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SHRI B M PATIL MEDICAL COLLEGE HOSPITAL

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TITLE OF THE TOPIC

"A STUDY OF SENSORINEURAL HEARING LOSS IN PATIENTS WITH DIABETES MELLITUS BY PURE TONE AUDIOMETRY"

By

Dr. NIVEDHA.N

Dissertation submitted to

SHRI B M PATIL MEDICAL COLLEGE HOSPITAL & RESEARCH CENTRE, VIJAYAPURA

In partial fulfillment of

MASTER OF SURGERY IN OTORHINOLARYNGOLOGY

UNDER THE GUIDANCE

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ENDORSEMENT BY HEAD OF DEPARTMENT & PRINCIPAL

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ACKNOWLEDMENT

First and foremost, thanks to the GOD , for his blessings throughout my research work and accompanying me throughout this remarkable journey.

I would like to express my sincere gratitude to **Dr. R N KARADI** MS ENT, Professor & Head of the Department of ENT and **Dr. VIJAYKUMAR G WARAD** MD GENERAL MEDICINE, Pofessor, Department of General Medicine , B.L.D.E (DU) , Shri B.M.Patil Medical College Hospital and Research Centre , Vijayapura for their invaluable guidance throughout this research.

My gratitude extends to **Dr .ARAVIND V PATIL**, Principal of Shri B.M.Patil Medical College Hospital and Research Centre , Vijayapura.

I am honored and privileged to extend my sincere respect, regards and gratitude to **Dr H.T LATHADEVI , Dr SHASHIKUMAR .T , Dr MANALI BHAT,**

Dr SHIVASHANKAR AJUR , Dr SUNITA & Dr SHARANABASSU for their guidance and support throughout my research.

My gratitude extends to **RAKSHITHA** (Audiologist) AND **SANGEETHA** (Audiologist) AND **SHILPA** for their help throughtout my research.

My gratitude extends to my colleagues **Dr. ANGELA SUSAN, Dr. RESHMA RAJEEV, Dr SUSHMA GADI , Dr. SAGARIKA ,Dr. ADISHREE , Dr. BHOOMIKA** for their support and well wishes.

My heartfelt thanks to my parents **Mr.NATESH R** and **Mrs. MALATHI R** for their sacrifices , love and constant support . I am also grateful to my brother **Mr MATHESH** and my husband **Mr Ambigai Balan** for their love.

Finally, I express my heartfelt appreciation to all the **Study Paticipants** who voluntarily participated and contributed their time without which this study would not have been possible.

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LIST OF ABBREVATIONS

PTA	Pure Tone Audiometry
DM	Diabetes mellitus
SNHL	Sensory neural hearing loss
Hba1c	Glycosylated haemoglobin
FBS	Fasting blood sugar
PPBS	Post prandial blood sugar
EAC	External Auditory Canal
TM	Tympanic membrane
ABC	Absolute bone conduction
AC	Air conduction
BC	Bone conduction

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ABSTRACT

BACKGROUND:

Diabetes mellitus is a significant public health problem with many secondary micro and macrovascular complications. [1] The most underestimated complication of diabetes mellitus is sensorineural hearing loss.[1]

In 1857, Jordao was the first to document the correlation between diabetes mellitus and hearing impairment. Incidence of hearing loss in diabetes patients ranges up to 80%. The hearing loss observed in diabetic patients will be of progressive bilateral sensorineural type affecting high frequencies. [2]

Goal of the present study is to establish a relationship between glycemic control and sensorineural hearing loss.

OBJECTIVES OF THE STUDY:

- To assess the association of sensorineural hearing loss in patients with diabetes mellitus.
- To measure levels of HbA1c in diabetes mellitus patients to know the glycemic control and its influence on sensorineural hearing loss .

DESIGN OF STUDY: Hospital based cross-sectional study.

MATERIALS AND METHOD:

Study included 70 patients among which 35 were clinically diagnosed diabetes mellitus patients experiencing hearing loss and 35 were non-diabetic patients with similar complaints who were selected from the ENT and Medicine outpatient departments at BLDE (Deemed to be University) Shri B.M.Patil Medical College and Research Centre , Vijayapura. All participants were < 60 years of age and were chosen based on specific inclusion and exclusion criteria. Comprehensive history

taking, clinical examinations, and tuning fork tests were performed. Blood tests, including fasting blood sugars (FBS), postprandial blood sugars (PPBS), and HbA1c (glycosylated hemoglobin), performed on these patients. All the subjects underwent pure tone audiometry, and the results were analyzed and documented.

RESULTS :

In our study SNHL is more prevalent in cases i.e reduced hearing with known diabetic, whereas in non diabetic with reduced hearing controls only 20 % had SNHL according to PTA values (right ear) .

According to PTA values (left ear) , SNHL is more prevalent in cases i.e reduced hearing with known diabetic, whereas in non diabetic with reduced hearing controls only 22.9 % had SNHL .This signifies that SNHL is more prevalent in diabetic patients compared to non -diabetic controls .

Cases were further divided into two groups , HbA1C less than 7 were considered as good control and HbA1C more than 7 were considered as poor control .

In our study out of 35 cases only 11(31.43%) were good control patients and the remaining 24(68.57%) were poor control patients. It was observed that all 11 good controlled dm patients experienced mild SNHL whereas in poorly controlled dm patients 3(40%) had severe SNHL and 16(66.7%) had moderate SNHL and 5 (14.3%) had mild SNHL in right ear .

In the left ear out of 11 good controlled dm patients 7 (63.6%) experienced mild SNHL and 4 (36.4%) had moderate SNHL ,whereas in poorly controlled dm patients 3(8.6%) had very severe SNHL and 10 (28.6%) had severe SNHL and 14(40.0%) had moderate SNHL and 8 (22.9%) had mild SNHL in the left ear. pvalue is less than 0.001 showing strong significance which proves poorly controlled

diabetes mellitus patients exhibited more severe hearing loss compared to those with well-controlled diabetes.

CONCLUSION:

The prevalence of sensorineural hearing loss (SNHL) is higher in patients with type 2 diabetes based on PTA values, while patients with poorly controlled diabetes mellitus, as indicated by HbA1c values, exhibited more severe hearing loss. In our current study, we emphasize the importance of impact of diabetes on hearing health. Therefore complete audiological evaluation and maintaining strict glycemic control is crucial for reducing the impact of diabetes on hearing sensitivity.

KEY WORDS:

Sensorineural hearing loss , Diabetes mellittus , PTA , HbA1c .

INTRODUCTION

Hearing plays a vital role in our day today life by allowing us to understand the language spoken and respond appropriately. Hearing also significantly plays a crucial role in various aspects of our life including social interactions, professional performance and wellbeing of an individual. [3] Problems with any aspect of hearing leads to the feelings of isolation and depression, which in turn results in the decreased quality of life.

Pure tone audiometry is a hearing test which measures hearing sensitivity using sinusoid stimuli at octave frequencies from 250 hz up to 8000 hz. The results are plotted on an audiogram. The unit is expressed as decibel (dB). 0-20 dB indicates hearing within normal limits. High frequency hearing loss and no air bone gap in audiogram is suggestive of SNHL.[4]

Diabetes Mellitus by definition is the presence of hyperglycemia. Diabetes mellitus can be generally categorized into Type 1 diabetes, Type 2 diabetes, and gestational diabetes. [5] DM is a systemic disease which can affect multiple organ system. [5]

In type 2 DM the circulating insulin are elevated but there is a relative defeciency of insulin, because in peripheral tissues there is a reduced sensitivity to insulin and β cells cannot make sufficient insulin to overcome the insulin resistance. [5]

The exact mechanisms behind hearing loss in individuals with diabetes remain unclear. Various potential explanations have been suggested, such as microangiopathy (which involves damage to the small blood vessels) impacting the inner ear,

neuropathy (nerve damage) of the cochlear nerve, and or a combination of these factors. [6]

Despite the growing body of evidence suggesting a link between hearing loss and type 2 diabetes, there remains a significant lack of awareness regarding this potential comorbidity. Many are unaware of the association between these two conditions, even though multiple studies have demonstrated a clear connection. [6]

In our current study, we emphasize the importance of impact of diabetes on hearing health. It is essential for the prompt identification and efficient management of hearing loss in people with diabetes mellitus.

AIMS AND OBJECTIVES

1. To assess the association of sensorineural hearing loss in patients with diabetes mellitus.
2. To measure levels of HbA1c in diabetes mellitus patients to know their glcemic control and its influence on sensorineural hearing loss .

REVIEW OF LITERATURE

BASICS IN EMBRYOLOGY:

The nine-month period from the implantation of the fertilized egg, known as the blastocyst, to birth is categorized into three stages..[7]

1. Pre embryonic phase - lasts 21 days [7]
2. Embryonic phase – 35 days [7]
3. Foetal phase – 210 days [7]

EMBRYONIC PHASE:

In the embryonic stage, the ectoderm, mesoderm, and endoderm undergo growth and differentiation, resulting in the formation of all major organ systems by the end of this phase. Consequently, the late embryo takes on a human-like external appearance. [7]

A stage is attained in which the mesenchyme around the primitive foregut and pharynx develops into maxillary and mandibular swellings on either side of the midline, positioned just above and below the buccopharyngeal membrane. [7]

This membrane subsequently disappears, leading to the formation of both the nasal and oral cavities. [7]

In mesenchyme , surrounding the pharynx, five or six parallel thickenings develop as bands , these are the branchial arches numberedone to five from head to tail. [7]

As a result, they develop into the trunk and limbs. [7]

A groove forms on the outer surface between each branchial arch, corresponding to a cleft or pouch on the inner surface of the pharynx. [7]

In every branchial arch, there forms a cartilage , a set of muscles, a related artery, and a cranial nerve that provides innervation to these structures and their derivatives. [7]

The cranial nerve is referred to as the post-trematic nerve. [7]

Furthermore, a nerve originating from the arch provides innervation to the inner endodermal surface of the arch, known as the pretrematic nerve. [7]

EXAMPLES OF PRE-TREMATIC AND POST- TREMATIC NERVE: [7]

EXAMPLES FOR PRE-TREMATIC NERVE	**EXAMPLES OF POST-TREMATIC NERVE**
1)Chorda tympani (from VII nerve) running to the first arch (V) [7] 2)Jacobson's nerve (the tympanic branch of IX) running to the second arch (VII).[7]	1) First arch has the trigeminal nerve [7] 2) Second arch has facial nerve (VII) [7] 3) Third arch has glossopharyngeal nerve (IX).[7]

FIRST AND SECOND ARCH DERIVATIVES: [7]

CARTILAGE	POST TEMATIC NERVE	PRE TREMETIC NERVE	ARTERY
First arch derivatives [7] Meckel's cartilage Malleus bone Incus bone Mandible bone Spheno mandibular ligament	Mandibular nerve (V)	Chorda tympani nerve (VII)	
Second arch derivatives [7] Reichert's Stapes bone Styloid process Lesser cornu of the hyoid bone	The VII cranial nerve	Tympanic branch of glossopharyngeal nerve (IX)	Stapedial

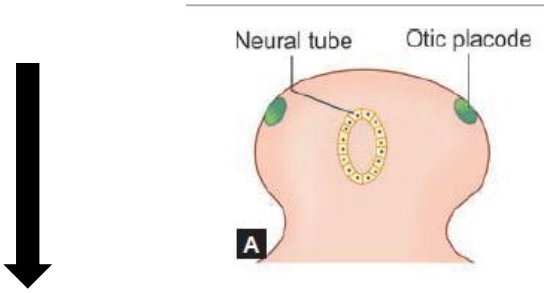
EMBRYOLOGY OF EAR:

The internal ear is the earliest part to form among the three sections of the ear. It consists of the membranous labyrinth and the bony labyrinth. [8]

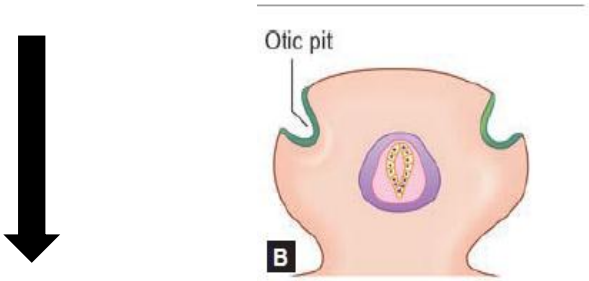
MEMBRANOUS LABYRINTH:

Originating from the region of surface ectoderm located on both sides of the developing myelencephalic section of the rhombencephalon. [8]

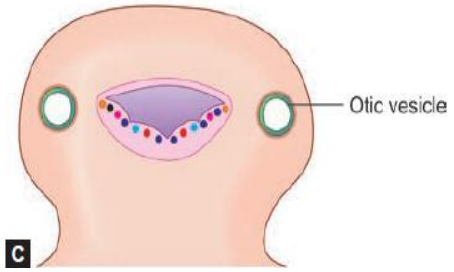
This region initially manifests as a thickening known as the otic placode. (Fig.1) [8]



The otic placode sinks in to create the otic pit.[8] (Fig.2)



The otic pit subsequently rounds out to create the otic vesicle or otocyst, which detaches from the surface ectoderm.[8] (Fig.3).



