FACTORS INFLUENCING THE DECISION ON COCHLEAR IMPLANTS IN ADULTS IN INDIA

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CERTIFICATE

This is to certify that this dissertation entitled "**Factors influencing the decision on cochlear implants in adults in India**" is a bonafide work submitted in part-fulfilment for the degree of Master of Science (Audiology) of the student with Registration Number: P01II21S0056. This has been carried out under the guidance of a faculty of this institute and has not been submitted earlier to any other University for the award of any other Diploma or Degree.

Mysuru
September 2023

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CERTIFICATE

This is to certify that this dissertation entitled "**Factors influencing the decision on cochlear implants in adults in India**" has been prepared under my supervision and guidance. It is also certified that this dissertation has not been submitted to any other University for the award of any other Diploma or Degree.

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DECLARATION

This is to certify that this dissertation entitled "**Factors influencing the decision on cochlear implants in adults in India**" is the result of my own study under the guidance of Dr. Geetha C., Associate Professor in Audiology, Department of Audiology, All India Institute of Speech and Hearing, Mysuru, and has not been submitted earlier to any other University for the award of any Diploma or Degree.

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Abstract

Aim and objectives: *The purpose of the current study was to find the prevalence of probable adult cochlear implant candidates reported at AIISH and to analyse the factors such as lifestyle, surgery, knowledge of cochlear implant, employment, family and travel, which may affect the decision on cochlear implantation in adults.* ***Method:*** *A detailed review of 1000 adult case files reported between December 2022 and February 2023 was conducted, probable cochlear implant candidates were selected based on the pure tone average, speech identification scores, middle ear status, degree and type of hearing loss, hearing aid trial and MRI/CT scan if available. Six audiologists were involved in the development and content validation of the questionnaire to identify the factors affecting cochlear implantation in adults. It was administered on 16 adult cochlear implant candidates. The questionnaire consisted of six sections, and the responses were collected on a five-point Likert scale.* ***Results:*** *The prevalence of probable cochlear implant candidates in adults reported to AIISH was reported to be 5%. Fifty-two ears were eligible for traditional bilateral cochlear implants, twenty-three ears were suitable for unilateral cochlear implants, and two ears were eligible for electro-acoustic stimulation. The primary reason for not going for a cochlear implant was the cost of the device. Other factors such as lack of family support, lack of knowledge of cochlear implant centres and risk of surgery affected the decision on cochlear implant. Factors such as lifestyle/social barriers, employment, and travel may or may not affect one's decision on a cochlear implant.* ***Conclusion:*** *The study shows that there are probable adult candidates for cochlear implants who report for audiological evaluation, however, factors such as the cost of the device, lack of family support, lack of knowledge of centres for cochlear implantation, risk of*

surgery may affect the decision on cochlear implantation. There is a need for the implementation of schemes that may help adults who are not benefiting from a hearing aid, this can help to assist them financially and remove a major barrier for cochlear implants in adults.

CHAPTER 1

INTRODUCTION

The prevalence of hearing loss in India is 0.3% of the population, of which 49.8% reported hearing only loud sounds or inability to hear at all, according to the 75th National Sample Survey (*India - Household Social Consumption: Health, NSS 75th Round Schedule-25.0: July 2017-June 2018*, 2018). Verma et al. (2022) reported a prevalence of hearing loss between 6% and 26.9% of individuals and a prevalence of disabling hearing loss between 4.5% and 18.3% of individuals among all age groups. The study reported a higher prevalence of hearing impairment in rural areas and older adults. A retrospective study done at AIISH between 2018 and 2019 revealed a 29.93% hearing loss prevalence in adults (Sahana & Rajalakshmi, 2021). Results also showed that profound hearing loss was more prevalent in adults, followed by mild and severe hearing loss. It is well-known that individuals with higher degrees of hearing loss are probable candidates for a cochlear implant, as the benefit from hearing aids may be limited (Flynn et al., 1998).

Numerous studies on children report a high performance when implanted very early (Holman et al., 2013; Leigh et al., 2013). Several studies have highlighted speech perception improvements (Boisvert et al., 2020) and quality of life improvements in adults after cochlear implantation (Krabbe et al., 2000; Lassaletta et al., 2006; Straatman et al., 2014). Studies have shown the complication after surgery for adults is low and is associated with good outcomes (Aldhafeeri et al., 2019; Carlson et al., 2010; Chen et al., 2013; Jaiswal et al., 2023; Roberts et al., 2013; Schwab et al., 2015; Wong et al., 2016). Sladen et al. (2017) had done a prospective study to see the quality of life outcomes and speech recognition pre- and post-implantation. They reported that the average speech recognition score for the consonant nucleus consonant word test was

10% pre-operatively and 66.7% at 12 months post-activation. The health-related quality of life (HRQoL) scores were also significantly improved post cochlear implantation in eight of the nine domains.

Gstoettner et al. (2008) conducted a study to investigate the amount of hearing preserved and the improvement seen in speech recognition score after adult listeners underwent electro-acoustic stimulation cochlear implant. The results showed that in 80% of their patients, hearing was preserved and there was a significant difference in the speech perception score in quiet post-implantation when compared to pre-implant scores with hearing aids. Similar improvement was also reported for patients with unilateral severe to profound hearing loss who underwent cochlear implant (Firszt et al., 2012; Hansen et al., 2013). Both the authors showed improvement in open-set speech recognition in the implanted ear post-implantation and also improvement in sound localization.

The advanced age of an individual has no negative effects after cochlear implants, as shown by various studies (Buchman et al., 1999; Castiglione et al., 2015; Migirov et al., 2010; Shabashev et al., 2017). Studies have also shown there is risk involved in surgery in these population, similar to that of young adults (Carlson et al., 2010; Chen et al., 2013; Roberts et al., 2013; Schwab et al., 2015; Wong et al., 2016). Elderly adults who have undergone cochlear implant have shown good improvement in speech perception (Dillon et al., 2015; Lenarz et al., 2012), quality of life (Djalilian et al., 2002; Wong et al., 2016) and cognition (Cosetti et al., 2016; Mosnier et al., 2015). Yang and Cosetti (2016) also suggested that age alone should not be a barrier for cochlear implantation.

Despite the improvements reported, there is a lag in the number of adult cochlear implant recipients compared to children (De Raeve et al., 2020; Sorkin &

Buchman, 2016). In the United States of America, the number of cochlear implants was 1,70,252 as of 2015, with a net increase in cochlear implants (Nassiri et al., 2022). Fakurnejad et al. (2020) studied the trends in the age of probable cochlear implant candidates in the US. Results showed that between 2003 and 2016, the number of implanted individuals increased annually in all age groups, with the greatest increase in those above 60 years. The average age of participants undergoing a CI increased from 26.6 to 57.2 years. The number of cochlear implants in Europe has increased from 2010 to 2016 in the pediatric population by 8 to 12 cochlear implants per 1000 newborns and in the adult population by 0 to 5 implants per million inhabitants (De Raeve et al., 2020).

A few researchers have probed into the factors leading to fewer cochlear implants in adults. Major factors related to low percentage of probable adult cochlear implant candidates were concerns about surgery and limited knowledge of cochlear implants (Bierbaum et al., 2019). Challenges such as restrictions on the number of candidates for funded implants and political decisions and issues also contribute to the decision on cochlear implants in adults (Athalye et al., 2015).

Sorkin and Buchman (2016) found that, in developing countries, the awareness of cochlear implant needed to be higher. Due to the lack of screening for adults, and the cochlear implant candidacy criteria and outcomes were unfamiliar, leading to lower patient referrals. Chundu and Buhagiar (2013) also found similar results. Chundu and Buhagiar conducted a questionnaire study. The study concluded that the audiologist might not feel confident discussing cochlear implants with patients due to the lack of training and familiarity. In 2020, Dillon and Pryce studied the factors determining whether an adult eligible for a cochlear implant may choose to take up an implant. The study was conducted in the United Kingdom using a quantitative in-depth interview study. Results revealed that the decision-making process is complex, and factors such

as living context and support, information, and social identity play a significant role (Dillon & Pryce, 2020).

The above studies have discussed the factors for poor reception of cochlear implants outside India. In the Indian context, a few studies have explored the factors leading to the decision to use a cochlear implant in children. The high cost of surgery, lack of manpower, and lack of government schemes have been highlighted as possible factors for child cochlear implant candidates (Garg et al., 2011). Patient affordability was also found to be responsible for the low percentage of CI cases (Krishnamoorthy et al., 2014).

Krishnamoorthy et al. (2014) suggested that developing indigenous implants may help overcome the cost limitations in India. Financial constraints may also be a common factor which can affect the decision for cochlear implant in children (Kothari et al., 2015). To overcome this limitation, multiple free schemes have been implemented for children (Friedner, 2022; Kumar & Kameswaran, 2018). However, for adults, there are no such schemes.

The decision-making process for an adult for a cochlear implant is complex and involves multiple factors. Studies done outside India have highlighted the lack of awareness among audiologists and the lack of referral for cochlear implant (Chundu & Buhagiar, 2013; Sorkin & Buchman, 2016). For children in India, various newborn screening programs have been initiated, and the awareness of early rehabilitation is growing. However, awareness may be a factor that may affect cochlear implantation in adults. Further, living context, support and social identity have been factors for non-acceptance of cochlear implant in the United Kingdom (Dillon & Pryce, 2020). In India, due to the difference in lifestyle and the cost of living, fear of surgery and the cost of

the device can also be a barrier for cochlear implantation. Cosmetic appeal and comfort have been reported to influence the decision on cochlear implantation (Chundu & Stephens, 2013).

1.1 Need for the study

With a rise in hearing impairment (World Health Organization, 2018), there is a gap between eligible candidates and those who go for a cochlear implant. The prevalence of profound hearing loss (around 34%) is the most in adults (Sahana & Rajalakshmi, 2021). These individuals are probable candidates for cochlear implants. However, Sahana and Rajalakshmi (2021) did not report the configuration of hearing loss. It is important to look into hearing thresholds across different frequencies. Even sloping loss cases with moderate hearing loss in the low frequencies are eligible for cochlear implants according to the expanded cochlear implant candidacy (Spitzer et al., 2021). Hence, it is vital to explore the number of adults who could be eligible for cochlear implants according to the latest criteria.

In India, through the scheme of Assistance to Disabled Persons for Purchase/ Fitting of AIDS/Appliances (ADIP scheme), there is an increase in the number of cochlear implants in children from 357 in the year 2016-2017 to 763 in the year 2018-2019. There are several other state schemes and central schemes, such as Rashtriya Bal Swasthya Karyakram (RBSK), for cochlear implants in children, leading to an increase in the number of children with cochlear implants. Krishnamoorthy et al. (2014) highlighted that the cost of the device was one of the most prominent factor affecting the decision of cochlear implant in children. Kothari et al. (2015) also report that financial constrain were the common factor for the delay in cochlear implantation for the paediatric population. For this reason, the government has introduced various

schemes for the paediatric population, reducing financial burden. However, there are currently no such schemes for adults, which may affect their decision on cochlear implant.

In addition, these are various studies done in India to find the factors which affect the decision on cochlear implants in paediatric population (Garg et al., 2011; Kothari et al., 2015; Krishnamoorthy et al., 2014). Factors such as the high cost of surgery, lack of manpower, and lack of government schemes have been highlighted by Garg et al.,(2011) in children. However, for adults there may be other factors that could affect the decision (Chundu & Stephens, 2013).

