25
88	36	40	25	25	50	20	20	50	30	30
89	21	40	25	25	40	15	15	40	30	30
90	34	50	25	25	50	30	30	40	15	30
91	22	40	15	15	50	30	40	40	25	25
92	43	40	15	25	45	20	20	40	30	30
93	40	40	25	25	50	35	35	45	30	30
94	40	40	20	20	45	25	25	50	35	35
95	34	40	20	20	50	25	25	55	45	45
96	21	40	20	30	40	15	15	40	30	30
97	31	40	15	25	40	20	30	40	25	25
98	39	50	25	25	50	30	35	50	30	30
99	32	55	30	30	55	45	45	45	30	35
100	22	40	25	25	40	20	20	40	30	30