The otic vesicle is an oval-shaped formation that develops into the components of the membranous labyrinth. [8]

Fig 3: Formation of membranous labyrinth [8]

The otic vesicle splits into two parts: the dorsal vestibular component and the ventral cochlear component. This process involves a gradual change from a simple rounded otic vesicle to the intricate structure of the membranous labyrinth. [8]

The otocyst or otic vesicle [8]

⬇

Development of the endolymphatic sac[8]

⬇

Separation of the otocyst into vestibular and cochlear sections. [8]

⬇

The ventral cochlear section produces the saccule and cochlear duct (organ of Corti) and interacts with the spiral ganglion of the vestibulocochlear nerve. Meanwhile, the dorsal vestibular section generates the utricle, semicircular ducts, endolymphatic duct, and sac, and connects with the vestibular ganglion of the vestibulocochlear nerve. [8] [9]

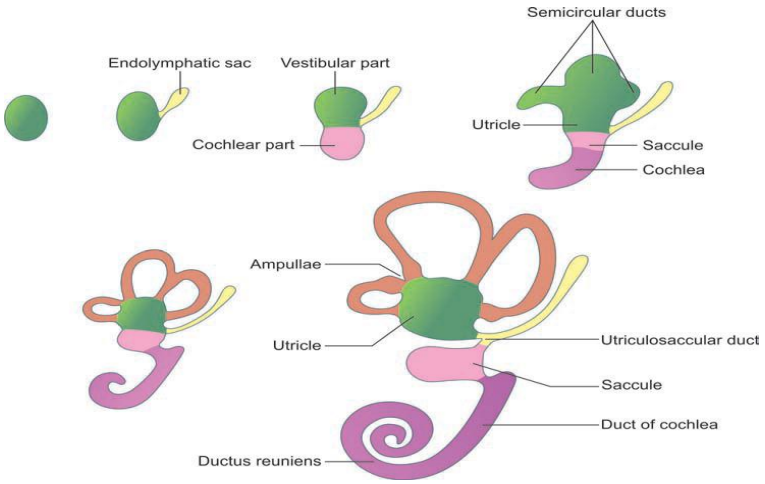


Fig 4 :The process of changing a rounded otic vesicle into the complex structure of the membranous labyrinth.. [8]

Specific regions of the epithelium in the membranous labyrinth develop into specialized sensory organs responsible for balance and hearing. [8] [9]

The sensory receptors responsible for balance are the cristae found in the semicircular ducts and the macula located in the utricle. The sensory structures involved in hearing include the macula of the saccule and the organ of Corti within the cochlea. [8]

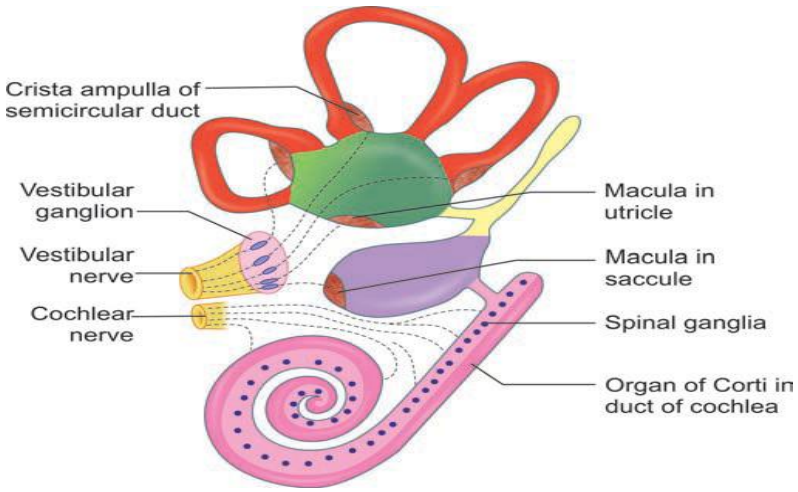


Fig 5 : The formation of specialized sensory regions in the inner ear and their associated nerve connections.[8]

BONY LABYRINTH:

The bony labyrinth is created from the mesenchymal tissue surrounding the membranous labyrinth. [8] (Fig. 6)

⬇

The mesenchyme becomes compacted to create the otic capsule. [8]

⬇

The mesenchymal condensation is subsequently transformed into cartilage. [8]

⬇

There is a layer of loose periotic tissue filled with perilymph located between the cartilage and the membranous labyrinth .[8]

The periotic tissue, around the utricle and saccule, dimnishess to form a space called the **vestibule** . [8]

The periotic tissue, around the semicircular ducts, also dimnishes to form the **semicircular canals**. [8]

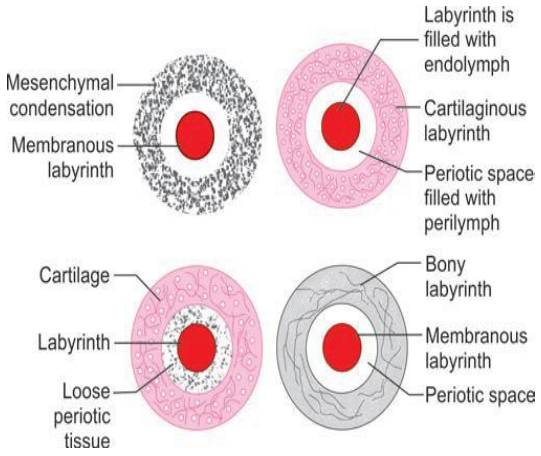


Fig 6: Bony labyrinth [8]

MIDDLE EAR:

The epithelial lining of the middle ear and the pharyngotympanic tube develops from the tubotympanic recess. [8]

Tubotympanic recess develops from the 1st pharyngeal pouch, and also receives a contribution from the second pouch .[8]

The tubotympanic recess originates from the first pharyngeal pouch and also gets input from the second pouch.. [8]

The malleus bone and the incus ⟹ bone originates from the Meckel's cartilage (Fig 7). [10]

The stapes ⟹ bone originates from the cartilage of the second pharyngeal arch

(Reichert'scartilage) (Fig 7). [10]

The ossicles in the ear completely ossify by the fourth month of fetal development. [10]

The tensor tympani muscle originates from the mesoderm of the first pharyngeal arch, while the stapedius muscle comes from the second arch. [10]

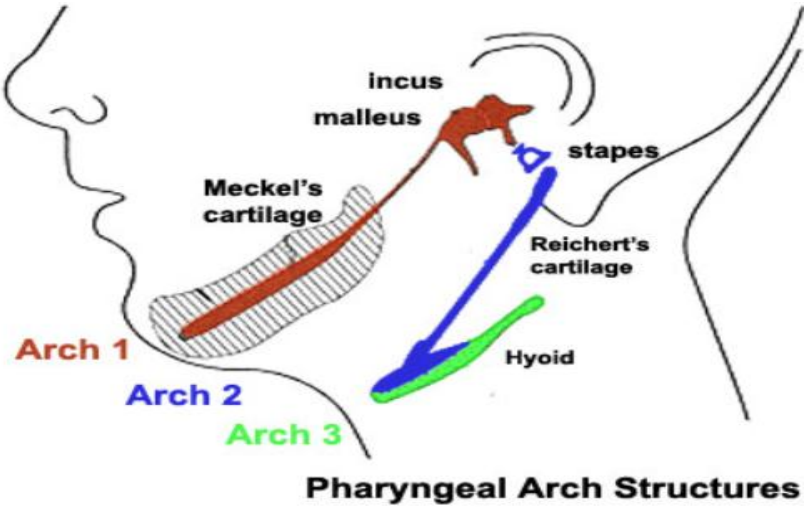


Fig 7: Pharyngeal arch structures. [10]

EXTERNAL EAR AND TM:

The external acoustic meatus isoriginated from the first ectodermal cleft. {Pharyngeal arches are derived from mesoderm. [8] Ectodermal cleft are grooves that appears between the pharyngeal arches} [8]

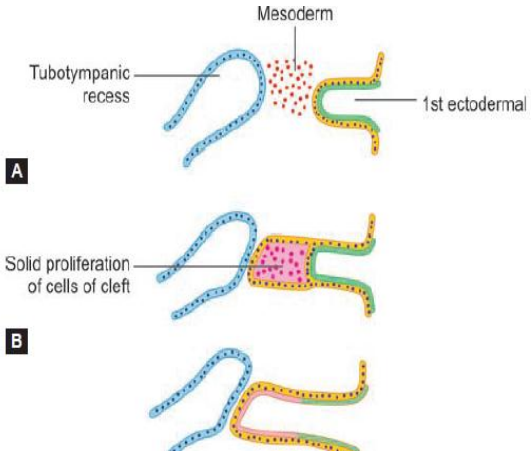


Fig 8 : Formation of EAC[8]

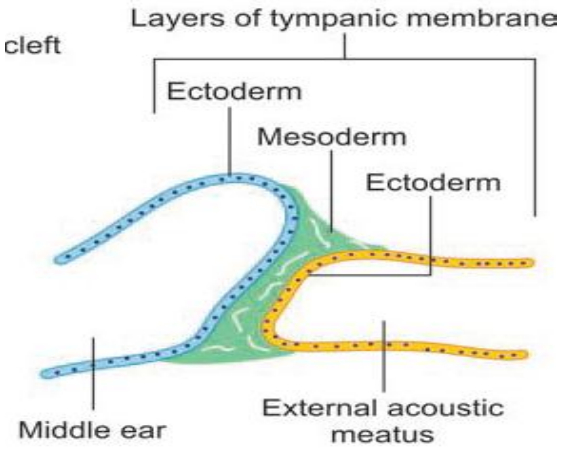


Fig 9 : Layers of Tympanic membrane[8]

The tympanic membrane is created by the joining of the tubotympanic recess and the first ectodermal cleft, which together establish the inner endodermal and outer ectodermal epithelial layers of the tympanic membrane. The mesoderm in between develops into the connective tissue . [11] (Fig. 9)

Initially, the chorda tympani nerve is located outside the membrane, but it eventually becomes situated within the layers of the tympanic membrane due to the upward growth of the membrane. [8]

PINNA:

The pinna is created from six thickened areas of mesoderm that develop on the mandibular and hyoid arches, surrounding the entrance of the first ectodermal cleft.[12] (i.e near the entrance of the external ear canal). [12]

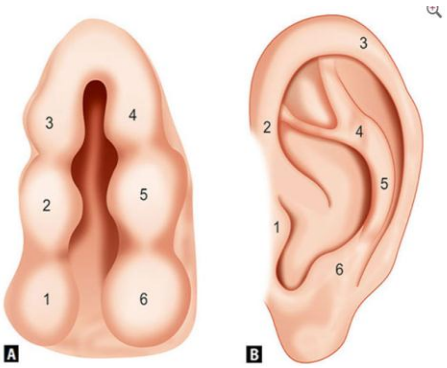
{Pharyngeal arches originate from mesodermal tissue.}

1 st pharyngeal arch (mandibular arch)

2 nd pharyngeal arch (hyoid arch)

Ectodermal clefts are indentations that occur between the pharyngeal arches. The mandibular arch contributes solely to the formation of the tragus and a small surrounding area, while the rest of the auricle develops from the hyoid arch.[12]

(Fig 10)



and B: The embryology of the pinna. The six hillocks of His form as follows: one (tragus), two (helix crus), three (helix), four (antihelix), five (antitragus), and six (lobule, inferior helix).