Dillon and Pryce (2020) studied the factors determining whether an adult eligible for a cochlear implant may choose to take up an implant in the United Kingdom. Results revealed that the decision-making process is complex, and factors such as living context and support, information and social identity played a major role. However, in India, factors such as aesthetics and comfort may not be major factors as the primary factor may be the cost of the device due to the difference in living style and culture (Garg et al., 2011; Krishnamoorthy et al., 2014). The cost of the device has been highlighted to be a major factor in children in India. Hence, the authors expect differences in the findings of such studies between India and other countries. Therefore, the current study aims to fill in this gap and find out the possible reasons for adults, who are eligible for a cochlear implant, may not choose to take up the implant in India. It is necessary to understand these factors since it will help us better understand the problem from the patient's point of view and also help make cochlear implantation more accessible for patients by creating better awareness in the adult population.

1.2 Aim of the study

The study aimed to find the number of probable adult cochlear implant candidates, and to find out the factors influencing the decision-making on cochlear implants in adults who are eligible for a cochlear implant.

1.3 Objectives of the study

The objectives of the study were-

1. To determine the number of eligible cochlear implant adult candidates by

   a) Analysing the type and degree of hearing impairment of 1000 adult cases reported to AIISH and identifying the number of probable cochlear implant candidates.

   b) Classifying the probable cochlear implant candidates based on the type of device implantable.

2. To explore the factors for not choosing to undergo a cochlear implant.

CHAPTER 2

REVIEW OF LITERATURE

Cochlear implant (CI) performs better for profound hearing loss than users with hearing aids in adults (Buchman, Herzog, et al., 2020). The quality of life benefits in cochlear implant users are greater than hearing aid users with mild hearing loss (Cohen et al., 2004). The risk associated with cochlear implants is also low (Jaiswal et al., 2023). Despite these benefits, there is a lack of adult cochlear implant users. This section reviews studies on the latest candidacy criteria and the factors influencing the decision-making on cochlear implants in adults who are eligible for a cochlear implant. This section has been divided into two major sections. Section I discusses the patient-related factors which affect the decision on cochlear implantation, and Section II discusses factors which the clinician is involved and other factors.

2.1 Section I: Patient-related factors

In the decision-making process of cochlear implantation, both the patient and clinician play a role. There are many patient-related factors that affect the decision for cochlear implantation in adults. Factor such as the cost of the device plays an important role during the decision for cochlear implant as it puts a huge financial burden on the candidates (Krishnamoorthy et al., 2014). The amount of knowledge about cochlear implant and the amount of counselling may also influence the decision on cochlear implant (Chundu & Buhagiar, 2013). Family support also plays an important role for cochlear implant as their support is needed post-cochlear implantation for rehabilitation and transportation to the cochlear implant centre (Dillon & Pryce, 2020; Vieira et al.,

2014). In this section, the studies related to patient-related factors such as socio-economic status, age and aesthetics and comfort are discussed.

Dillon et al. (2020) tried to identify the factors which affect the decision-making process for CI implantation in adults. It was a qualitative interview study based on open-ended questions. First, participants above 18 years and those who met the NICE (2009) guidelines were selected. They either had done a CI or were in the process of being assessed for CI implantation or rejected CI altogether. A total of 15 participants underwent the interview. The interviews were recorded and later transcribed by the interviewer. The interview consisted of 22 open-ended questions under eight subheads: lifestyle style, relationships, employment, rehabilitation, physical appearance, surgery, travel to cochlear implant centres, and clinicians.

The responses were later transcribed from the recording and were analysed line-by-line open coding. Similar codes were grouped into common categorisation. The results were discussed under eight themes (subsections). Based on the participants' responses and using the code, a theoretical framework for decision-making in adults eligible for cochlear implants was developed. They had identified living context and support, information needs and sources, consideration of risk, and social identity as major factors.

Vieira et al. (2014) tried to understand the family's decision-making process for cochlear implantation. It was qualitative research, and data was collected from the family members using a semi-structured interview. A total of 32 participants participated in the study. The interview was recorded and transcribed. The data was analysed using data coding and categorisation process. The results showed that the lack of knowledge about cochlear implant, risks and long-term repercussions, and the

restrictions imposed using an electromagnetic implant had influenced their decision process for cochlear implantation. Other patient-related factors such as age, aesthetics and socioeconomic status, are discussed in the next section.

2.1.1 Socio-economic status

The cost of a cochlear implant is high due to which factors such as socioeconomic status may affect the decision-making process of cochlear implantation in adults. Davis et al. (2023) attempted to find the possible factors influencing adult cochlear implantation decisions. This was a retrospective study in which a review of all adult patients referred to a cochlear implantation centre was taken between April 2017 and July 2017.

They wanted to compare two factors, which were the time taken to travel to the cochlear implant centre and the lower socioeconomic status. The zip code and county of the participants were collected to calculate the time travelled. Insurance status or the payer type was obtained to assess the socioeconomic status of the participants. Other demographic details such as referral source, age at the time of referral and the decision regarding cochlear implant were taken. The time to the cochlear implant centre was calculated using geocoding, where the location was derived using the zip code and city. Using the ArcGIS 10.8.1 software, the travel time was calculated. Socioeconomic status was calculated by using the Social Deprivation Index.

They found out that the travel time was not significantly different between the group of people who attended the cochlear implantation evaluation and those who did not. Still, a lower socioeconomic status was associated with missing cochlear implantation evaluation and may have affected the decision-making process in cochlear implant candidates in adults.

Dornhoffer et al. (2020) conducted a survey in the United States of America to determine demographic and audiological factors associated with the delay in treatment with cochlear implants. This was a retrospective study done from 2012 to 2017. A total of 492 adults were taken. Details such as time to implantation, per-implantation audiological outcomes and demographic details such as age, sex, race and health insurance status were taken from their cochlear implant database. The results showed that race (non-white) impacted the time of implantation. Other factors such as gender, audiological results, and health insurance status did not significantly differ.

2.1.2 Age

Various studies have shown that the advanced age of an individual has no adverse effects after cochlear implants (Chen et al., 2013; Schwab et al., 2015; Wick et al., 2020; Wong et al., 2016). One such study was done by Zao Yang and Maura Cosetti (2016). This was a review article in which they reviewed reports that assessed the risk associated with cochlear implantation surgery in older adults and the outcome measures. The study concluded that cochlear implant is a safe and effective treatment for elderly adult patients with hearing loss. The risk associated with cochlear implant surgery and anaesthesia is low and is comparable to that of younger adults. The speech perception in quiet was comparable to that of young adults. The authors suggest that the older age of implantation alone should not be considered as a barrier to implantation.

2.1.3 Aesthetics and comfort

Chundu and Stephens (2013) aimed to study patients' decision-making process in choosing a cochlear implant. They had retrospectively studied these factors. In this study, they had taken 43 adults and 19 children. These subjects had implants from various manufacturers like Advance bionics, Cochlear, Medel, and Neurelec. In their

study, about 40% of adults listed out the fit and comfort of the processor as a reason, followed by 19% for ease of use of the device, and 14% followed by the smaller size of the processor as a reason that affected their decision-making process. For children, a similar trend was seen, with 37% stating fitting and comfort of the processor as the major reason. The author included all types of manufacturers as they wanted to study factors related to aesthetics and comfort rather than the technical aspects. Authors concluded that aesthetics and comfort may be reasons for choosing a particular implant.

2.2 Section II: Clinician-related and Other factors

The decision on cochlear implant may also be influenced by the knowledge of the clinician and his/her awareness about cochlear implants (Chundu & Buhagiar, 2013). The criteria may also prevent a candidate who may benefit from a cochlear implant but may not fall under the latest FDA guidelines (Park et al., 2021; Zwolan & Basura, 2021). For these reasons, it is important to understand other factors that may influence adults' decision-making process for cochlear implantation. In this section, studies related to clinicians and other factors are discussed.

2.2.1 Audiological Criteria and Evolving Criteria

When CI was first introduced, it was only for people with severe to profound hearing loss and those with very poor speech recognition scores, but with the recent advances in CI technology, such as electro-acoustic stimulation, this criterion is now expanded to even sloping hearing loss with moderate to severe degree of hearing loss.

Holder et al. (2018) analysed the audiological and demographic data of adults presenting for preoperative CI evaluation. Data was collected for 287 adults prospectively. The patients underwent pure-tone audiometry, speech recognition in aided condition using consonant-nucleus-consonant (CNC) word list, AzBio sentence

test, Bamford-Kowal-Bench speech in noise test (BKB-SIN) and assessment of spectral resolution (Quick spectral modulation detection (QSMD) test). The participants also filled the Abbreviated profile of hearing aid benefit (APHAB) and Speech, Spatial, and Qualities of Hearing Scale (SSQ) and underwent screening for cognitive impairments. Out of the 287 patients in their study, 51 of them had good speech and audiometric thresholds, and 37 of them did meet the FDA criteria for CI. The authors have given several reasons and recommendations as to why patients may not pursue a cochlear implant.

The authors stated that even if the patient may not meet the FDA criteria for cochlear implant, they may have difficulty with the current device. In this case the authors recommend the use of SSQ to better understand the patient's difficulties. And also, they recommend more follow-ups and counselling for these patients. Another possible reason is that the otolaryngologist and audiologist may lack knowledge of current indications for cochlear implant. About 25.4% of their sample were possible candidates for a hybrid implant, and about 72.1% were possible candidates for a bimodal implant, and these patients did not undergo a cochlear implant. The authors report that this may be due to a lack of awareness and poor insurance availability.

2.2.2 Awareness

Earlier, the awareness of hearing aids and CI was low, as shown by Cohen et al. (2005). They surveyed various primary care physicians regarding their referral of patients for hearing aids and CI. It consisted of a questionnaire about patients with hearing loss, hearing loss screening and referral practices and the availability of local resources. Out of 260 physicians, 85 had responded. Results showed that lack of time, lack of knowledge about identifying probable candidates and “where to refer” were the

main factors affecting the physicians' ability to refer more patients. Further, primary care physicians do not routinely test for hearing impairment in adults.

Nonetheless, this was many years ago. Appelbaum et al. (2017) aimed to study if the duration of hearing loss before CI has changed over the years since CI was first introduced. The study also aimed to determine whether there is a change in testing for adult preoperative CI. They reviewed a total of 71 articles that met their inclusion criteria. The relation between the article's publication year and the duration of hearing loss before CI implantation was taken and a meta-regression was done. Results showed a positive correlation between study year and duration of hearing loss, showing a 0.28-year increase in the duration of hearing loss for every increasing study year. The authors attributed this to a lack of awareness of CI and lack of access to CI.

2.2.3 Effect of referral

The low CI candidacy testing rate in adults can also be due to a lack of referrals. This was studied by Looi et al. in 2017. The study reviewed case files, and a questionnaire was administered on clinicians. The case files were reviewed to see the number of probable CI candidates and to make a comparison on how many were actually referred and underwent CI surgery. The questionnaire was administered to identify the factors influencing the referral pathway to CI assessments. A total of 1249 adult case files were selected whose PTA was above 65 dB HL and had an unaided phoneme recognition score of less than 50%. Eighteen patients met the CI candidacy criteria, of whom 16 had a CI discussion with their audiologist, 11 were referred for CI evaluation, and four proceeded for implantation. There is a discrepancy between the number of probable CI candidates and those who were referred for CI evaluation. The questionnaire filled out by the clinicians better explains this. According to the

questionnaire, clinicians responded that if a client expressed no interest, they would not recommend a possible CI candidate for a CI evaluation. Additionally, they stated that they might not recommend a patient if they are culturally Deaf, have insufficient support for continuous rehabilitation, are elderly, or are in poor health.

The study also reported lack of tools and resources to assist in clinicians' decision-making process in the context of referrals for CI candidacy assessments. Some clinicians reported that they are not well informed and updated about the CI referral process. The authors concluded that the referral pathway to obtain a CI candidacy testing is a barrier that contributes to a low CI candidate in adults.

To summarise, the above studies have emphasised various factors that could affect the acceptance of cochlear implant in adults. Factors such as the cost of the device, risk of surgery, travel, awareness, and cosmetic appeal affect the decision of cochlear implant in adults (Chundu & Stephens, 2013; B. Dillon & Pryce, 2020). However, many studies have explored the factors that affect the decision on cochlear implants in adults in other countries. Studies about factors that influence the decision-making in India, such as the cost of the device, have been studied in India (Krishnamoorthy et al., 2014), but other factors, such as travel, cosmetic appeal, awareness of the device, and surgery, have not been extensively studied. Hence, there is a need to study the factors that would affect the decision on cochlear implants in adults.

CHAPTER 3

METHOD

The current study included two major objectives. The first objective was to determine the number of eligible cochlear implant adult candidates out of 1000 adults tested at AIISH, for which a retrospective review of casefiles was done. The second objective was to explore the reasons/factors for not choosing to undergo a cochlear implant. The participants were selected through purposive sampling. Hence, the current study was conducted in two phases. The details are presented under the following headings:

Phase 1: Assessment of the number of probable CI candidates.

- Step 1: Searching the audiology database.
- Step 2: Collecting information from the case files.
- Step 3: Categorisation of data.

Phase 2: Development of a questionnaire to assess the factors affecting CI in adults.

- Step 1: Development of the questionnaire.
- Step 2: Translation of the questionnaire into Kannada.
- Step 3: Administration of the questionnaire on probable CI candidates.

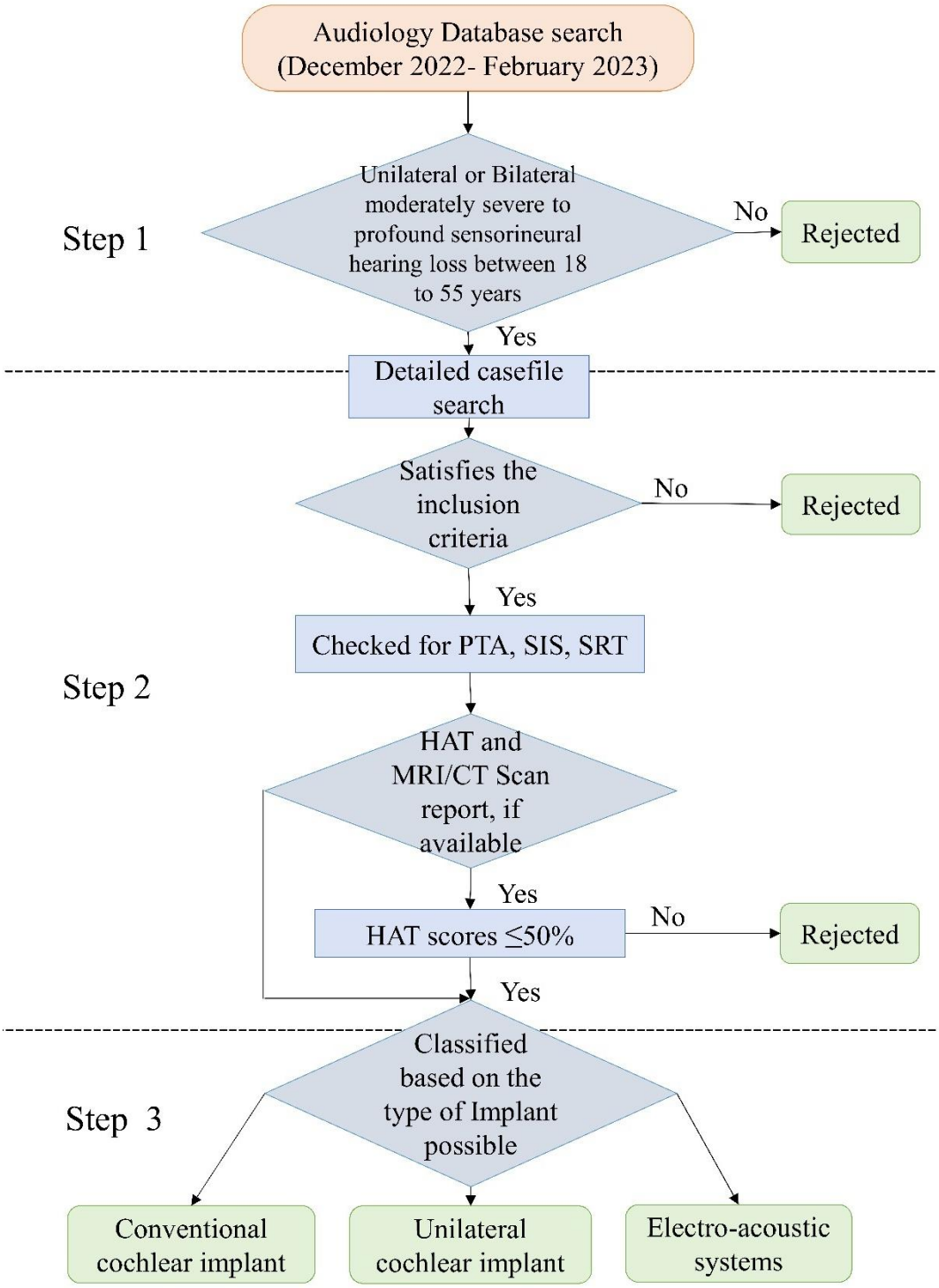
3.1 Phase 1: Assessment of the number of probable CI candidates

The audiology database was searched from December 2022 to February 2023. A total of 1,000 adult cases registered at AIISH were reviewed. The total number of

adult hearing-impaired cases reported was noted. This search was conducted in three steps, as described in Figure 3.1.

Figure 3.1

Summary of Phase 1 and its steps. (PTA- pure tone average, SIS- speech intelligibility score, SRT- speech recognition score, HAT- hearing aid trial).



3.1.1 Audiology Database Search

From the database, cases with unilateral or bilateral moderately severe to profound sensorineural hearing loss were selected. The cases within the age range of 18 to 55 years were selected. The cases that did not fit this criterion were not chosen for the next phase.

3.1.2 Detailed casefile search

The case files of the above-selected cases were reviewed, and information about the demographic details, nature of hearing loss, the onset of hearing loss, duration of hearing loss for both ears, ENT reports, pure tone average, speech reception scores, speech intelligibility scores, provisional diagnosis and type of hearing loss were noted down. If the case had undergone a hearing aid trial and/or radiological assessment, they were also considered for analysis. The inclusion criteria was decided after a review of the latest FDA criteria (2022). Table summarises the criteria used by different manufacturers. If the case had passed the below inclusion criteria, they were taken for further analysis.

Inclusion criteria:

a. The participants had to have air conduction threshold of normal to moderate hearing loss in frequencies less than or equal to 500 Hz and air conduction thresholds greater than 75 dB HL in frequencies above 2000 Hz at least in one ear or severe to profound hearing loss in one or both ears (FDA, 2022) Complete details are given in Table 3.1.
b. The case had speech intelligibility score of less than 50% in at least one ear. This cut-off was taken as a possible candidate may fit into any of the devices. Complete details are given in Table 3.1.

c. The type of hearing loss was sensorineural hearing loss in at least one ear, and the nature should be acquired.

d. If hearing aid trial results are available, the open-set speech intelligibility score was less than 50% in one or both ears. Complete details are given in Table 3.1.

Table 3.1

Summary of indication for cochlear implants in adults retrieved from FDA (2022).

Name of manufacture and implant	Puretone required	Speech performance
Traditional bilateral implants		
Advanced Bionics HR90k ultra 3D	Bilateral severe to profound sensorineural hearing loss (>70 dB HL)	<50% score in open-set sentence recognition (HINT)
Cochlear Nucleus 24		≤50% in the ear to be implanted (recorded open-set sentence recognition)
MEL-EL Synchrony and synchrony 2		≤40% score in open-set sentence recognition (HINT)
Unilateral implants		
Cochlear Nucleus 24	Severe to profound hearing loss in the ear to be implanted (>80 dB HL) and normal or near normal hearing in the better ear (≤30 dB HL)	<5% in the CNC word test in the ear to be implanted
MEL-EL Synchrony and synchrony 2	Severe to profound hearing loss in the ear to be implanted (>90 dB HL) and normal/mild or mild to moderate hearing loss in the better ear.	<5% in the CNC word test in the ear to be implanted
Electro-acoustic stimulation		
Cochlear Nucleus Hybrid L-24	Moderate to profound at low frequency (41-90 dB HL) and profound for mid to high frequencies (>90 dB HL) for both ears	≤60% CNC word recognition in quiet in the ear to be implanted
MEL-EL Synchrony and synchrony 2 EAS	Normal to moderate sensorineural hearing loss in low frequencies (<65 dB HL up to 500 Hz and severe to profound in mid to high frequencies (>75 dB HL from 2000 Hz and above)	≤60% CNC word recognition in quiet in the ear to be implanted

Note: CNC- consonant nucleus consonant test; HINT- Hearing in noise test

3.1.3 Categorisation of data

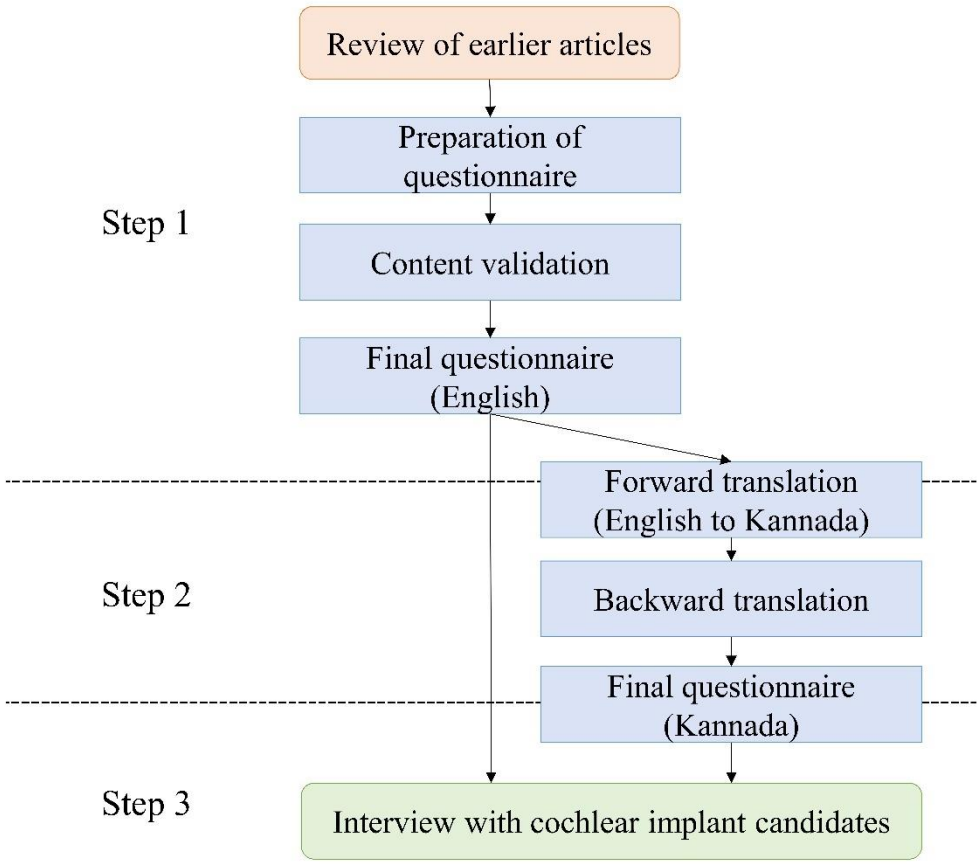
The cases that fulfil the above inclusion criteria were selected for further analysis. Based on the data, the prevalence of probable cochlear implant candidates was calculated. The probable cochlear implant candidates were also assigned under three possible implant categories based on the latest U.S. Food and Drug Administration (FDA) (2022). The categories included conventional bilateral cochlear implants, unilateral cochlear implants, and electro-acoustic stimulation based on the configuration of loss, degree of loss, speech audiometry scores, and hearing aid trial scores, if available.