Fig 10: The six hillocks of His[12]

DEVELOPMENTAL EVENTS:. [13]

22nd day ----Otic placode seen. [13]

5th week--- Tubotympanic recess . [13]

6th week ----The auricle, cochlea, and semicircular canals begin to develop. [13]

7th week ----The mesenchymal condensations for the ear bones become visible. [13]

8th week ----The cochlea and semicircular canal take on their final external shape. [13]

10th week ----Scala vestibuli and scala tympani . [13]

7th month---- External acoustic meatus gets canalized [13]

ANATOMY OF EAR:

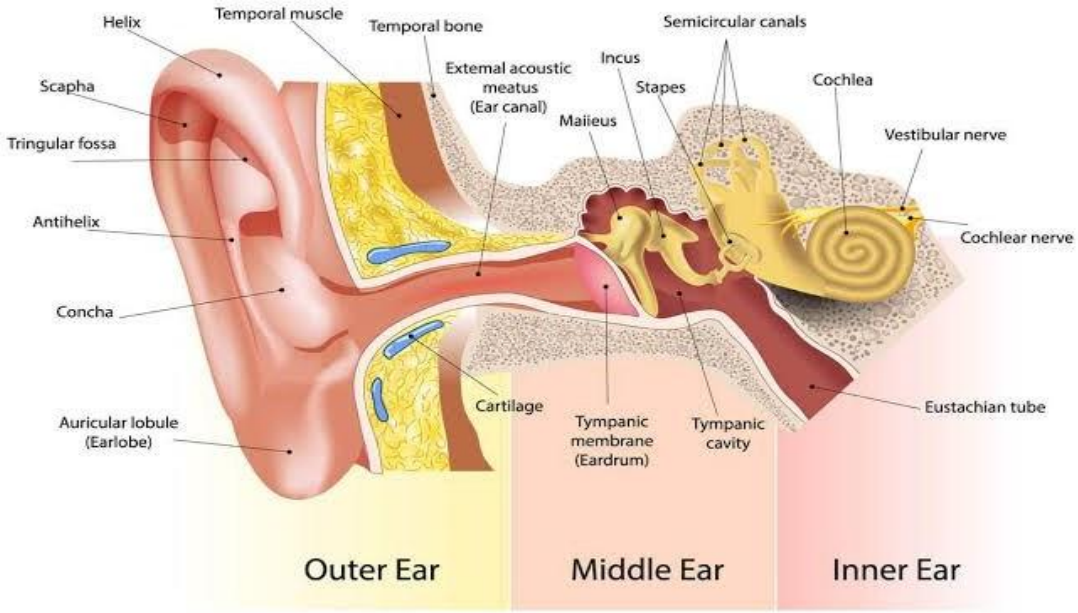


Fig 11 : Anatomy of ear [14]

The external ear: [14]

The outer ear,

The ear canal, and

The eardrum.

Middle ear : [14]

Ossicles (Malleus bone , Incus bone and Stapes bone) Eustacian tube

Inner ear: [14]

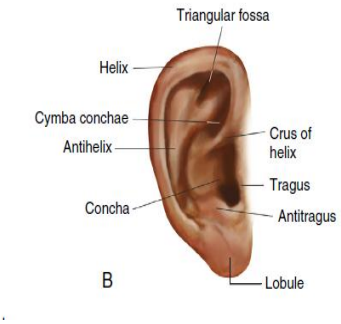
Bony and membranous labyrinth which includes cochlea, utricle

EXTERNAL EAR:

THE PINNA :

The pinna refers to the outer ear structure, not including the lobule or the outer part of the external auditory canal, developed from a single piece of yellow elastic

cartilage that is covered by skin. The outer surface of the pinna features various elevations and depressions. [15]



The region known as the incisura terminalis is located between the tragus and the crus of the helix, and it lacks cartilage. [15]

Fig 12: Auricle[15]

The region known as the incisura terminalis is located between the tragus and the crus of the helix, and it lacks cartilage. [15]

Advantages of pinna :

Endaural approach:

A cut made in the incisura terminalis does not penetrate cartilage and is utilized in surgical procedures involving the external auditory canal or the mastoid. [15]

Reconstructive surgery of the middle ear: [15]

Cartilage from the tragus[15]

Fat from the lobule[15]

Perichondrium from the tragus are used. [15]

For depressed nasal bridge[15]

Conchal cartilage [15]

For repair of defects of nasal ala[15]

Skin and cartilage composite grafts taken from the ear. [15]

EXTERNAL AUDITORY CANAL

It stretches from the base of the concha to the eardrum and is approximately 24 mm in length.[15]

PARTS OF EAC: [15]

CARTILAGINOUS PART	BONY PART
It makes up the outer one-third (8 mm) of the canal. The skin that covers the cartilaginous canal is thick and has ceruminous and sebaceous glands that produce wax. [15]	It makes up the inner two-thirds, measuring 16 mm. The skin that lines the bony canal is thin and remains continuous over the tympanic membrane. It lacks hair and ceruminous glands. [15]

TYMPANIC MEMBRANE:

PARS TENSA

The outer edge is thickened to create a fibrocartilaginous ring known as the annulus tympanicus, which fits into the tympanic sulcus. [16] Umbo is the central part of the pars tensa, where malleus tip is located. In the anteroinferior quadrant, a bright cone of light can be observed radiating from the tip of the malleus. [16]

PARS FLACCIDA:

Located above the lateral process of the malleus, positioned between the notch of Rivinus and the anterior and posterior malleal folds. [16]

Tympanic membrane consists of three layers: [16]

Outer epithelial layer [16]

Inner mucosal layer[16]

Middle fibrous layer[16]

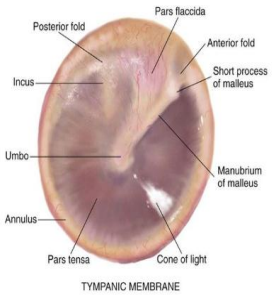


Fig 13: Tympanic membrane[16]

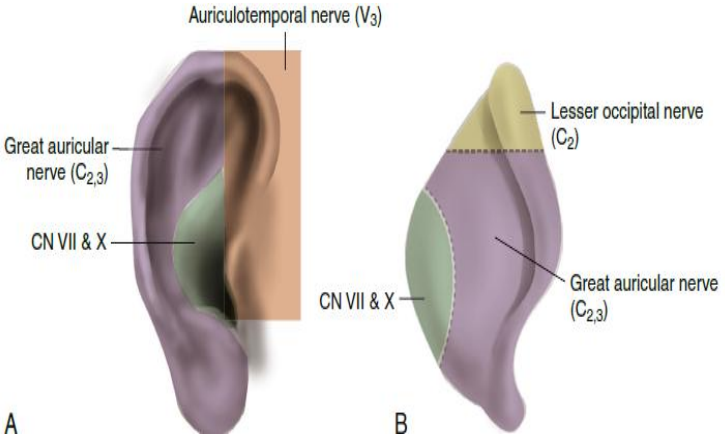


Fig 14 : Nerve supply [15]A)Lateral surface B)Medial surface[15]

MIDDLE EAR:

The middle ear cleft includes the middle ear, eustachian tube, aditus, antrum, and mastoid air cells. [17]

(Fig 15)

It is covered by a mucous membrane and contains air. [17]

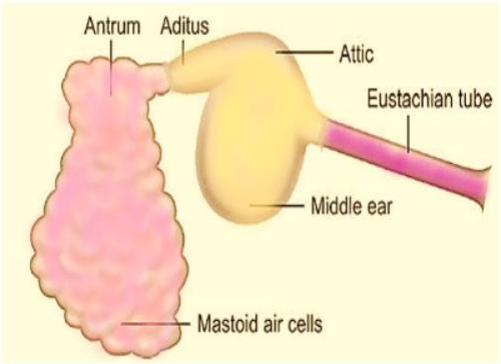


Fig 15:Middle ear cleft [17]

Middle ear is divided into:

1. epitympanum [17]
2. mesotympanum[17]
3. hypotympanum [17]

Walls of middle ear and structures related to them : (Fig 16)

1. The **roof** consists of a thin layer of bone known as the tegmen tympani. [17]
2. The floor is also composed of a thin bony layer that separates the tympanic cavity from the jugular bulb. [17]
3. The **anterior wall** has a thin layer of bone that divides the cavity from the internal carotid artery. [17]
4. The **posterior wall** is located close to the mastoid air cells and features a bony protrusion known as the pyramid. [17]
5. The **aditus** is an opening that links the attic to the antrum. [17]
6. **Facial recess** is is an indentation in the posterior wall lateral to the pyramid. [17]
7. **Medial wall** is labyrinth. [15]
8. It includes a projection called the promontory, which is formed by the base coil of the cochlea. [15]
9. The oval window has the footplate of the stapes attached to it, while the round window is protected by the secondary tympanic membrane . [15]
10. Just anterior to the oval window lies the processus cochleariformis. [17]
11. The lateral wall consists of the tympanic membrane and the bony outer attic wall known as the scutum. [17]

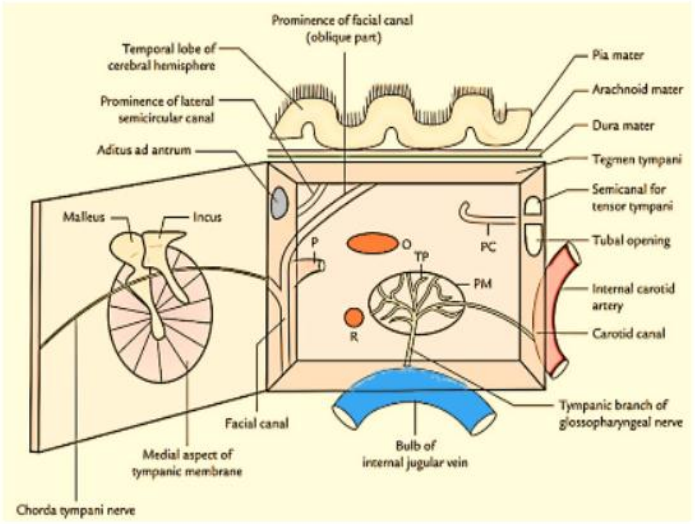
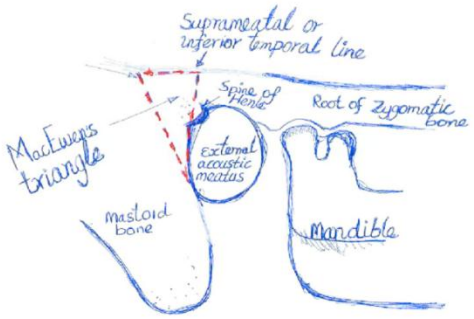


Fig 16 : Walls of middle ear and structures related [17]

MASTOID :

The attic is a spacious area filled with air located in the upper section of the mastoid and connects to the aditus. [18]

MacEwen's triangle (Fig 17) is defined by the temporal line, the posterosuperior part of the bony external auditory canal, and a line drawn tangentially to the external canal. [18]



It is an important landmark to find the mastoid antrum in mastoid surgery. [15]

Fig 17 : Mac Ewens triangle [18]

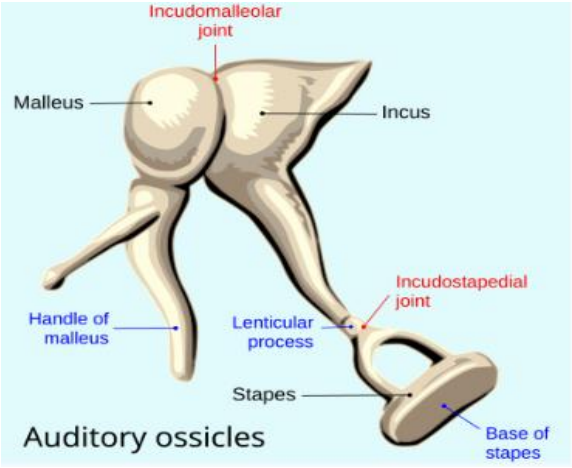


Fig 18 : Ear ossicle [19]

Three ossicles in the middle ear are(Fig 18) : [19]

1. Malleus [19]
2. Incus [19]
3. Stapes [19]

INNER EAR:

The inner ear is an important organ of hearing and for balance. [15]

BONY LABYRINTH:

Vestibule : It is the central part of the labyrinth. [20]

An oval window is located in its side wall. [20]There is a spherical recess that contains the saccule [20]. Additionally, there is an elliptical recess that houses the utricle. [20]

Semicircular canals:

There are three canals: the lateral semicircular canal, the posterior semicircular canal, and the superior semicircular canal. [20]

Each canal features an ampullated end that connects separately to the vestibule. [20]

The non-ampullated ends of the posterior and superior canals merge to create a shared pathway known as the crus commune. [20]

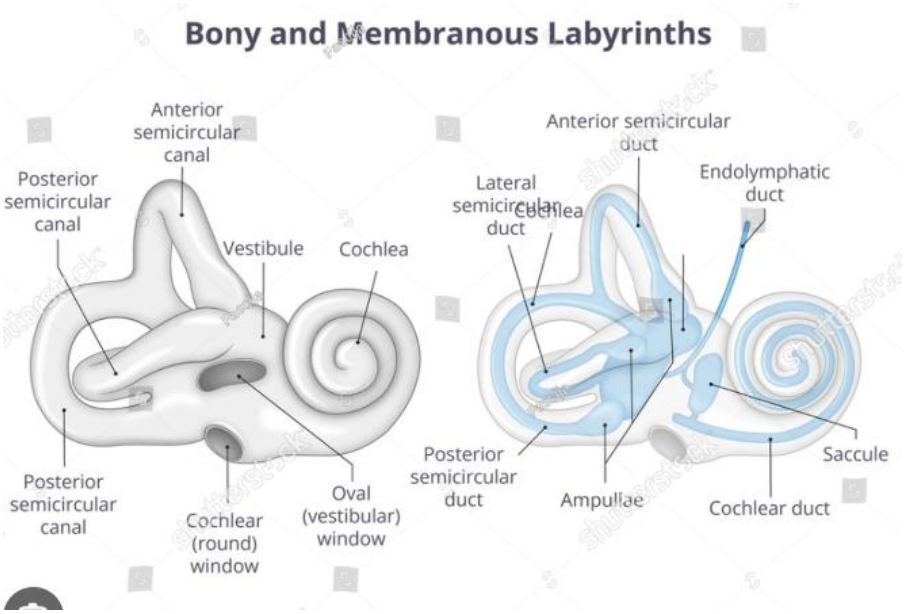


Fig 19 : Bony labyrinth and Membranous labyrinth [20]