3.2 Phase 2: Development of questions for the interview

In this phase, a questionnaire was developed which was used on probable adult cochlear implant candidates. This is described below in three steps and summarised in Figure 3.2.

Figure 3.2

The summary of steps involved in the development of the questionnaire.



3.2.1 Development of the questionnaire

A questionnaire with closed and open-ended questions was modified from similar studies done by Dillon et al. (2020), Bierbaum et al. (2019), Athalye et al. (2015), Sorkin et al.(2022) and Chundu et al. (2013). After reviewing these articles, the most common factors were taken under the sections, such as lifestyle, knowledge of cochlear implants, surgery, and family support. Each question was reviewed by three audiologists who were experts in the field of cochlear implants. Based on their recommendations, the initial questionnaire was made.

The questionnaire had 33 questions and was divided into two parts. Part 1 consisted of demographic details. Part 2 consisted of 23 questions under six sections, including lifestyle/social barriers, knowledge of cochlear implants, surgery, family support, employment, and travel. The questionnaire included open-ended and rating scale based questions.

3.2.2 Rating scale

Each of the closed-end questions was given a five-point Likert rating scale. The parameters which may affect the decision on cochlear implant negatively were given a higher rating. The rating scale for all six sections is summarised in Table 3.2.

Table 3.2

Rating scale used for each section in the questionnaire.

Section	Rating scale
Lifestyle/ social barriers	1 = Very unlikely, 2 = Unlikely, 3 = Neutral, 4 = Likely, 5 = Very likely
Knowledge of cochlear implants	5 = Very much unaware, 4 = Unaware, 3 = Neither aware or unaware, 2 = Aware, 1 = Very much aware.
Surgery	1 = Very unlikely, 2 = Unlikely, 3 = Neutral, 4 = Likely, 5 = Very Likely
Family support	5 = Never, 4 = Rarely, 3 = Sometimes, 2 = Often, 1 = Always
Employment	5 = Never, 4 = Rarely, 3 = Sometimes, 2 = Often, 1 = Always
Travel	1 = Never, 2 = Rarely, 3 = Sometimes, 4 = Often, 5 = Always

3.2.3 Content validation

The developed questionnaire was sent to six audiologists to provide qualitative and qualitative feedback. They were also given a content validation form in which they

were asked to rate each question for relevance, clarity, simplicity, and ambiguity. Each of these parameters was rated on a 4-point scale modified from a study by Saiful and Yusoff (2019). The following scale was used for relevance: 1 = the item is not relevant to the measured domain, 2 = the item is somewhat relevant to the measured domain, 3 = the item is quite relevant to the measured domain, 4 = the item is highly relevant to the measured domain. For clarity, the following scale was used: 1 = not clear, 2 = item needs some revision, 3 = clear but needs minor revision, 4 = very clear. For simplicity, the following scale was used: 1 = not simple, 2 = item needs some revision, 3 = simple but needs minor revision, 4 = very simple. For ambiguity, the following scale was used: 1 = meaning is doubtful, 2 = item needs some revision, 3 = no doubt but needs minor revision, 4 = meaning is clear.

3.2.4 Final questionnaire

The content validation index (CVI) was calculated by using the guidelines given by Saiful and Yusoff (2019). The scores given by the experts were scores between 1 and 4. The ratings given by the experts were then coded, wherein a score of 1 was given if the expert had given a rating of 4 or 3 and a score of 0 was given if the exert had given a score of 2 or 1. The codes assigned for each of the experts were averaged to obtain the CVI for each question and the CVI ranged from 0 to 1. The questions were modified based on the feedback and suggestions provided. The items with a CVI of at least 0.83 or above were selected. The selected items had CVI within the acceptable values for six experts as recommended by Polit et al. (2006) and Polit et al. (2007). The rating of each question by the audiologist is summarised in Table 3.3.

Table 3.3

CVI calculated for different parameters rated by the audiologists.

Parameter	**S-CVI/Ave** (Scale-level content validity index based on the average method)
Relevance	0.992
Clarity	0.954
Simplicity	0.992
Ambiguity	0.969

Based on the above, the final questionnaire was developed in English. The final questionnaire had 31 questions and is given in Appendix I. The next step of this section involved the translation of this English questionnaire to Kannada.

3.2.5 Translation of the questionnaire into Kannada

The questionnaire was translated using the widely acknowledged American Association of Orthopaedic Surgeons (AAOS) (Beaton et al., 2000) guidelines, which include a forward, backward translation process. The following steps were included in the procedure.

3.2.6 Forward translation

The questionnaire was given to two adult bilingual translators from the field of speech and hearing who were proficient in both English and Kannada. Each of the translators independently produced a forward translation copy.

3.2.7 Synthesising popular translation

Popular translation synthesis: A single merged approved version of the forward translations was produced after the multiple forward translation stage. All researchers

and translators are involved in this strategy. This procedure involved all of the translators and main researchers coming to an agreement on how to structure the consolidated translations.

3.2.8 Backward translation

The second crucial step in the translation-adaptation process is recommended as a way to verify accurate original-to-target language translation. It assists in mapping the semantic equivalence of the translated measure's original and target versions and acts as a quality check by pointing out important discrepancies and conceptual errors (Beck et al., 2003). The reverse translation was carried out by freelance bilingual translators who was not a part of the study group and was not familiar with the topic of the study (Baeza et al., 2010). As a result, the English translation of the consolidated approved version was done on its own by an adult bilingual translator with no medical training and no knowledge of speech or hearing.

3.2.9 Analysis by the Expert Committee

After all these steps, a comparison was made of all the versions (Forward translation, synthesised common translation, and back translation) to prepare the pre-final version of the questionnaire. After reviewing everything, a final version was produced in Kannada, which is given in Appendix II.

3.3 Phase 3: Interview with the CI candidates

Nineteen participants, in the age range of 17 to 50 years, who have not undergone cochlear implantation were selected through purposive sampling. The demographic details of the participants are summarised in Table 3.4. The inclusion and exclusion criteria for choosing the participants are listed below:

Inclusion Criteria:

1. The selected participants had audiogram and speech identification scores eligible for cochlear implantation (FDA, 2022).
2. The participants had acquired hearing loss, their age was greater than or equal to 17 years and had acquired language before the onset of hearing impairment.
3. The type of hearing loss was sensorineural.
4. The participants had undergone a cochlear implant candidacy assessment.

Exclusion Criteria:

1. Participants with middle ear pathology were not included.
2. Patients with a confirmed diagnosis of retrocochlear pathology were excluded.
3. Pre-lingual hearing loss cases who have not acquired language were not eligible for the study.

Table 3.4

Demographic details of participants.

Sample characteristics	**Number of participants (percentage)**
Male/ Female	8 (42.1%)/ 11 (57.9%)
Urban	11 (57.9%)
Rural	8 (42.1%)
Slab I	16 (84.2%)
Slab II	1 (5.2%)
Slab III	2 (10.6%)
Education of participant	
Postgraduate	4 (21.1%)
Undergraduate	7 (36.8%)
PUC	3 (15.8%)
SSLC	3 (15.8%)
Primary education	1 (5.3%)
Illiterate	1 (5.3%)
Diagnosis	(n= number of participants)
Bilateral severe to profound hearing loss	n = 9 (47.4%)
Unilateral profound hearing loss	n = 8 (42.1%)
ANSD	n = 1 (5.3%)
Bilateral severe sloping hearing loss	n = 1 (5.3%)
No. of participants willing to go for CI	3 (15.8%)

Note: ANSD- Auditory neuropathy spectrum disorder, PUC-Pre-university course (competed grade 11th and 12th), SSLC- Secondary school leaving certificate (competed grade 10).

3.3.1 Step 3: Administration of the questionnaire

Participants who satisfied the inclusion criteria were included in the study. Informed consent was taken from all the participants. The participants were asked topic-guided questions through either an in-person interview or a phone-in interview. The author noted down the rating given by the participants. The mean age of the participants

was 29.74 years (SD ± 10.16 years). The study included eight males and eleven females. They all had moderately severe to profound sensorineural hearing loss in one or both ears and satisfied the inclusion criteria. Out of the 19 total participants, 16 participants were not willing to go for a cochlear implant. Hence, only their questionnaire responses have been taken for the frequency analysis.

3.4 Statistical Analysis

The demographic details and responses for each question in the questionnaire were tabulated and analysed using Statistical Package for the Social Sciences (SPSS for Windows, version 26.0) software. Frequency analysis was done to see which factors affected the decision on cochlear implantation. The Mann-Witney test was done to see if there was any difference between the probable bilateral implant candidates and probable unilateral implant candidates.

CHAPTER 4

RESULTS

The current study aimed to find the number of probable adult cochlear implant candidates, and to understand the factors influencing the decision-making on cochlear implants in adults who are eligible for a cochlear implant. The results for each objective are discussed in two parts:

4.1. Prevalence of probable cochlear implant candidates

4.2. Factors affecting cochlear implantation in adults.

4.1. Prevalence of probable cochlear implant candidates

This part of the study involved a retrospective analysis of the case files of adults who were reported to All India Institute of Speech and Hearing, Mysuru, between 1st December 2022 to 15th February 2023. A total of 1,000 cases whose files were available were taken for review. The data was analysed to determine the number and percentage of probable candidates eligible for a cochlear implant.