Cochlea:

The bony cochlea is a spiral structure that makes 2.5 to 2.75 turns around a central bony core known as the modiolus, which permits the passage of auditory nerve fibers. [15]

Surrounding the modiolus is a thin bony plate called the osseous spiral lamina, which spirals like a screw thread. [15]

This plate partially divides the bony cochlea and serves as an attachment point for the basilar membrane. [15][21]

The bony cochlea includes :

1. Scala vestibuli [21]
2. Scala tympani[21]
3. Scala media [21]

At the top of the cochlea, the scalae connect at the **helicotrema.** [21]

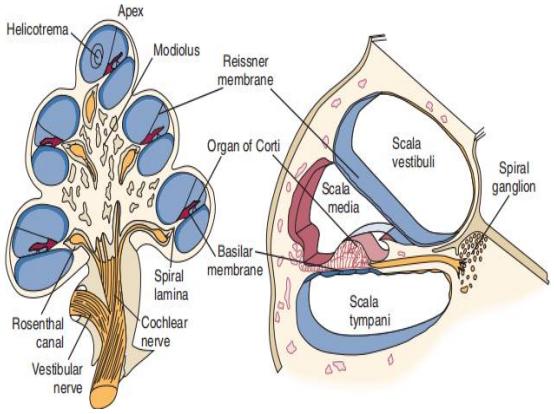


Fig 20: Cochlea [21]

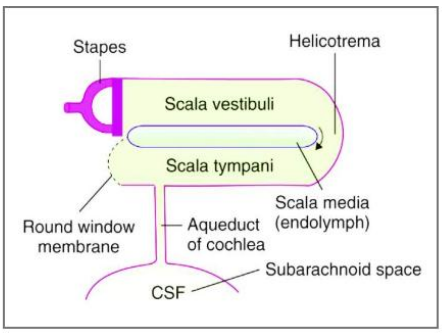


Fig 21: aqueduct of cochlea [22]

The scala vestibuli and scala tympani contain perilymph fluid. [21]

Scala media filled with endolymph (through aqueduct of the cochlea). [21t]

MEMBRANOUS LABYRINTH:

The organ responsible for hearing is located in the membranous labyrinth. It constitutes the third chamber of the cochlea, known as the Scala media. [21]

1)Cochlear duct / scala media :

Superiorly - Reissner membrane [21]

Inferiorly – Basilar membrane [21]

Laterally - Outer cochlear wall [21]

The stria vascularis is a highly vascularized tissue that plays a crucial role in maintaining the metabolic conditions of the scala media. [21]

The Organ of Corti serves as the sensory organ for hearing. [21]

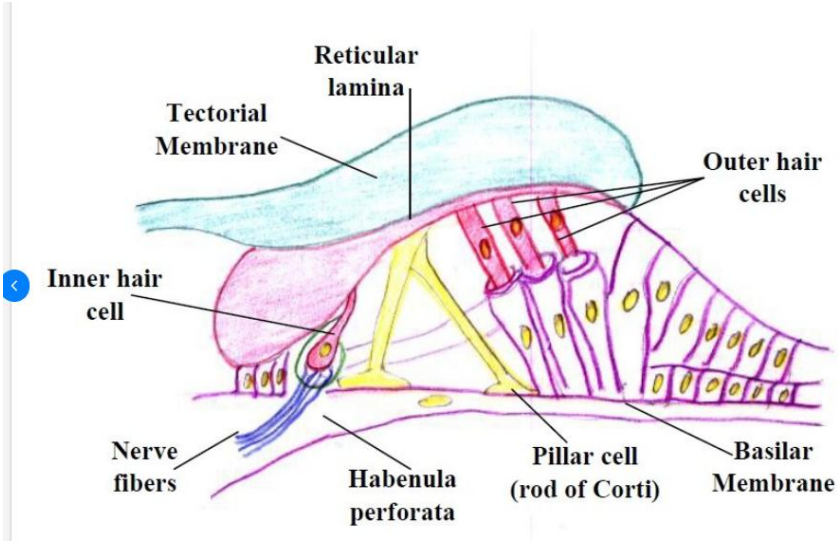


Fig 22 : Organ of corti [23]

1. The Inner and outer hair cells act as receptor cells that convert mechanical movement into an electrochemical signal, which then activates the auditory nerve. [23]
2. There are three semicircular ducts, each corresponding precisely to three bony canals.. [23]
3. Endolymphatic duct and sac:

This structure is created by the merging of two ducts, one originating from the saccule and the other from the utricle. The end of the duct expands to create the endolymphatic sac. [23]

The labyrinth receives its blood supply from the labyrinthine artery. [23]

MECHANISM OF HEARING:

The pinna gathers sound waves from the surroundings. [15]

It travels through the external auditory canal and then hits the tympanic membrane. [15]

The vibrations of the Tm are conveyed to the stapes footplate via the ossicles [15]

The movement of the stapes footplate leads to variations in pressure within the labyrinthine fluids, which in turn causes the basilar membrane to move. [15]

As a result, the hair cells in the organ of Corti are activated. [15]

These hair cells function as transducers, transforming mechanical energy into electrical impulses that are transmitted through the auditory nerve.[15]

AUDITORY PATHWAY:It::

Endolymphatic duct is formed by the union of two ducts, one each from the saccule and the utricle. ABLE 46.3 Derivatives of the ffigirsFf

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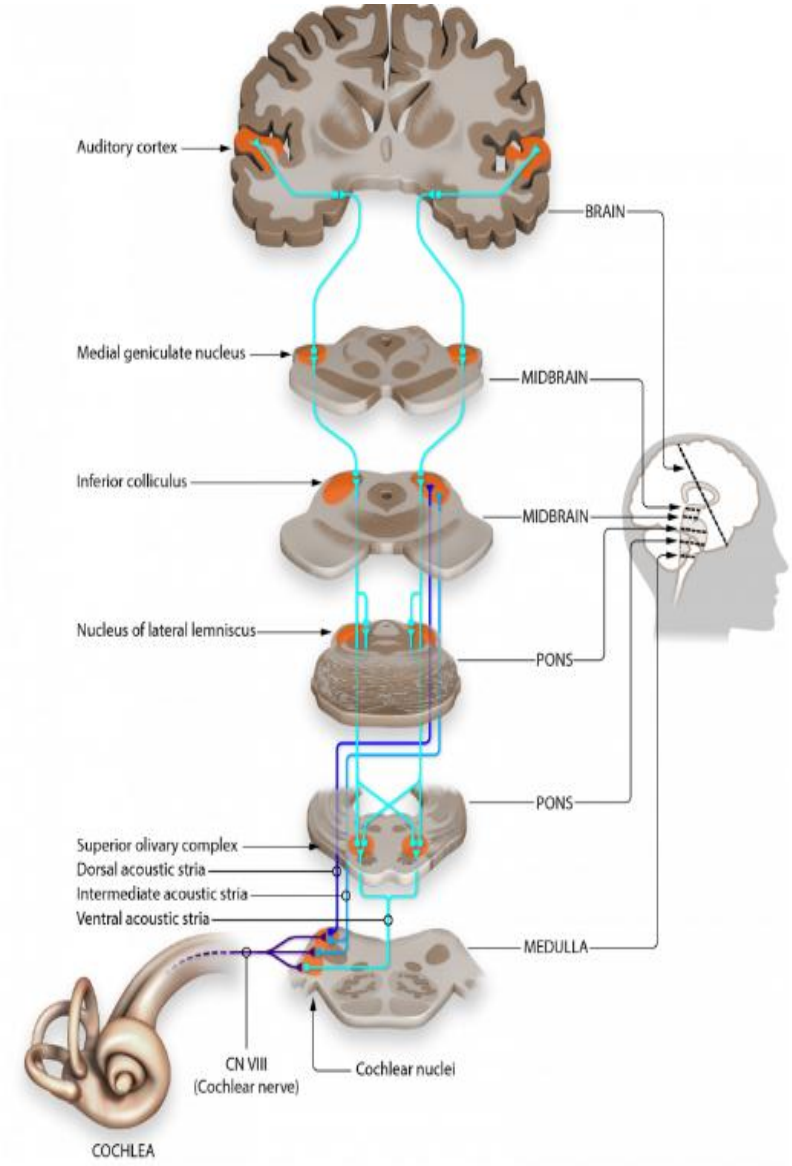
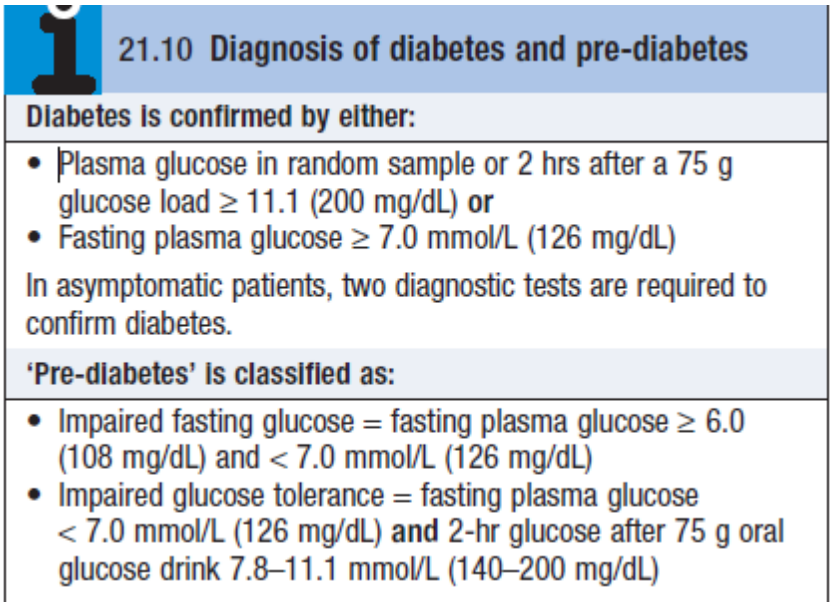


FIG 23 :AUDITORY PATHWAYIt[24]

DIABETES MELLITUS:

1. Diabetes poses a significant challenge for healthcare systems worldwide. [5]
2. It is defined by elevated levels of blood glucose (hyperglycemia). [5]
3. - **Type 1 diabetes** ---- is caused by the autoimmune destruction of β cells (the cells in the pancreas that produce insulin), leading to a lack of insulin. [5]
4. - **Type 2 diabetes** ---- involves insulin resistance and the pancreas's inability to produce enough insulin to counteract this resistance**.** [5]



21.10 Diagnosis of diabetes and pre-diabetes

Diabetes is confirmed by either:

- Plasma glucose in random sample or 2 hrs after a 75 g glucose load ≥ 11.1 (200 mg/dL) **or**
- Fasting plasma glucose ≥ 7.0 mmol/L (126 mg/dL)

In asymptomatic patients, two diagnostic tests are required to confirm diabetes.

'Pre-diabetes' is classified as:

- Impaired fasting glucose = fasting plasma glucose ≥ 6.0 (108 mg/dL) and < 7.0 mmol/L (126 mg/dL)
- Impaired glucose tolerance = fasting plasma glucose < 7.0 mmol/L (126 mg/dL) **and** 2-hr glucose after 75 g oral glucose drink 7.8–11.1 mmol/L (140–200 mg/dL)

Fig 24 :Diagnostic criteria of diabetic and pre – diabetic patients [5]

PATHOGENESIS OF SENSORINEURAL HEARING LOSS IN DIABETICS:

The inner ear microangiopathy may be regarded as a potential factor contributing to hearing loss in individuals with diabetes**.** [25]

Cochlear hair cell loss can be considered as a possible etiology for SNHL. [25] Basement membrane thickening could be another possible etiology for SNHL in long standing diabetic patients. [25]

SNHL can also occur due to microangiopathic effects on the vessels of the endolymphatic sac and the basilar membrane. [25]

DM can also cause the following:

1. damage to the blood vessels [26]
2. spiral ganglion neurons [26]
3. organ of Corti [26]
4. stria vascularis. [26]

Macrovascular and microvascular damage that leads to reduced blood flow, impaired oxygen exchange, and disrupted ion transport are significant complications of diabetes mellitus (DM) that can impact the sensory cells in the cochlea. [27]

SIMILAR STUDIES:

In a study conducted by Jyoti J et al concluded that "SNHL is more with the increasing age and duration of diabetes. Iincreased prevalence of SNHL in poor glycemic control patients compared to good control patients". [1]

In a study conducted by Khalid Al-Rubeaan et al concluded that "Hearing loss is an underestimated comorbid condi-tion in type 2 diabetes that warrants frequent hearing assessments andmanagement. Strict glycemic and hypertension control is essential forthe minimization of the effects of diabetes on hearing sensitivity". [2]

In a study conducted by Gita Khakurel et all concluded that "diabetic patients had bilateral mild to moderate sensorineural hearing loss affecting hearing thresholds in higher frequencies than the normal patients according to PTA results." [28]

In a study conducted by Malli et al suggested that "the hearing loss seen in diabetes patients was insidious onset, gradually progressive, bilaterally symmetrical SNHL and aggravated with the increasing age and duration of diabetes". [29]

In a study conducted by Makwana et al suggested that ‘there is a strong association between SNHL and diabetes mellitus and also higher frequencies hearing loss” . [30]

MATERIALS AND METHODOLOGY

SOURCE OF DATA :

This study includes all clinically diagnosed diabetes mellitus patients presenting with hearing loss to the ENT and Medicine OPD, as well as non-diabetic patients with hearing loss, in the Department of Otorhinolaryngology and Department of Medicine BLDE (Deemed to be University), Shri B. M. Patil Medical College and Research Centre, Vijayapura.

DESIGN OF STUDY: Hospital based cross-sectional study.

STUDY PERIOD : Jun 2023– Jan 2025

SAMPLE SIZE:

With anticipated proportion of hearing loss among diabetic patients 7543.1% and in normal hearing among diabetes cases 26% (ref) respectively. The study requires a sample size of 35 per group as cases and controls of the corresponding age group (i.e. a total sample size of 70 assuming equal group sizes), to achieve a power of 99% for detecting a difference in proportions of between the two groups at a two sided p-value of 0.05**.**

INCLUSION CRITERIA:

1. Diabetic patient who has sensorineural hearing loss with the age group of 15-60 years are included.
2. Both type 1 and type 2 diabetic mellitus patients are included.
3. Patient should be a known case of diabetes mellitus for minimum duration of 5 years

EXCLUSION CRITERIA:

1. Newly diagnosed diabetic patients are excluded from the study.
2. Patient who is already diagnosed with hearing loss prior to the onset of diabetes mellitus.

METHOD OF COLLECTION OF DATA :

All patients fulfilling the inclusion criteria, presenting to the ENT and Medicine OPD, BLDE (Deemed to be University), Shri B. M.Patil Medical College and Research Centre, Vijayapura were selected for the study.

All patients involved in the study provided informed consent after being given a thorough explanation of the study's purpose in their native language.

Proper history taking and thorough clinical examination was performed.

Tuning fork test was performed .

Frequencies used 256 HZ 512 HZ AND 1024 HZ.

INFERENCE OF TUNING FORK TEST:

TEST	**NORMAL**	**CONDUCTIVE DEAFNESS**	**SENSORINEURAL HEARING LOSS**
RINNE'S TEST	AC > BC	BC> AC	AC > BC
WEBERS TEST	Central	Lateralized to affected ear	Lateralized to better ear
ABSOLUTE BONE CONDUCTION	Same as examiner	Same as examiner	Reduced compared to examiner

Then patients were subjected to **PURE TONE AUDIOMETRY.**

The calculated dB is in dB HL, and the hearing level referred to is the pure tone average.

This average is determined by calculating the mean of the hearing threshold levels at 500 Hz, 1000 Hz, 2000 Hz, and 3000 Hz, as normal human speech primarily consists of sounds within these frequency ranges.

INFERENCE OF PTA:

0 – 25 dB – Normal hearing

26-40 dB - Mild hearing loss

41-55 dB - Moderate hearing loss

56-70 dB – Severe hearing loss

71- 90 dB – Very severe hearing loss

>90 dB – Profound hearing loss

Following Blood investigations were performed for all the study participants:

1. FBS
2. PPBS
3. HbA1C

INFERENCE OF SUGAR LEVELS:

	FBS (FASTING BLOOD SUGAR)	PPBS (POST PRANDIAL BLOOD SUGAR)	Hba1c
NORMAL	<126 mg/dl	<200 mg/dL	< 6.5%
DIABETIC PATIENTS	≥126 mg/dl	≥200 mg/dl	≥ 6.5%

STATISTICAL ANALYSIS:

The data obtained will be entered in a Microsoft Excel sheet, and statistical analysis will be performed using statistical package for the social sciences (Version 20). Results will be presented as Mean (Median) ±SD, counts and percentages and diagrams. For normally distributed continuous variables will be compared using independent t test. For not normally distributed variables Mann Whitney U test will be used. Categorical variables will be compared using Chi square test. $p < 0.05$ will be considered statistically significant. All statistical tests will perform two tailed.

RESULTS

In our study, 70 patients who presented to the Department of ENT and Medicine with the complaints of reduced hearing were selected.

These 70 patients were further divided into 2 groups:

1. Cases (Reduced hearing with Diabetes Mellitus)-35 patients
2. Control (Reduced hearing without Diabetes Mellitus)-35 patients

The data collected was analysed using Chi square test.

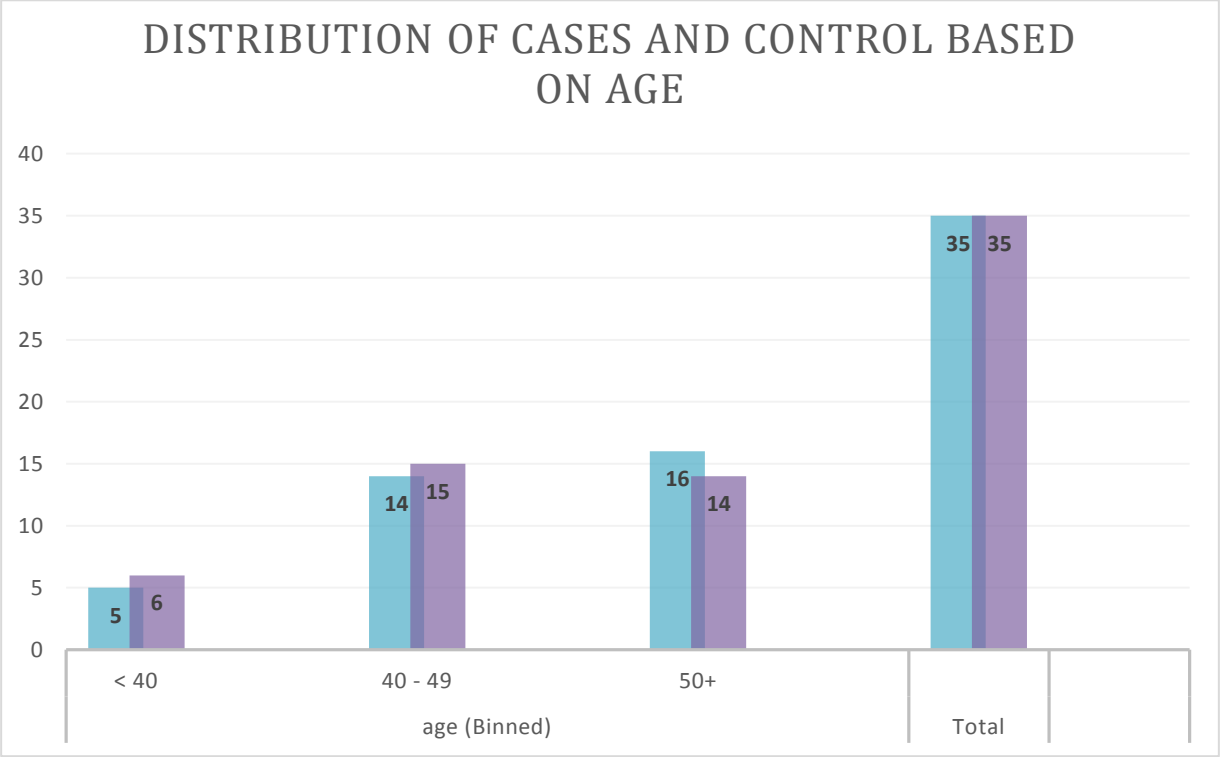
p < 0.05 will be considered statistically significant.

TABLE 1 – DISTRIBUTION OF CASES AND CONTROL BASED ON THEIR AGE :

AGE	CASE (DM n = 35)	CONTROL (n=35)
30 -40 years	5 (14.3 %)	6 (17.1%)
40 -49 years	14 (40 %)	15 (42.9%)
50 -60 years	16 (45.7%)	14 (40%)

Chi-Square Tests		
	Value	Asymptotic Significance (2-sided)
Pearson Chi-Square	.259	.879

GRAPH 1:



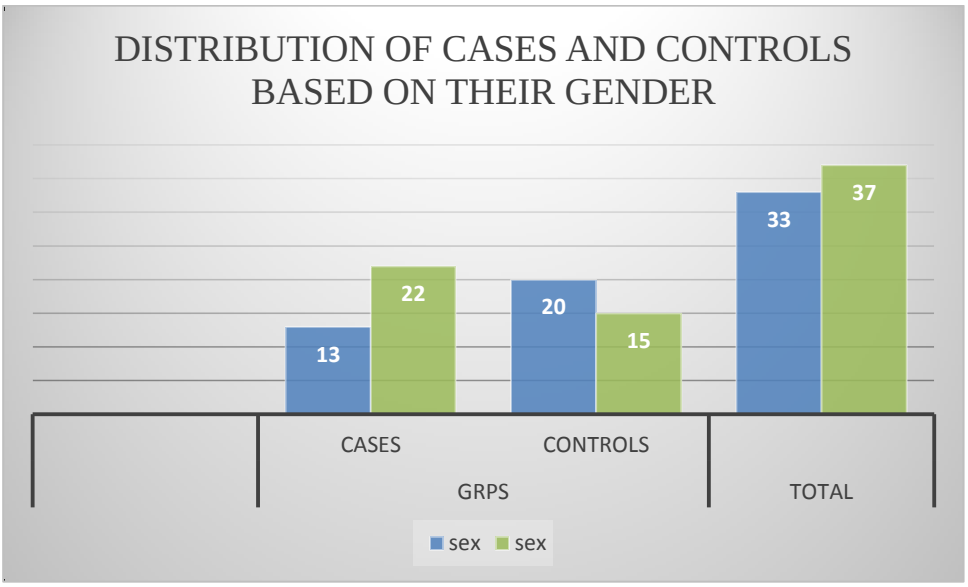
In the present study ,a total of 11 patients were of the age group <40 of which 5(14.3%) had DM and hearing loss and 6 (17.1%) had only hearing loss .In the age group of 40-49 , 14 (40.0 %%) had DM and hearing loss and 15(42.9%) had only hearing loss. >50 of which 16(45.7%) had DM and hearing loss and 14 (40%) had only hearing loss.

Pvalue is .879 ---- which is not significant .

TABLE 2 – DISTRIBUTION OF CASES AND CONTROLS BASED ON THEIR GENDER

GENDER	TEST (DM n = 35)	CONTROL (n=35)
Male	22 (62.9%)	15 (42.9 %)
Female	13 (37.1 %)	20 (57.1 %)

GRAPH 2:



As observed in Table 2 and Graph 2, out of 33 females, 20(57.1%) had only reduced hearing and 13 (37.1%) had diabetes and reduced hearing .And out of 37 males, 15 (42.9%) had only reduced hearing and 22 (62.9 %)had diabetes and reduced hearing.

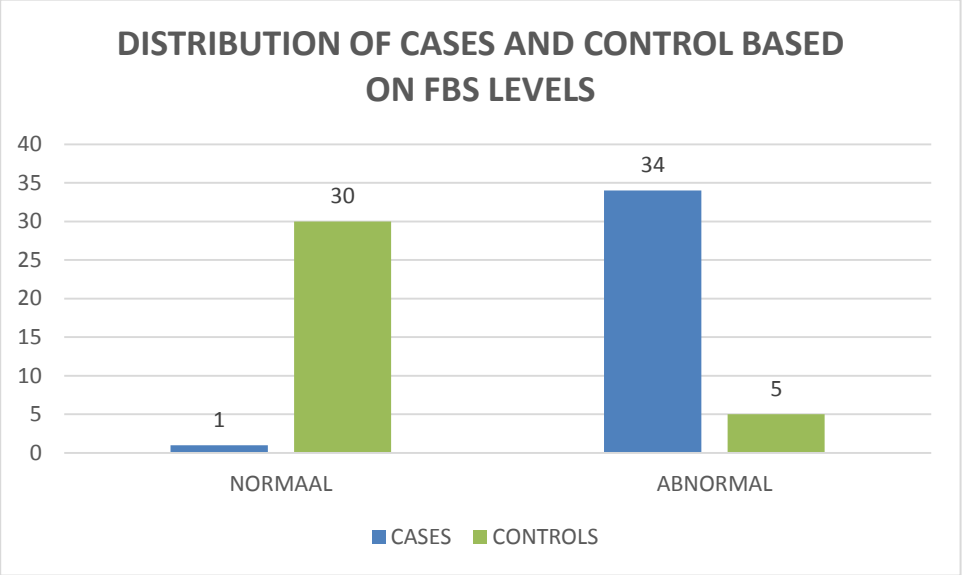
Chi-Square Tests		
	Value	Asymptotic Significance (2-sided)
Pearson Chi-Square	2.809	.094

P value is 0.094 which is not significant.