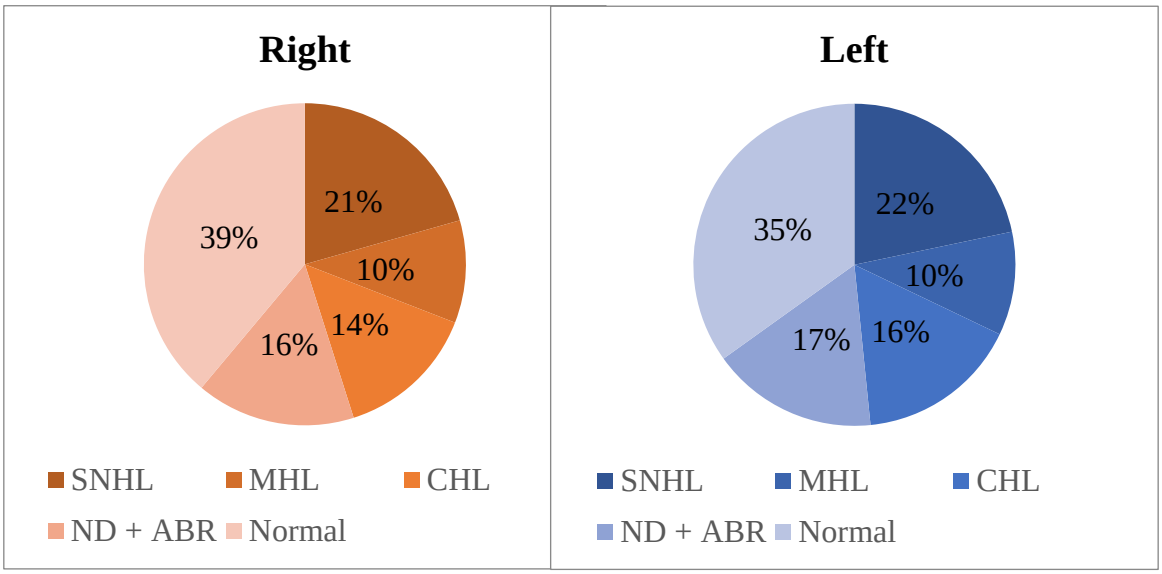
4.1.1. Prevalence of hearing impairment in adults

A total of 1,000 cases between the age range of 18 to 55 years were searched in the audiology database. There were 536 males and 464 females. These 1,000 cases were analysed with respect to their degree and type of hearing loss in each ear. A total of 423 ears were diagnosed to have sensorineural hearing loss (206 right and 217 left); 207 ears were diagnosed to have mixed hearing loss (103 right and 104 left); 305 ears were diagnosed to have conductive hearing loss (142 right and 163 left); 161 ears were diagnosed to have normal hearing sensitivity; and for 327 ears the type of hearing loss could not be determined as they were diagnosed based on auditory brainstem response

or were not mentioned in the database, but they were taken for the next step in this phase. During the casefile search, their eligibility for cochlear implantation was assessed. The prevalence of degree of hearing loss in an individual with hearing impairment showed that sensorineural hearing loss was most prevalent, followed by conductive hearing loss and then mixed hearing loss; this is depicted in Figure 4.1.

Figure 4.1

Prevalence of different types of hearing loss in adults visited AIISH for right and left ears. (SNHL: Sensorineural hearing loss, MHL: Mixed hearing loss, CHL: Conductive hearing loss, ND- not determined, ABR: diagnosed based on Auditory brainstem response).



Analysis was also done to find the prevalence of hearing loss with respect to the degree of hearing loss. The results are shown in Table 4.1.

Table 4.1

Prevalence of hearing loss in adults with respect to the degree of hearing loss for right and left ears.

Right		**Left**	
Degree	**Number of ears (%)**	**Degree**	**Number of ears (%)**
Normal	389 (38.9%)	Normal	349 (34.9%)
Minimal	118 (11.8%)	Minimal	139 (13.9%)
Minimal to Mild	5 (0.5%)	Minimal to Mild	4 (0.4%)
Mild	96 (9.6%)	Mild	99 (9.9%)
Mild to Moderate	10 (1%)	Mild to Moderate	11 (1.1%)
Moderate	119 (11.9%)	Moderate	137 (13.7%)
Moderate to Moderately severe	6 (0.6%)	Moderate to Moderately severe	5 (0.5%)
Moderately severe	79 (7.9%)	Moderately severe	93 (9.3%)
Moderately severe to Severe	15 (1.5%)	Moderately severe to Severe	9 (0.9%)
Severe	57 (5.7%)	Severe	54 (5.4%)
Severe to Profound	47 (4.7%)	Severe to Profound	35 (3.5%)
Profound	59 (5.9%)	Profound	65 (6.5%)

Table 4.1 shows that many cases have sensorineural hearing loss of various degrees. However, all cases who have thresholds above moderate degree of hearing loss could not be considered probable candidates for cochlear implantation. As in the present study, only acquired loss was considered. Further, the configuration of hearing loss,

speech identification scores and the results from hearing aid trial were also considered. Hence, all ears which had a sensorineural type of loss and hearing loss greater than moderate to moderately severe, along with those diagnosed based on ABR were taken for the next step of analysis.

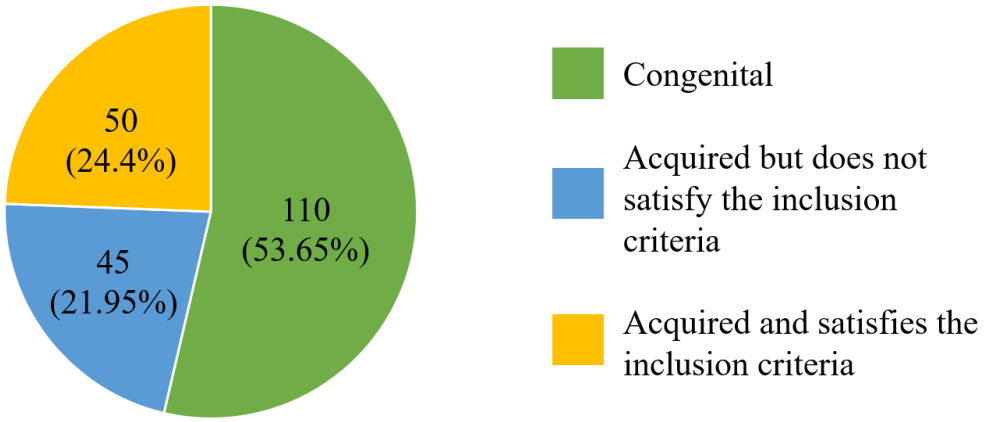
4.1.2. Prevalence of probable cochlear implant candidates.

Out of the 1000 cases taken from the audiology database, 205 files were taken as they satisfied the inclusion criteria based on the degree and type of hearing loss at least in one ear, as shown in Figure 4.2. These 205 files were reviewed in detail and were analyzed based on the cause of hearing loss (if congenital or acquired), the configuration of hearing loss, speech identification scores and hearing aid trial or MRI or CT scans if available.

From these 205 files, 110 had congenital hearing loss and were not taken for further review, and 45 of them had acquired hearing loss but were not taken for further review as they had either had a speech identification score during the hearing evaluation of ≥50% in the casefile or if the client had followed up for a hearing aid trial and had obtained an open-set aided scores of ≥60% as they did not satisfy the inclusion criteria as described in chapter 3. If the client had been diagnosed to have a middle ear pathology as diagnosed by immittance evaluation, then they were not considered. Only 50 cases (77 ears) satisfied every inclusion criterion and were probable candidates for a cochlear implant (Figure 4.2).

Figure 4.2

The distribution of 205 cases selected for detailed case file search.



Among these 50 cases, only seven had followed up for hearing aid trial, and all had either open-set speech score of < 60% or aided thresholds out of the speech spectrum in two or more frequencies. The percentage of probable cochlear implant candidates was calculated. Out of 1000, the prevalence of probable cochlear implant candidates was 5%.

4.1.3. Analysis based on the type of cochlear implant

The 50 cases who were probable candidates for a cochlear implant were further analyzed and categorized into three groups based on which devices they could be implanted with. The three groups are traditional bilateral cochlear implants, unilateral cochlear implants and electro-acoustic stimulation. For the traditional bilateral cochlear implants, 26 cases (52%) out of the 50 satisfied the candidacy for a bilateral cochlear implant (52 ears); unilateral implants could be fitted to 23 cases (46%) as they satisfied the candidacy for a unilateral cochlear implant (23 ears) and electro-acoustic stimulation could be fitted for 1 case (2%) as they fitted the criteria for a hybrid cochlear implant (two ears).

Under traditional bilateral cochlear implants, 13 (26%) cases had bilateral moderately-severe to profound hearing loss (26 ears) their air-conduction thresholds are shown in Figure 4.3. Thirteen cases (26%) had been diagnosed with Auditory Neuropathy Spectrum Disorder (26 ears) and their air-conduction thresholds are shown in Figure 4.4.

Figure 4.3

Air-conduction thresholds of probable candidates under the category for bilateral cochlear implants having bilateral moderately-severe to profound hearing loss (25 ears).

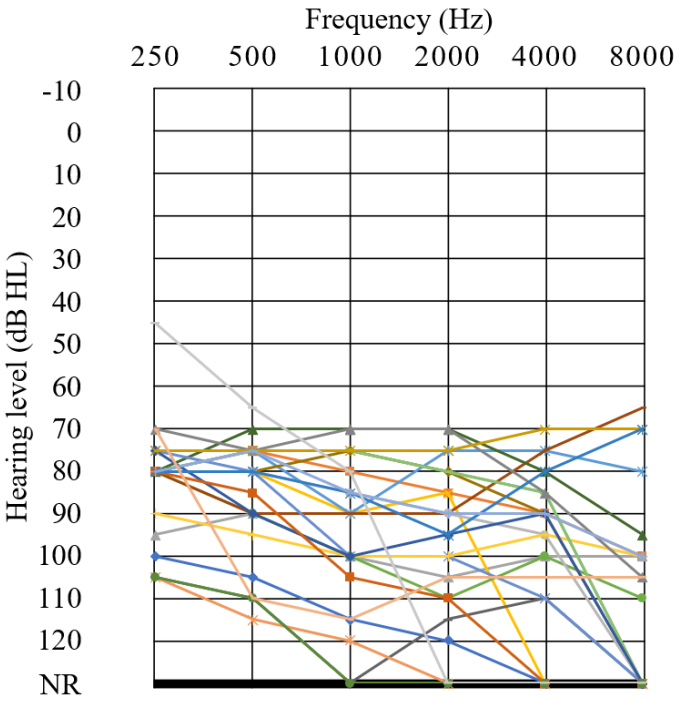
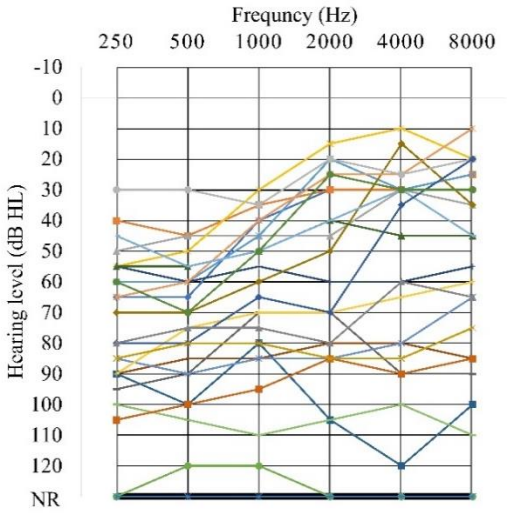


Figure 4.4

Air-conduction thresholds of probable candidates under the category for bilateral cochlear implants having Auditory Neuropathy Spectrum Disorder (25 ears).