TABLE 3 - DISTRIBUTION OF CASES AND CONTROL BASED ON FBS LEVELS:

FBS	CASES (DM n = 35)	CONTROL (n=35)
Normal (70-110 mg/dl)	01 (2.86%)	30 (85.72%)
Abnormal (> 110 mg/dl)	34 (97.14%)	05 (14.28%)
Total	35 (100%)	35 (100%)

GRAPH :3



In this study, we observed that among the 35 patients with reduced hearing and DM 34(97.14%) had an abnormal FBS value and 1(10%) had normal FBS value. While in only reduced hearing group, majority had normal FBS values i.e 30 (85.72%) and only 5(14.28%) had abnormal FBS values.

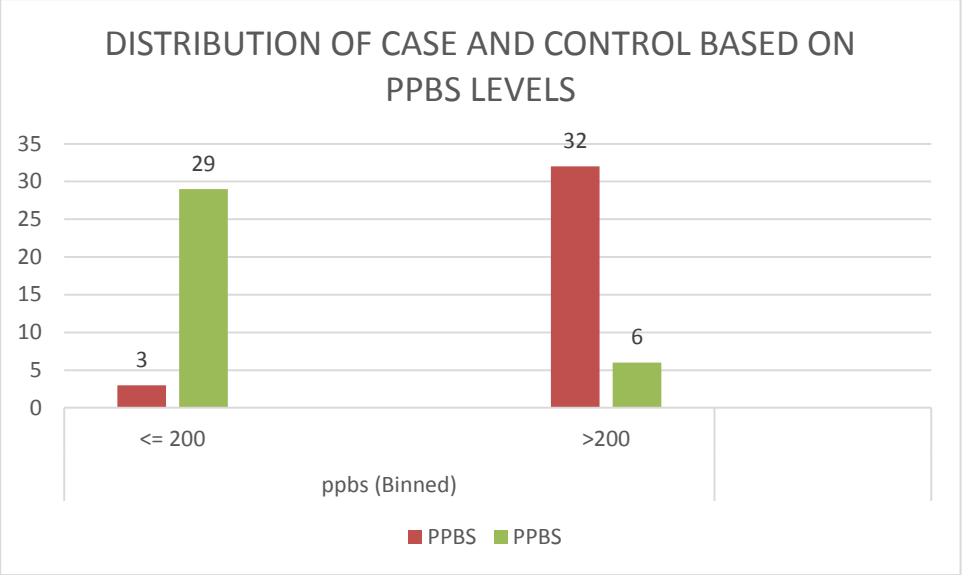
	Value	Asymptotic Significance (2-sided)
Pearson Chi-Square	45.39	.000

Pvalue is less than 0.05 showing significance.

TABLE 4: DISTRIBUTION OF CASE AND CONTROL BASED ON PPBS LEVELS:

PPBS	CASE (DM n = 35)	CONTROL (n=35)
Normal (< 200 mg/dl)	03 (8.57%)	29 (82.86%)
Abnormal (≥ 200 mg/dl)	32 (91.43%)	06 (17.145)
Total	35 (100%)	35 (100%)

GRAPH 4:



In this study, we observed that among the 35 patients with reduced hearing and DM 32(91.43%) had an abnormal PPBS value and 3(8.57%) had normal PPBS value. While in only reduced hearing group, majority had normal PPBS values i.e 29 (82.86%) and only , 6(17.145%) had abnormal PPBS values which implies strong significance.

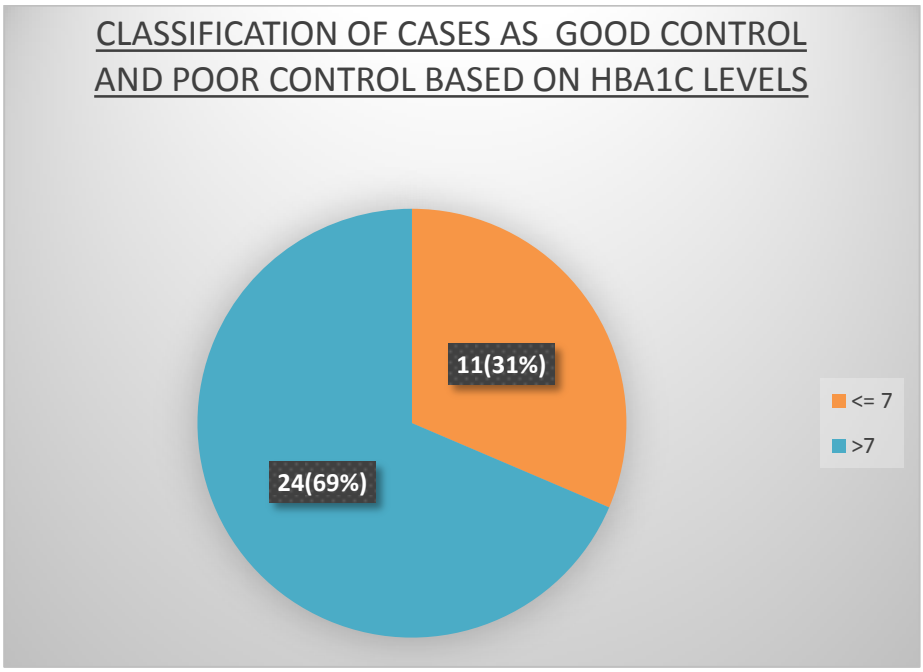
Chi-Square Tests		
	Value	Asymptotic Significance (2-sided)
Pearson Chi-Square	35.98	.000

Pvalue is less tha 0.05 showing significance

TABLE 5: CLASSIFICATION OF CASES AS GOOD CONTROL AND POOR CONTROL BASED ON HBA1C LEVELS

HbA1C	n =35
HbA1C ≤ 7 (GOOD CONTROL)	11 (31.43%)
HbA1C > 7 (POOR CONTROL)	24 (68.57%)

GRAPH 5:



Cases were divided into two groups based on their HbA1C values. Patients who had HbA1C less than 7 were considered as good control . Patients who had HbA1C more than 7 were considered as poor control . In our study out of 35 cases only 11(31.43%)were good control patients and the remaining 24(68.57%) were poor control patients.

Chi-Square Tests		
	Value	Asymptotic Significance (2-sided)
Pearson Chi-Square	36.522	.000

Pvalue is less tha 0.000 showing strong significance.

TABLE :6 COMPARISION OF HEARING LOSS ACCORDING TO PTA VALUES IN CASES AND CONTROLS (RIGHT EAR):

					Total
			Cases	Controls	
PTA (RIGHT)	mild SNHL		14	6	20
			40.0%	17.1%	28.6%
	moderate SNHL		16	1	17
			45.7%	2.9%	24.3%
	normal		0	28	28
			0.0%	80.0%	40.0%
	severe snhl		5	0	5
			14.3%	0.0%	7.1%
Total			35	35	70
			100.0%	100.0%	100.0%

GRAPH 6:

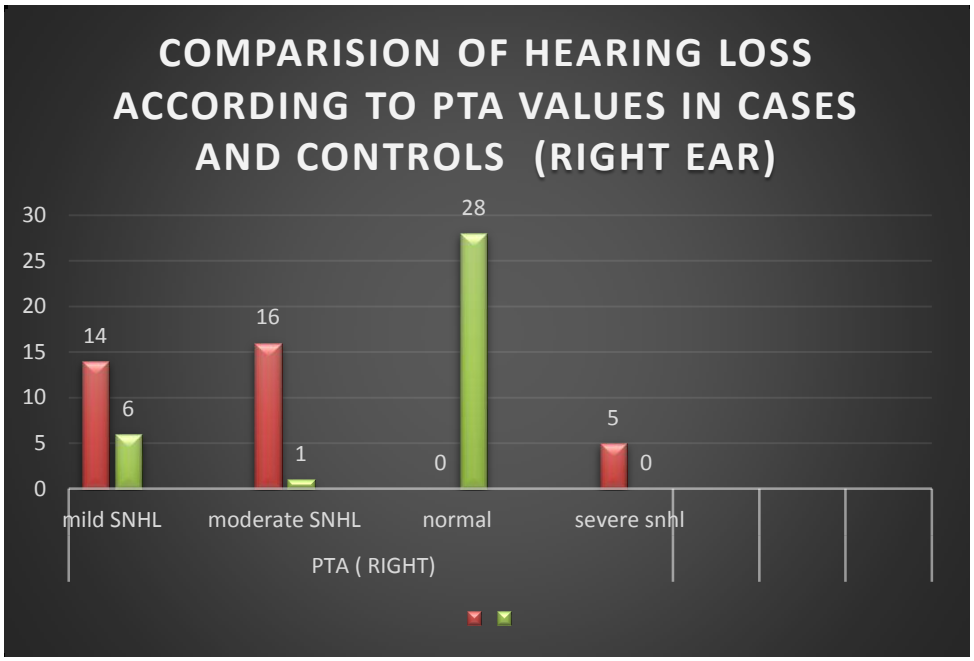


Table 6 and Graph 6, shows the comparision of hearing loss in right ear according to PTA valus in cases and controls. In the cases, it was observed that majority , i.e 16(45.7%) had moderate SNHL followed by 14(40.0%) had mild SNHL. In cases 28(80%) had normal hearing sensitivity, followed by 6(17.1%) mild SNHL and 1(2.9%) moderate SNHL.

Therefore in cases everyone had SNHL , whereas in controls only 20 % had SNHL which proves that SNHL is more prevalent in diabetic cases compared to non diabetic

	Value	Asymptotic Significance (2-sided)
Pearson Chi-Square	49.435	.000

Controls according to PTA values in right ear. Pvalue is less than 0.05 which shows stronger significance.

TABLE 7: COMPARISION OF HEARING LOSS ACCORDING TO PTA VALUES IN CASES AND CONTROLS (LEFT EAR):

			GRPS		Total
			Cases	Controls	
PTA (LEFT)	mild SNHL		8	5	13
			22.9%	14.3%	18.6%
	moderate SNHL		14	3	17
			40.0%	8.6%	24.3%
	normal		0	27	27
			0.0%	77.1%	38.6%
	severe snhl		10	0	10
			28.6%	0.0%	14.3%
	very severe		3	0	3
			8.6%	0.0%	4.3%
Total			35	35	70
			100.0%	100.0%	100.0%

GRAPH 7:

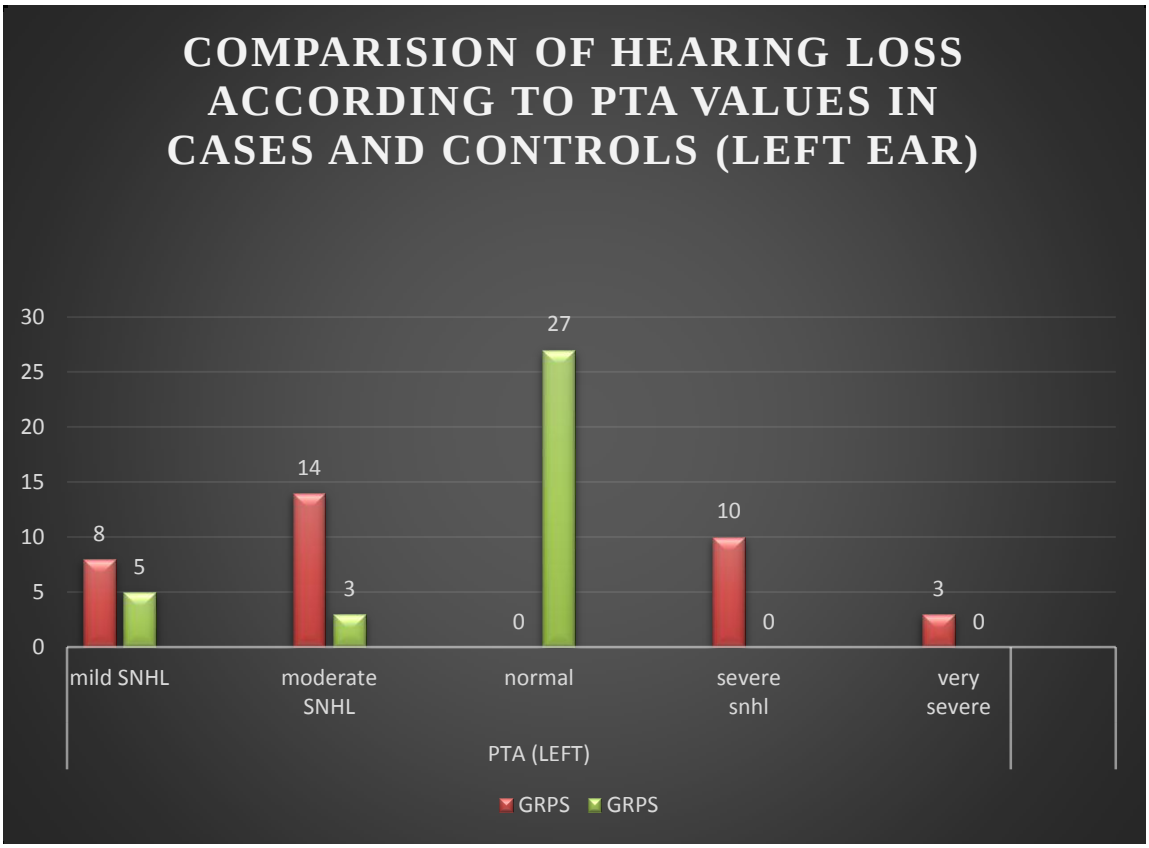


Table 7 and Graph 7, shows the comparision of hearing loss in left ear according to PTA valus in cases and controls. In the cases, it was observed that majority , i.e 14(40.0%) had moderate SNHL followed by 10(28.6%) had severe SNHL and 8 (22.9%) had mild SNHL and 3(8.6%) had very severe SNHL.

In control group 27(77.1%) had normal hearing sensitivity, followed by 5(14.3%) mild SNHLand 3(8.6%) moderate SNHL.

Therefore in cases everyone had SNHL , whereas in controls only 22.9 % had SNHL which proves that SNHL is more prevalent in diabetic cases compared to non diabetic controls according to PTA values in the left ear.

	Value	Asymptotic Significance (2-sided)
Pearson Chi-Square	47.810	.000

Pvalue is less than 0.05 which shows stronger significance

TABLE 8: COMPARISION OF HEARING LOSS BETWEEN UNCONTROLLED & CONTROLLED DM PATIENTS (RIGHT EAR) BY PTA:

			hba1c (Binned)		Total
			<= 7.0	7.1+	
PTA (RIGHT)	mild SNHL		11	3	14
			100.0%	12.5%	40.0%
	moderate SNHL		0	16	16
			0.0%	66.7%	45.7%
	severe snhl		0	5	5
			0.0%	20.8%	14.3%
Total			11	24	35
			100.0%	100.0%	100.0%

GRAPH 8:

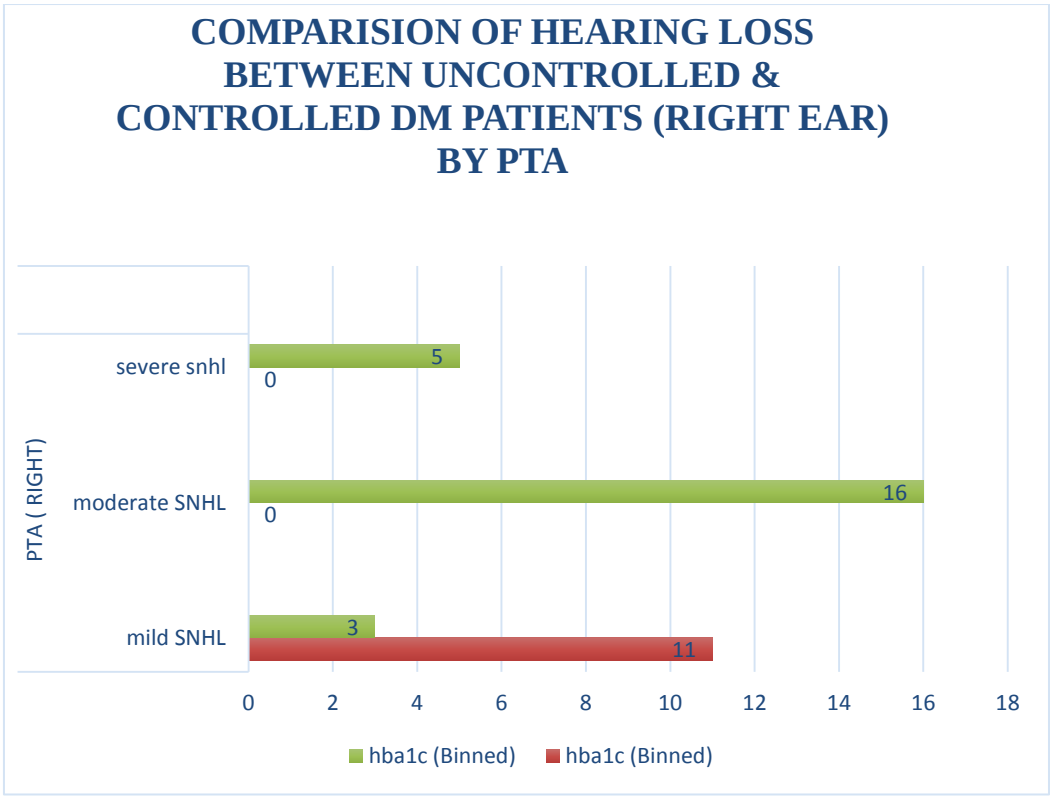


Table 8 and Graph 8, shows the comparision of hearing loss right ear between uncontrolled DM and controlled DM patients . "It was observed that the severity of hearing loss in patients with uncontrolled diabetes mellitus was significant, i.e 5 (20.8%%) were suffering from severe SNHL and 16 patients (66.7%%) experiencing moderate sensorineural hearing loss (SNHL) and 3 patients (12.5%%) suffering from mild SNHL."

Whereas in controlled DM patients majority only had mild SNHL i.e 11(100%)

Chi-Square Tests		
	Value	Asymptotic Significance (2-sided)
Pearson Chi-Square	24.063	.000

Pvalue is less tha 0.000 showing strong significance

TABLE 9: COMPARISION OF HEARING LOSS BETWEEN UNCONTROLLED AND CONTROLLED DM PATIENTS (LEFT EAR) :

Crosstab					
			hba1c (Binned)		Total
			<= 7.0	7.1+	
PTA (LEFT)	mild SNHL		7	1	8
			63.6%	4.2%	22.9%
	moderate SNHL		4	10	14
			36.4%	41.7%	40.0%
	severe snhl		0	10	10
			0.0%	41.7%	28.6%
	very severe		0	3	3
			0.0%	12.5%	8.6%
Total			11	24	35
			100.0%	100.0%	100.0%

GRAPH 9:

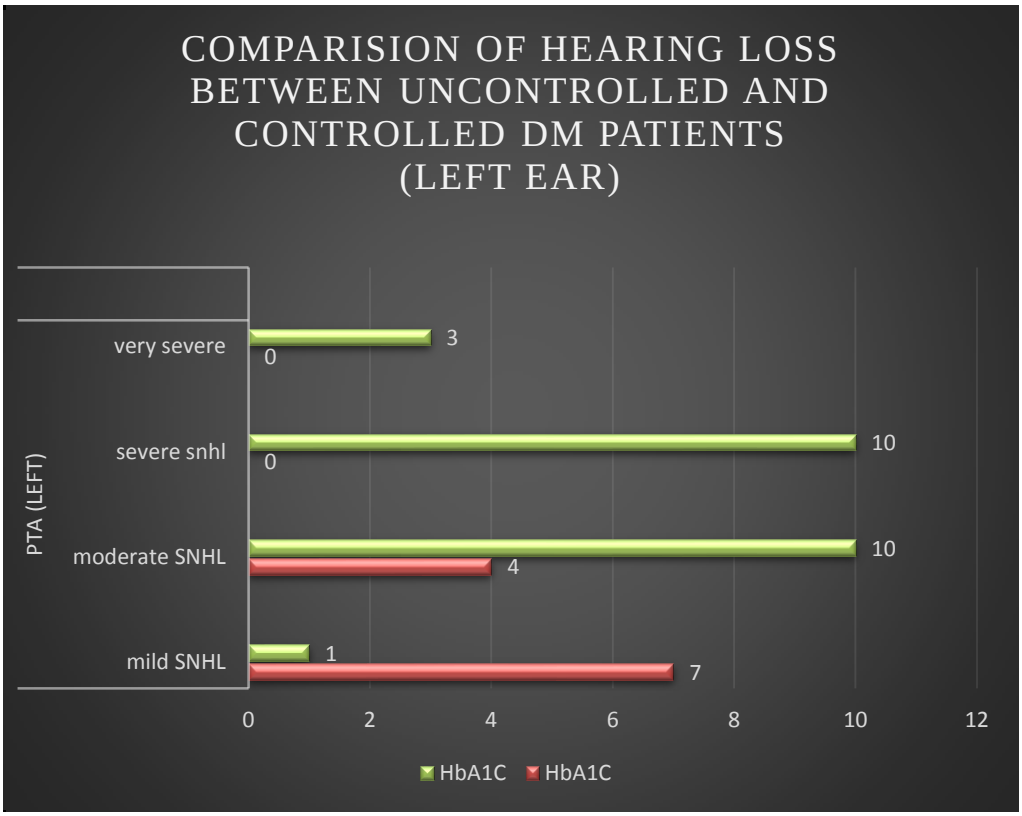


Table 9 and Graph 9, shows the comparision of hearing loss in left ear between uncontrolled DM and controlled DM patients . "It was observed that the severity of hearing loss in patients with uncontrolled diabetes mellitus was significant, i.e 3 (12.5%) patients suffering from very severe SNHL and 10 patients (41.7%) experiencing severe SNHL and 10 (41.7%) patients experiencing moderate sensorineural hearing loss (SNHL) and only 1 patients (4.2%)had mild SNHL."

Whereas in controlled DM patients had only mild SNHL i.e 7(63.6%) and 4(36.4%) moderate SNHL.

Chi-Square Tests		
	Value	Asymptotic Significance (2-sided)
Pearson Chi-Square	17.682	.001

Pvalue is less tha 0.001 showing strong significance

DISCUSSION

The present cross-sectional study entitled "A STUDY OF SENSORINEURAL HEARING LOSS IN PATIENTS WITH DIABETES MELLITUS BY PURE TONE AUDIOMETRY" was conducted in the department of Otorhinolaryngology and Medicine, BLDE Hospital vijayapura.

A 35 diabetic patients with hearing loss and 35 non diabetes mellitus patients with hearing loss were studied. All these patients were subjected to otoscopic examination and tuning fork tests . This was followed by PTA. Haematological tests like FBS, PPBS and HbA1c were also done for these patients.

Patients aged between 15 and 60 years are included. Among 70 cases and controls , 37 are males and 33 are females.

In our study all the patients were less than 60 years of age which exclude possibility of presbyacusis. In our study cases were already a known case of diabetes. In a study conducted by M. Mozaffari, et al on "diabetic patients consisting of similar age group the mean age of diabetic patients with SNHL was 47.7 (SD 8.07) years and in diabetic patients without SNHL was 42.3 (SD 10.12) years. There was a statistically significant association between presence of SNHL and age in DM. patients ($P < 0.05$)". [31]

In our study mean fasting blood sugar levels of DM group was 158.77 ± 34.02 ,whereas mean fasting blood sugar levels of non-DM group 99.57 ± 14.69

The mean post prandial blood sugar levels of DM group 294.17 ± 75,whereas mean post prandial blood sugar levels of non-DM group was 176.86 ± 22.69.

In our study, after PTA evaluation, it was found that among 70 cases and controls , control group only 7 patients had SNHL whereas in cases group 28 had SNHL(right ear) and in the left ear among controls 8 patients had SNHL whereas in

cases 27 patients had SNHL which indicates that prevalence of SNHL is more in diabetic patients . Similarly a study conduded by Sameer Karmacharya1 et all "concluded that prevalence of hearing loss was 72% among diabetic patients, whereas it was only 18% in non-diabetic individuals." [32]

It is estimated that globally, 30% of individuals with diabetes are unaware of their condition and already have long-term complications due to chronic high blood sugar by the time they are diagnosed. [33] Hence, an International Expert Committee recommended the use of glycated haemoglobin (HbA1c) to test the 3-month glycemic control. [33]

Our cases were further divided into well controlled and poorly controlled groups of DM, based on their HbA1c values. Among 24 poorly controlled DM patients ,It was observed that 5 (20.8%) were suffering from severe SNHL and 16 patients (66.7%%) experiencing moderate sensorineural hearing loss (SNHL) and 3 patients (12.5%%) suffering from mild SNHL, which obviously indicates that incidence and severity of SNHL is more compared to controlled DM patients .Similarly a study conducted by Srinivas CV et al concluded that "incidence of SNHL, among poorly controlled patients (i.e HbA1c >8) is 85.71 % where as it is 62 % with HbA1c 7–8 and 38 % among well controlled patients (i.e HbA1c < 7) p value 0.004336)". [34]Also a study conducted by Ratih Anindita et al "concluded that the majority (74.3%) in the controlled Type 2 DM group had a normal hearing threshold, whereas in the uncontrolled group of Type 2 DM patients, only 40% showed a normal hearing threshold". [35]

COCLUSION

Our study highlights a higher prevalence of sensorineural hearing loss (SNHL) in diabetic patients compared to non-diabetics, based on PTA values. Further in our study cases i.e known diabetic with hearing loss were further divided into two groups based on their HbA1C values as poorly controlled dm and well controlled dm patients and severity of hearing loss were analysed. pvalue is less than 0.001 showing strong significance which implies poorly controlled diabetes mellitus patients exhibited more severe hearing loss when compared with well-controlled diabetic patients.