Unilateral cochlear implants candidates were 15 (30%) single sided deafness (15 ears) and 8 (16%) with asymmetrical hearing loss with only one ear eligible for implantation (8 ears). Their air-conduction thresholds are shown in Figure 4.5 and Figure 4.6 respectively for unilateral and asymmetrical hearing loss cases.

Figure 4.5

Audiogram to the left shows air-conduction thresholds of probable candidates under the category for single sided deafness (14 ears). Audiogram to the right shows air-conduction thresholds of the better ear.

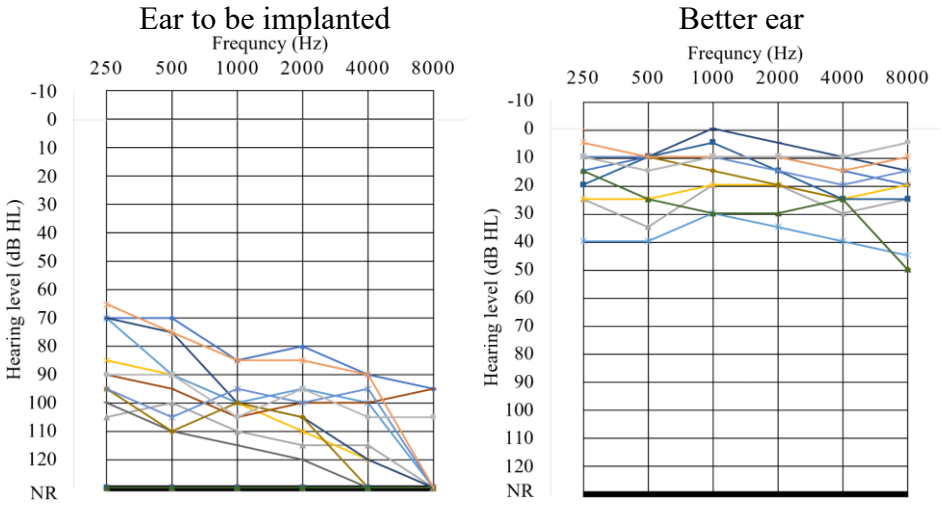
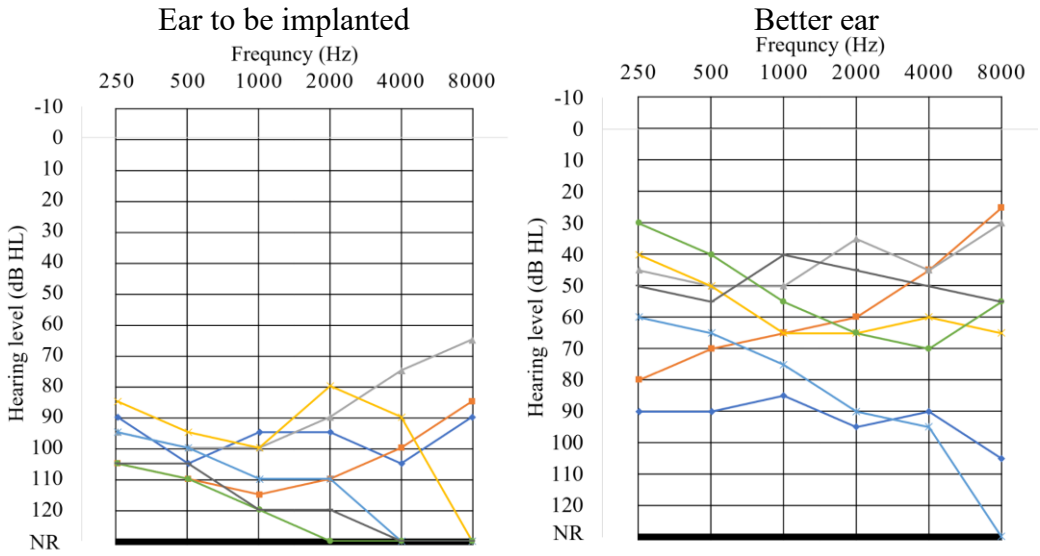


Figure 4.6

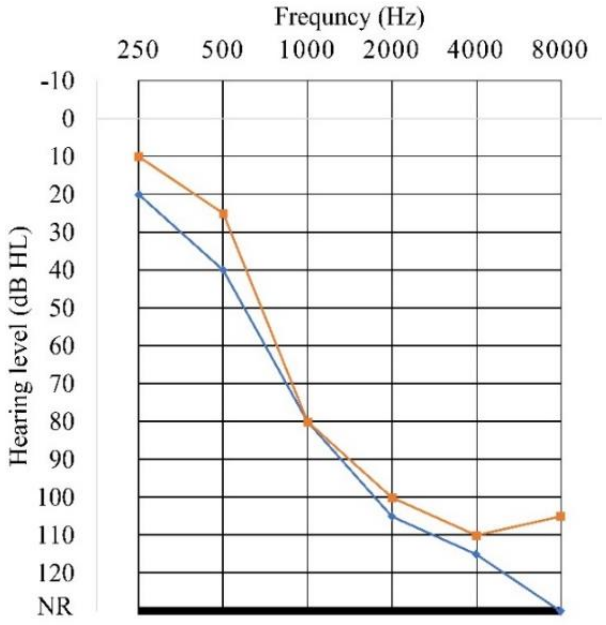
Audiogram to the left shows air-conduction thresholds of probable candidates under the category for asymmetrical hearing loss (7 ears). Audiogram to the right shows air-conduction thresholds of the better ear.



For hybrid implants, there was one (2%) case with precipitous sloping hearing loss (two ears); their air-conduction thresholds are shown in Figure 4.7.

Figure 4.7

Air-conduction thresholds of probable candidates under the category for Electro-acoustic stimulation (two ears).



The ear-wise distribution of 50 probable cochlear implant candidates is shown in Figure 4.8. The distribution of the probable cochlear implant candidates is shown along with pure tome average, and speech intelligibility scores are shown in Table 4.2.

Figure 4.8

Distribution of probable cochlear candidates based on the number of ears (total=77) based on the type of device/ear. (EAS: Electro-acoustic stimulation, ANSD: Auditory Neuropathy Spectrum Disorder, SSD: Single-sided deafness).

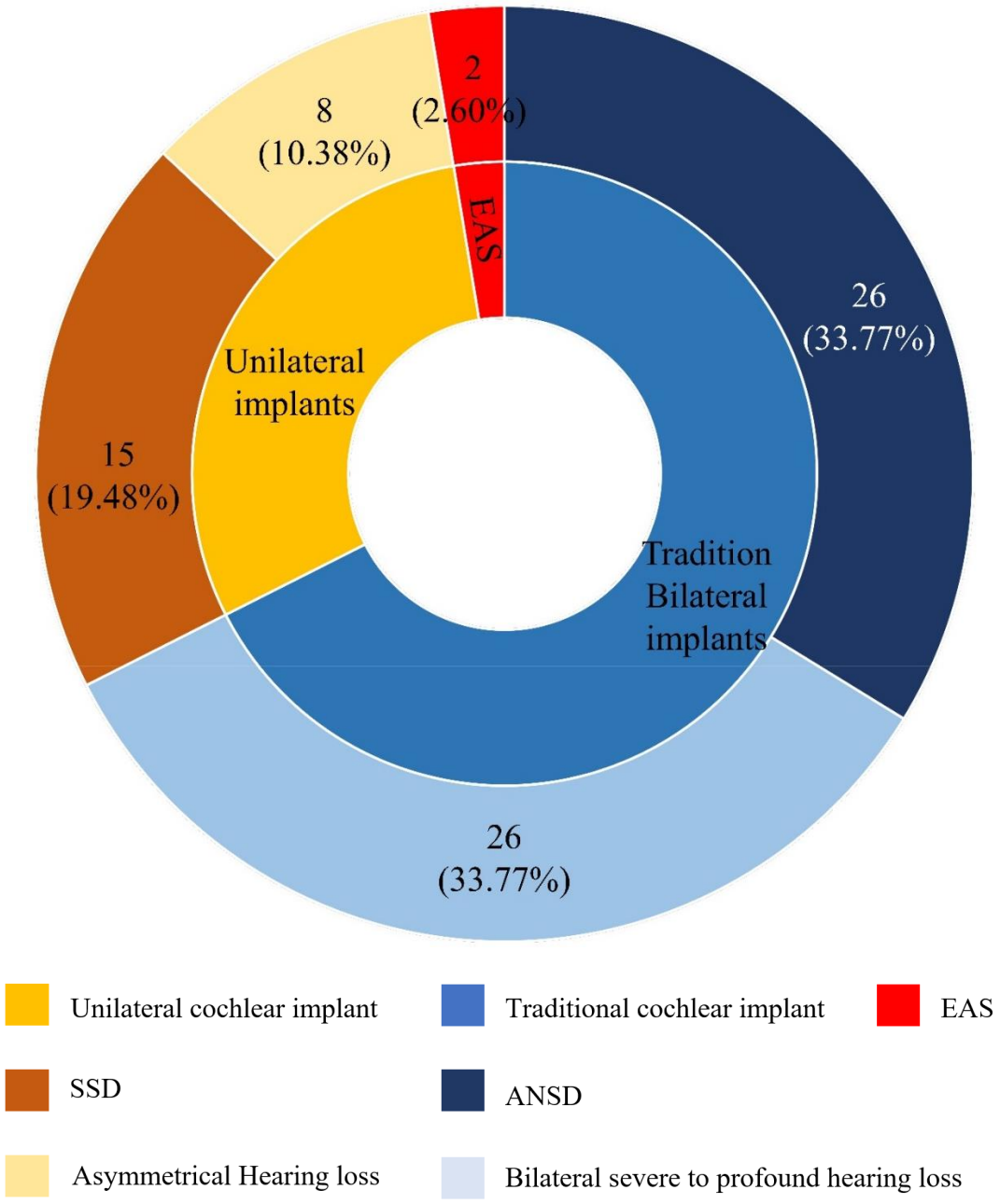


Table 4.2

Distribution of 50 probable cochlear candidates (77 ears) and their pure tone average and speech identification score.

Categories	Number of clients	Number of ears (n)	In the ear to be implanted (n)				In Better ear (n)			
			PTA (dB HL)	SD	SIS (%)	SD	PTA (dB HL)	SD	SIS (%)	SD
Traditional bilateral cochlear implant candidates										
Bilateral candidates	13	26	86.83	9.83 (n = 13)	8.68	18.05	-	-	-	-
			>90	NA (n = 12#)	NA	NA	-	-	-	-
			>90	NA (n = 1*)	NA	NA	-	-	-	-
Auditory neuropathy spectrum disorder (ANSD)	13	26	57.43	25.32 (n = 25)	18.96	30.07	-	-	-	-
			>90	NA (n = 1*)	NA	NA	-	-	-	-
Unilateral cochlear implant candidates										
Single Sided Deafness (SSD)	15	15 (3 Truma + 2 post Tumour + 1 sudden + 9 unknown)	91.81	31.25 (n = 9)	9.06	16.15	23.84	16.95 (n = 14)	97	3.42
			>90	NA (n = 5#)	NA	NA	-	-	-	-
			>90	NA (n = 1*)	NA	NA	>90	NA (n = 1*)	NA	NA
Unilateral Asymmetrical candidates	8	8 (1 Truma +7 unknown)	91.25	0 (n = 2)	6.33	15.51	56.75	14.64 (n = 6)	72	13.74
			>90	NA (n = 5#)	NA	NA	>90	NA (n = 1#)	NA	NA
			>90	NA (n = 1*)	NA	NA	>90	NA (n = 1*)	NA	NA

Table 4.2 continued.

Table 4.2 (continued).

Categories	Number of clients	Number of ears (n)	In the ear to be implanted (n)				In Better ear (n)			
			PTA (dB HL)	SD	SIS (%)	SD	PTA (dB HL)	SD	SIS (%)	SD
Electro-acoustic stimulation										
Sloping hearing loss	1	2	81.88	4.42	56	0	-	-	-	-

*Note: n- number of ears, PTA-Pure Tone Average, SIS-Speech Identification Scores, SD-Standard Deviation, #- PTA could not be calculated as there was no response at audiometric limits at one or more frequency, *-PTA was not calculated due to inconsistent response, NA- not applicable.*

4.2 Factors affecting cochlear implantation in adults

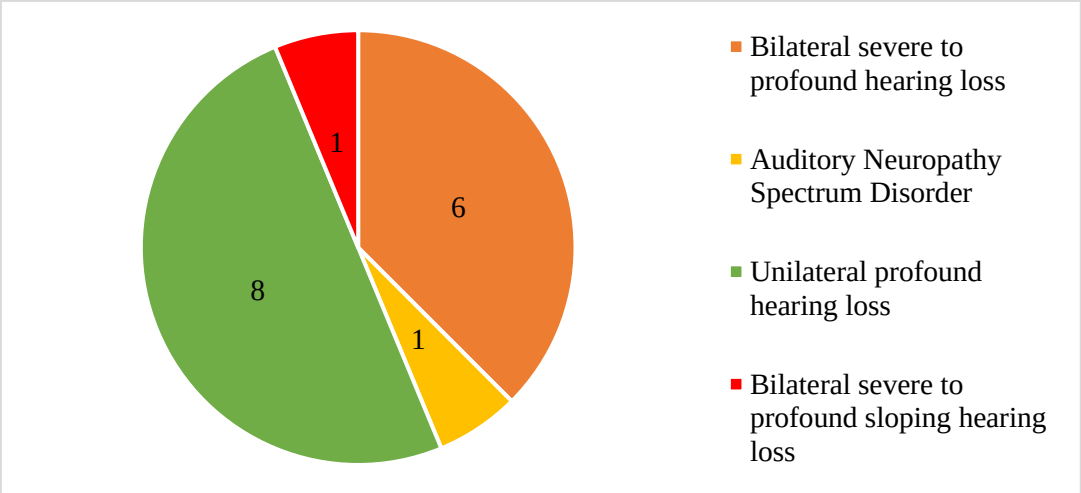
For this part of the study first, a questionnaire was developed, and six audiologists validated the questions in the questionnaire. The questions with acceptable content validation index were selected. After which it was administered on cochlear implant candidates. By means of purposive sampling, adult cochlear implant candidates who did not undergo cochlear implants were selected. A total of 19 participants were selected for the study, out of whom three were willing to go for cochlear implantation. Hence, 16 participants fulfilled the inclusion criteria given in Phase 3.

4.2.1 Distribution of participants

Out of the 16 participants, 24 ears were eligible for cochlear implants, 6 (47.4%) participants had bilateral severe to profound hearing loss (12 ears), 8 (42.1) participants had unilateral profound hearing loss, one (5.3%) participant had been diagnosed with ANSD (two ears), and one (5.3%) participant had bilateral severe to profound sloping hearing loss. The distribution of participants in the study is shown in Figure 4.9.

Figure 4.9

Distribution of participants taken for the study.



The details were taken from the case files as well as the questionnaire which was developed for the study. Analysis of the questionnaire was done to see the number of responses for each question. The results are given for each section below:

4.2.2 Distribution of Responses in each Section

The questionnaire was administered on 16 of the participants either through a phone-in interview or direct interview, and their responses were taken on a five-point Likert rating scale. The responses are described for each section: lifestyle/social barriers, knowledge about cochlear implant, surgery, family support, employment and travel. The participant's response frequency for each section is described below.

4.2.2.1 Lifestyle/social barriers

The questions in this section aimed to collect responses about the difficulty hearing, cosmetic concerns and other social barriers that may affect the decision on cochlear implantation in adults. The participants rated the items in this section on a five-point rating scale which ranged from 1 to 5 (1 = Very unlikely, 2 = unlikely, 3 = neutral, 4 = likely and 5 = very likely). The frequency of participants' responses is shown in Table 4.3.

Table 4.3

Participants' response frequencies for the section 'Lifestyle/social barriers' (n = 16).

	Participants' response				
Items	**Very unlikely**	**Unlikely**	**Neutral**	**Likely**	**Very Likely**
Q1. Difficulty communication	2	3	1	5	5
Q2. Difficulty at home	2	3	2	3	6
Q3. Due to Job	10	1	1	3	1
Q4. Cosmetic concern	5	2	0	1	8
Q5. Negative story	14	1	1	0	0
Total	33	10	5	12	20

The response frequency analysis shows that 10 (62.5%) of the participants were very unlikely to reject cochlear implantation due to job, and 14 (87.5%) of the participants' decision was not affected due to any negative story about cochlear implant they might have heard. Response frequency analysis also revealed that 8 (50%) of the participants' decision was influenced due to cosmetic concern. In this section, a total of 33 (41.25%) responses of "very unlikely" were reported.

4.2.2.2 Knowledge about cochlear implants

This section aimed to collect responses about the knowledge about cochlear implant and the knowledge on whom to approach for a cochlear implant. The participants rated the items in this section on a five-point rating scale, where the score ranged from 1 to 5 (1 = very much unaware, 2 = unaware, 3 = neither aware or unaware,

4 = aware and 5 = very much aware). The frequency of participants' responses is shown in Table 4.4.

Table 4.4

Participants' response frequencies for the section 'Knowledge about cochlear implants' (n = 16).

	Participants' response				
Items	**Very much unaware**	**Unaware**	**Neither aware or unaware**	**aware**	**Very much Aware**
Q6. Even Adults can use CI	0	0	1	5	10
Q7. How CI works	0	2	6	5	3
Q8. Whom to approach	0	5	2	4	5
Total	0	7	9	14	18

The response frequency analysis shows that 10 (62.5%) of the participants were very much aware that cochlear implant can be used by adults. In this section, a total of 32 responses of "very much aware" and "aware" were reported and none of the participants responded to "very much unaware". It shows that the participants demonstrated some knowledge about cochlear implant.

4.2.2.3 Surgery

The questions in this section aimed to collect responses about the knowledge of cochlear implant surgery and the risk associated with it. It also gave information about the cost of the device as a factor. The participants rated the items in this section on a five-point rating scale, and the score ranged from 1 to 5 (1= Very unlikely, 2 = unlikely,

3 = neutral, 4 = likely and 5 = very likely). The frequency of participants' responses is shown in Table 4.5.

Table 4.5

Participants' response frequencies for the section 'Surgery' (n = 16).

	Participant's response				
Items	**Very unlikely**	**Unlikely**	**Neutral**	**Likely**	**Very Likely**
Q9. Lack of surgery knowledge	2	4	3	3	4
Q10. Risk	1	2	4	4	5
Q11. Lack of knowledge of centres	2	3	1	2	8
Q12. Surgery	0	4	1	4	7
Q13. Cost of Device	0	1	1	1	13
Total	5	14	10	14	37

The response frequency analysis shows that 10 (62.5%) participants did not have knowledge of centres for cochlear implantation, and it very likely affected their decision on cochlear implant. In addition, 11 (68.75%) participants were not willing for cochlear implant due to fear of surgery and 14 (87.5%) participants were not willing to go for a cochlear implant due to its high cost. In this section, a total of 51 (63.75%) responses of "Very likely" and "likely" were recorded.

4.2.2.4 Family support

This section aimed to collect responses about the information on family support, which may affect the decision on cochlear implantation in adults. The participants rated the items in this section on a five-point rating scale. The score ranged from 1 to 5 (1=

Always, 2 = often, 3 = sometimes, 4 = rarely and 5 = never). The frequency of participants' responses is shown in Table 4.6.

Table 4.6

Participants' response frequencies for the section 'Family support' (n = 16).

	Participants' response				
Items	**Never**	**Rarely**	**Sometimes**	**Often**	**Always**
Q14. Family Agrees	1	11	1	3	0
Q15. Family Supportiveness	1	11	1	2	1
Total	2	22	2	5	1

The response frequency analysis shows that 12 (75%) participant's family member did not agree for a cochlear implant and were not supportive for cochlear implantation. Total of 24 (75%) responses of "Rarely" and "Never" were reported, which indicates poor family support for cochlear implant.

4.2.2.5 Employment

The section 'employment' aimed to collect responses about the difficulty hearing in worm place and other factors that may affect the decision on cochlear implantation in adults. The participants rated the items in this section on a five-point rating scale, the score ranged from 1 to 5 (1 = always, 2 = often, 3 = sometimes, 4 = rarely and 5 = never). The frequency of participants' responses is shown in Table 4.7.

Table 4.7

Participants' response frequencies for the section 'Employment' (n = 16).

	Participant's response				
Items	**Never**	**Rarely**	**Sometimes**	**Often**	**Always**
Q16. Hearing usage at work	13	0	0	0	3
Q17. Difficulty with Hearing aid at work	4	3	3	5	1
Q18. CI will improve communication	1	5	3	1	6
Total	19	8	6	6	10

The response frequency analysis shows that 13 (81.25%) participants were not wearing a hearing aid or other assistive devices at work. A total of 19 responses for "Never" and 10 responses for "Always" were recorded. This indicates that the listing needs at the employment area may be a factor which influence the decision on cochlear implant.

4.2.2.6 Travel

The items in this section aimed to collect responses about the difficulty travelling to cochlear implant centers and having limited access which may affect the decision on cochlear implantation in adults. The participants rated the items in this section on a five-point rating scale, were the score ranged from 1 to 5 (1 = never, 2 = rarely, 3 = sometimes, 4 = often and 5 = always). The frequency of participants' responses is shown in Table 4.8.

Table 4.8

Participants' response frequencies for the section 'Travel' (n = 16).

	Participants' response				
Items	**Never**	**Rarely**	**Sometimes**	**Often**	**Always**
Q19. Distance	5	3	1	3	4
Q20. Limited access	4	2	0	5	5
Total	9	5	1	8	9

The response frequency analysis shows that the distance to the cochlear implant centre and limited access may or may not influence the decision on cochlear implant as the participants' response were distributed evenly. In total, there were nine responses for "Always" and nine responses for "Never" in the section indicating that travel may or may not affect the decision on cochlear implant.

CHAPTER 5

DISCUSSION

The present study aimed to find out the prevalence of probable cochlear implant candidates in adults and also to study the factors that affect the decision on cochlear implants. Firstly, a detailed database search was done for 1000 adult cases and selected probable cochlear implant candidates based on audiological profile, speech identification scores, middle ear status and hearing aid trial (if available). For the second part of the study, a questionnaire was administered to cochlear implant candidates. The findings of each part of this study are discussed under two sections: prevalence of probable cochlear implant candidates and factors affecting cochlear implantation in adults.