In our current study, we emphasize the importance of impact of diabetes on hearing health. Therefore complete audiological evaluation and maintaining strict glycemic control is crucial for reducing the impact of diabetes on hearing sensitivity.

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Azadi Ka
Amrit MahotsaV

BLDE

(DEEMED TO BE UNIVERSITY)
Declared as Deemed to be University u/s 3 of UGC Act. 1956
Accredited "ith 'A' Grade by NA SC (Cycle-2)

The Constituent College
SHRI B. M. PATIL MEDICAL COLLEGE, HOSPITAL & RESEARCH CENTRE,
VIJAYAPURA10/4/2023 BLDE (DU)/IEC/ 987/2022-23

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Ethical Committee of this University met on Saturday, 18th March, 2023 at 11.30 a.m. in the CAL
Laboratory, Dept. of Pharmacology, scrutinizes the Synopsis/ Research Projects of Post Graduate Student / Under Graduate Student /Faculty members of this University /Ph.D. Student College from ethical clearance point of view. After scrutiny, the following original/ corrected and revised version synopsis of the thesis/ research projects has been accorded ethical clearance.

TITLE: "A STUDY OF SENSORINEURAL HEARING LOSS IN PATIENTS WITH DIABETES MELLITUS BY PURE TONE AUDIOMETRY".

NAME OF THE STUDENT/PRINCIPAL INVESTIGATOR: DR.NIVEDHA N.

NAME OF THE GUIDE: DR. R.N.KARADI. PROFESSOR,
DEPT. OF OTORHINOLARYNGOLOGY.

Dr. Santoshkumar Jeevangi
VIJAYAPURA
Chairman,
Institutional Ethical Committee,
BLOE (Deemed to be University)
Vijayapura

Chairperson
IEC, BLDE (DU),

Dr.A Akram A. Naikwadi
Member Secretary
IEC, BLDE (DU),
VIJAYAPURA
MEMBER SECRETARY
Institutional Ethics Committee
BLDE (Deemed to be University)
Karnataka

INFORMED CONSENT

BLDE (DEEMED TO BE UNIVERSITY)

SHRI B M PATIL MEDICAL COLLEGE HOSPITAL

ANDRESEARCH CENTRE, VIJAYAPURA- 586103

TITLE OF THE PROJECT: SENSORINEURAL HEARING LOSS IN PATIENTS WITH DIABETES MELLITUS BY PURE TONE AUDIOMETRY

PG STUDENT - Dr. NIVEDHA.N

DEPARTMENT OF OTORHINOLARYNGOLOGY

PG GUIDE - Dr.R.N.KARADI PROFESSOR

DEPARTMENT OF OTORHINOLARYNGOLOGY

SHRI B. M. PATIL MEDICALCOLLEGE HOSPITAL AND RESEARCH VIJAYAPURA – 586103

All aspects of this consent form are explained to the patient in the language understood by him/her.

4. **PURPOSE OF RESEARCH:**

I, NIVEDHA.N have been informed about this study. I have also been given a free choice of participation in this study.

5. **PROCEDURE:**

I, NIVEDHA.N am aware that in addition to routine care received I will be asked series of questions by the investigator. I have been asked to undergo the necessary investigations and treatment, which will help the investigator in this study.

6. **RISK AND DISCOMFORTS**

1. **NIVEDHA.N** understand that I may experience some pain and discomfort during the examination or during my treatment. This is mainly the result of my condition and the procedure of this study is not expected to exaggerate these feelings that are associated with the usual course of treatment.
2. **BENEFITS: NIVEDHA.N** understand that my participation in this study will help to improve survival of the patient and will bring about a better outcome.
3. **CONFIDENTIALITY: NIVEDHA.N** understand that the medical information produced by this study will be a part of Hospital records and will be subject to the confidentiality and privacy regulation. Information of a sensitive personal nature will not be a part of the medical records, but will be stored in the investigator's research file and identified only by a code number. The code-key connecting name to numbers will be kept in a separate location. If the data are used for publication in the medical literature or for teaching purpose, no name will be used and other identifiers such as photographs and audio or videotapes will be used only with my special written permission. I understand that I may see the photographs and videotapes and hear the audiotapes before giving this permission.
4. **REQUEST FOR MORE INFORMATION**: I understand that I may ask more questions about the study at anytime. Dr. NIVEDHA.N is available to answer my questions or concerns. I understand that I will be informed of any significant new findings discovered during the course of the study, which might influence my continued participation. If during the study, or later, I wish to discuss my participation in or concerns regarding this study

with a person not directly involved, I am aware that the social worker of the hospital is available to talk with me. A copy of this consent form will be given to me to keep for careful reading.

7. **REFUSAL OR WITHDRAWAL OF PARTICIPATION:**

1. understand that my participation is voluntary and that I may refuse to participate or may withdraw consent and discontinue participation in the study at any time without prejudice to my present or future care at this hospital. I also understand that DR. NIVEDHA.N may terminate my participation in the study after she has explained the reasons for doing so and has helped arrange for my continued care by my own physician or physical therapist, if this is appropriate.

INJURY STATEMENT:

1. understand that in the unlikely event of injury to me resulting directly from my participation in this study, if such injury were reported promptly, the appropriate treatment would be available to me, but no further compensation would be provided. I understand that by my agreement to participate in this study I am not waiving any of my legal rights.

I have explained to _____the purpose of the research, the procedures required and the possible risks and benefits to the best of my ability in patient's own language.

_____ _____

Dr. . NIVEDHA.N (Investigator)

Date

STUDY SUBJECT CONSENT STATEMENT

I confirm that DR. NIVEDHA.N has explained to me the purpose of research, the study procedures that I will undergo, and the possible risks and discomforts as well as benefits that I may experience in my own language. I have read and I understand this consent form. Therefore, I agree to give consent to participate as a subject in this research project.

_____

Participant / Guardian Date

_____ _____

Witness to signature

PROFORMA

SCHEME OF CASE TAKING

1) NAME: CASE NO:
2) AGE: IP NO:
3) SEX: DOA:
4) RELIGION: DOS :
5) OCCUPATION: DOD:

1) RESIDENCE:
2) CHIEF COMPLAINTS

Decreased hearing -

Onset - Duration -

Side –

Progression -

HISTORY OF PRESENTING ILLNESS:

3) PAST HISTORY:

1. Diabetes mellitus
2. Juvenile diabetes
3. Hypertension
4. Bronchial Asthma
5. Congenital Heart Disease
6. History of any previous surgery.

5. · FAMILY HISTORY:

GENERAL PHYSICAL EXAMINATION:

Pallor: Present/Absent

Icterus: Present/Absent

Clubbing: Present/Absent

Generalized Lymphadenopathy: Present/Absent

Built: Poor / Moderate / Well

Nourishment: Poor / Medium / Well.

VITALS

PR:

BP:

RR:

Temp:

LOCAL EXAMINATION

EAR Right Left

- Pinna
- Pre auricular area
- Post auricular area
- External Auditory Canal
- Tympanic Membrane

Tuning Fork Tests

Rinnes – ▪

Webers -

▪ Absolute Bone Conduction –

PURE TONE AUDIOMETRY

NOSE

ORAL CAVITY

OROPHARYNX

INVESTIGATION:

1)FBS

2)PPBS

3) HbA1c –

FINAL DIAGNOSIS:

MASTER CHART

CASES

s.no	name	age	sex	fbs	ppbs	hba1c	PTA (RIGHT)	PTA (LEFT)
1	maliksab	55	male	145	250	11	moderate SNHL	moderate SNHL
2	santhosh	45	male	111	232	12	mild SNHL	moderate SNHL
3	malama	60	female	131	161	8	moderate SNHL	moderate SNHL
4	manjunath 40	40	male	152	280	6.7	mild SNHL	mild SNHL
5	bhimappa 56	56	male	138	201	6.8	mild SNHL	mild SNHL
6	siddanna	55	male	180	310	8	moderate SNHL	severe snhl
7	kotyal	60	male	190	254	12	moderate SNHL	severe snhl
8	rekha	45	female	109	230	7	mild SNHL	mild SNHL
9	kalavathi	51	female	111	210	8	moderate SNHL	moderate SNHL
10	kiran	58	male	180	340	10	severe snhl	very severe
11	sahebal	59	male	210	380	9	moderate SNHL	severe snhl
12	mallama	53	female	118	240	6.9	mild SNHL	mild SNHL
13	rukmavva	50	female	130	360	6.8	mild SNHL	moderate SNHL
14	parashuram	52	male	148	390	7	mild SNHL	moderate snhl
15	bourawwa	56	female	170	420	16	moderate SNHL	severe snhl
16	kiran kumar	58	male	160	390	10	moderate SNHL	moderate SNHL
17	siddappa	55	male	130	280	12	severe snhl	severe snhl
18	laxman	58	male	160	250	10	moderate SNHL	moderate SNHL
19	veeresh	48	male	190	320	14	moderate SNHL	severe snhl
20	mahalakshmi	39	female	130	200	7	mild SNHL	mild SNHL
21	gangubhai	42	female	140	190	6.6	mild SNHL	moderate SNHL
22	sriram	35	male	130	196	7	mild SNHL	mild SNHL
23	sanganna	39	male	140	220	7	mild SNHL	mild SNHL
24	rathod	40	male	150	298	8	moderate SNHL	severe snhl
25	sangamesh	35	male	140	320	8	mild SNHL	mild SNHL
26	laxmi jadav	44	female	190	360	10	moderate SNHL	severe snhl
27	ashwini	46	female	200	380	11	moderate SNHL	moderate SNHL
28	babu	50	male	210	440	14	severe snhl	very severe
29	jetteppa	44	male	250	420	14	severe snhl	moderate SNHL
30	sunil	48	male	160	300	12	moderate SNHL	severe snhl
31	kashibai	44	female	190	310	11	moderate SNHL	moderate SNHL
32	mumtaj	46	female	140	290	10	mild SNHL	moderate SNHL
33	kasturi	38	female	210	340	12	moderate SNHL	severe snhl
34	bhimaray	44	male	130	210	6	mild SNHL	moderate snhl
35	samang	47	male	184	324	9	severe snhl	very severe snhl

S.no	name	age	sex	fbs	ppbs	hba1c	PTA (right)	PTA(left)
1	gujjavva	55	female	98	180	5.2	normal	normal
2	yamanappa	45	male	76	160	5	normal	normal
3	vijayalakshmi	60	female	102	148	6	normal	normal
4	devappa	40	male	100	170	5.3	normal	normal
5	oji	56	male	68	131	5.7	mod snhl	mod snhl
6	Siddappa	56	male	98	168	5.5	normal	normal
7	indrabai	60	female	94	184	5.4	normal	normal
8	gangavva	45	female	95	174	6	normal	mild snhl
9	shakunta	51	female	76	163	5.1	normal	normal
10	shantappa	58	male	86	148	5.4	normal	normal
11	iravva	59	female	110	160	5.3	mild snhl	mild snhl
12	gorabai	53	female	100	164	5	normal	normal
13	bharati	50	female	70	140	5.2	normal	normal
14	devakamma	49	female	108	200	5.7	normal	moderate snhl
15	jyoti	39	female	84	190	5.4	normal	normal
16	mukim	58	male	90	200	5.2	mild snhl	mild snhl
17	milindra kumar	55	male	98	110	5	normal	normal
18	adarsh	58	male	95	160	5.2	normal	normal
19	awati	48	male	110	195	5.4	mild snhl	moderate snhl
20	najma	39	female	99	180	4.8	normal	normal
21	jangiradar	42	male	90	190	4.9	normal	normal
22	yallawwa	35	female	100	186	5.2	normal	normal
23	guru	39	male	110	190	5.4	mild snhl	normal
24	suraj	40	male	98	180	6	normal	normal
25	prajwal	35	male	126	190	5.8	normal	normal
26	salman	44	male	118	186	6.2	normal	normal
27	mahadevi	46	female	130	210	5.5	mild snhl	normal
28	girish	50	male	110	200	5	normal	normal
29	yamanamma	44	female	112	201	5.5	normal	normal
30	shivamma	48	female	101	198	5	normal	normal
31	savita baj	44	female	110	210	4.8	mild snhl	mild snhl
32	mahaboobi	46	female	126	186	5	normal	normal
33	meenaxi	38	female	110	168	5.6	normal	normal
34	indumathi	44	female	98	176	5	normal	normal
35	saraswati	47	female	89	194	4.9	normal	mild snhl

9% Overall Similarity

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