5.1 Prevalence of probable cochlear implant candidates

Out of the 1000 adults included in the database search, 50 cases were identified as probable cochlear implant candidates, giving us an incidence of 5%. A similar study done for adults above 20 years in the United States by Nassiri et al. (2023) reported an incidence of 244 probable cochlear implant candidates per 1,00,000 (0.244%) in 2015 and an incidence of 350 per 1,00,000 (0.35%) in 2019. Another study done for adults above 60 years in the United States by Goman et al. (2018) reported that 1.9% of the total ears were candidates for hybrid implant in the better ear, 4.9% were candidates for hybrid implant in the poor ear, and 2.5% were candidates for traditional bilateral cochlear implants.

A study done in Belgium by Raeve et al. (2016) reported a prevalence of 0.4% of potential cochlear implant candidates in the age group of 18 to 80 years. In the Netherlands, Raeve and Hardeveld (2013) reported that there were 2400 probable

cochlear implant candidates per year. However, the percentage of probable candidates reported in the present study is higher than some of these previously reported studies. The lower number reported in the earlier can be due to the fact that these studies have taken only the data of people with severe to profound hearing loss, but have not accounted for the expanding criteria for unilateral and hybrid implants. Another reason could be the huge sample size that they have taken for the study.

The probable cochlear implant candidates were classified according to the suitable implant type. If one only considers severe to profound hearing loss for cochlear implants, then a few candidates who do not benefit from a hearing aid may be missed. The recent expansions in CI criteria open opportunities for single-sided deafness, asymmetrical hearing loss, ANSD and sloping hearing loss. The participants included for unilateral implant have satisfied the required PTA and SIS scores recommended by FDA (2022). However, the FDA also recommends that the candidate have past experience with a CROS or a conventional high-power hearing aid. This could not be verified as the case files did not include details about the use of such devices. The benefits of unilateral cochlear implant are significant (Buchman et al., 2020; Cutler et al., 2022; Gaylor et al., 2013). Hence, CI should be considered a rehabilitation option for single-sided deafness or asymmetrical hearing loss. An electro-acoustic simulation implant has been proven beneficial for moderately sloping to profound hearing loss (Buchman et al., 2020; Kelsall et al., 2017). Electro-acoustic stimulation implants also preserve residual hearing, which helps in speech in noise and music perception (Schaefer et al., 2021). Hence, CI can be considered for rehabilitation in individuals with moderate sloping to profound hearing loss.

Another group for whom CI can be implanted are ANSD. The decision of CI recommendation is a little debatable as a few studies report that there is no improvement

seen or it is not optimum (Leigh et al., 2009; Roush et al., 2011; Teagle et al., 2010). A person with ANSD cannot be considered a candidate for CI if we only see that FDA (2022) guidelines. However, could be considered under “off-label indications”. For considering a candidate with ANSD for CI various authors have either not considered the hearing thresholds (Vickers et al., 2016) or have not considered PTA if the thresholds were near normal (Harrison et al., 2015). In this study, only data about PTA, SIS and hearing aid trial was available; hence, these probable candidates were grouped based on the available data. Kaga (2016) reported that CI could be considered for ANSD if there is no improvement seen with a hearing aid. Breneman et al. (2012) suggested to rule out cochlear nerve deficiency before considering a candidate for CI. The current study included all participants diagnosed with ANSD and all of them had poor SIS scores. However, further investigations may be required before considering these participants for CI.

5.2 Factors affecting cochlear implantation in adults

For this part of the study, a questionnaire was administered on 19 cochlear implant candidates. Out of whom, 16 of them were not willing for a cochlear implant. Their responses were taken in a five-point Likert rating scale. The responses of each section are discussed below.

5.2.1 Lifestyle/social barriers

The candidates for cochlear implant have communication difficulties. However, 41.25% of the participants have responded as being unlikely, which indicates that lifestyle/social barriers is not likely to affect the decision on cochlear implant. They may be candidates for a unilateral implant as they can hear through the better ear. This is consistent with other studies done on the rejection of other implantable devices. Siau

et al. (2015) reported that single sided deafness patients rejected an implantable device due to perceived limited benefits.

The status of the current job did affect the decision on cochlear implant. The cosmetic concern did affect the decision on cochlear implant. Even with the existence of off-the-ear devices, it seems that few of the participants preferred a device that may not be visible externally. This finding was also reported by Chundu and Stephens (2013). Chundu and Stephens reported that the size of the device affected their decision for cochlear implantation.

In the present study, the decision on cochlear implant was not affected by a negative story that the participants might have heard. A study done by Bierbaum et al. (2019) reported that hearing a negative story could act as a barrier for cochlear implantation. These were the audiologist views who participated in their study, but the cochlear implant candidates did not report this as a factor and instead cited that they had been concerned about the cosmetics of the device.

5.2.2 Knowledge about cochlear implants

In the present study, 62.5% of the participants demonstrated some knowledge about cochlear implant. This section is not likely to influence the decision on cochlear implants. Although many studies have reported that the lack of knowledge about cochlear implant has been reported as a major factor that affects the decision on cochlear implantation (Appelbaum et al., 2017; Bierbaum et al., 2019; Cohen et al., 2005), however, in the present study, knowledge about cochlear implants did not seem to affect the decision on cochlear implant as these participants had been counselled about cochlear implant in our centre before cochlear implant assessment and the administration of questionnaire.

5.2.3 Surgery

In this section 68.75% of the participants were not willing to go for a CI due to fear of surgery and 87.5% of the participants were not willing to go for a CI due to its high cost. This suggest that, Surgery and the cost have a huge impact on the decision for CI. Although the risk associated with cochlear implant is low and is associated with good outcomes (Aldhafeeri et al., 2019; Carlson et al., 2010; Chen et al., 2013; Jaiswal et al., 2023; Roberts et al., 2013). Many studies have identified the fear of surgery to be a barrier for cochlear implantation in adults (Bierbaum et al., 2019; B. Dillon & Pryce, 2020; Nassiri et al., 2021). This is consistent with the findings of our study.

The cost of the device seems to be a major barrier for cochlear implant, and the responses of the participants also reflect on this. The cost of a cochlear implant is more expensive than a traditional hearing aid. This discourages a person to go for a cochlear implant. In India, this could be a major factor as it is a developing country and has a lower average annual income when compared to other developed countries. Krishnamoorthy et al. (2014) highlighted this as being a major factor. Davis et al. (2023) also reported that socioeconomic status affected the decision on cochlear implantation in adults.

5.2.4 Family support

The results of our study showed poor family support for cochlear implantation. Although going for a cochlear implant will improve communication with their family members, they may not be open to cochlear implantation due to the cost of the device, risk of surgery, maintenance of the device and the amount of time spent post-implantation for auditory training.

Dillon et al. (2020) also reported that some of their participants had considered family support as being one of the reasons for not going for cochlear implantation, while many of the participants reported that their family and friends were supportive of cochlear implant and would discuss regarding the same. The authors also reported that lack of family support had negatively influenced the decision on cochlear implant for some of the participants as they relied on family members for travel from their home to cochlear implant centre.

5.2.5 Employment

A hearing device at the workplace tends to improve communication with other workers, but it can also compromise employment opportunities. The number of participants wearing a hearing aid/ assistive device was very low in our study, and this could have been a factor for poor reception for cochlear implant. This may be due to the social stigma of wearing a device at work. A few of the participants reported that they did not have difficulty hearing at work. This may be due to the inclusion of unilateral cochlear implant candidates. Employment factors did not seem to affect the decision on cochlear implant much. Dillion et al. (2020) reported that for younger participants, their decision on cochlear implantation was influenced by the risk associated and their ability to continue performing their jobs due to hearing impairment.

5.2.6 Travel

Davis et al. (2023) explored the effect of extended time to travel to a cochlear implant centre and the lower socioeconomic status of an individual affected the decision on cochlear implant. They compared the distance between their home and the cochlear implant centre and their attendance for a scheduled candidacy evaluation. They reported that regardless of the distance their decision of cochlear implantation between those

who attended or did not attend, there was no significant difference. The authors attributed the poor attendance for cochlear implant evaluation was due to poor socioeconomic status.

This is consistent with our study. Travel did not affect the decision on cochlear implantation. The study included 11 (57.9%) people from urban areas and 8 (42.1%) from rural places. However, the distance did not seem to affect the decision on cochlear implant.

CHAPTER 6

SUMMARY AND CONCLUSION

The present study aimed to analyse the prevalence of adult cochlear implant candidates reporting to AIISH and to explore the factors which affected the decision for cochlear implantation in adults, as cochlear implant have been proven to be beneficial for those acquired severe to profound hearing loss, single-sided deafness and precipitous sloping hearing loss. Analysing the decision-making process will shed light on the factors which affect cochlear implantation in adults. The study first included a detailed analysis of 1000 case files reported to AIISH between December 2022 and February 2023. Based on the inclusion and exclusion criteria, probable cochlear implant candidates were classified based on the type of implant. To study the factors affected cochlear implantation, a questionnaire was developed and administered on cochlear implant candidates. The questionnaire was translated to Kannada using the AAOS guidelines. The study was conducted on 16 participants and their responses were taken in a five-point Likert rating scale.

The data from both the study objectives were tabulated, and descriptive statistics were carried out using SPSS software (v 26 for Windows). The results are as follows:

- The prevalence of probable cochlea implant candidates was found to be 5%. A total of 77 ears were identified to be implantable. Out of which, 26 ears (33.76%) were diagnosed with severe to profound hearing loss and candidates for traditional cochlear implant, 26 ears (33.76%) were diagnosed with ANSD and candidates for traditional cochlear implant, 15 ears (19.48%) were diagnosed with single-sided deafness and candidates for unilateral cochlear implant, 8 ears (10.39%) were

diagnosed with asymmetrical hearing loss and candidates for unilateral hearing loss, 2 ears (2.6%) were diagnosed with severe sloping hearing loss and candidates for electro-acoustic stimulation implants.

- In lifestyle/social barriers, the current status of job and any negative stories which they might have heard about cochlear implantation did not affect the decision on cochlear implant. However, the cosmetic appeal could play a minor factor.
- The participants demonstrated good knowledge about cochlear implant, and it did not affect the decision on cochlear implant.
- The cost of the device, fear of surgery and lack of knowledge of cochlear implant centres were identified to be major factors affecting the decision for cochlear implant.
- There was poor family support for cochlear implant and were identified to be major factors affecting the decision for cochlear implant.
- Employment factors did not affect the decision on cochlear implant. The travel distance and access to cochlear implant centres may affect the decision on cochlear implant.

It can be inferred that from the above results, the major factors affecting the decision for cochlear implantation in adults are the cost of the device, risk of surgery, lack of knowledge about cochlear implantation centres and lack of family support. There is a huge financial burden on the cochlear implant candidates. This is a major factor that discourages a potential candidate from getting a cochlear implant.

This can be solved by the development of a cheaper cochlear implant and by the implementation of a new scheme or extension of current scheme for adults with acquired hearing loss. The lack of awareness about cochlear implant centres, risk of

surgery and the lack of family support is due to patients' lack of awareness about cochlear implant. Hence, more counselling and awareness should be created about cochlear implant and their benefits.

6.1 Clinical implications

- Awareness programs should be carried out about cochlear implantation for both the patient and family members. More professionals should be trained about cochlear implantation candidacy assessment to improve more referrals for cochlear implantation for those who do not benefit with a hearing aid.
- This study sheds light on the different factors that can lead to adults not opting for CI. The results imply that, there is a need for schemes or a development of a low-cost device in India to support adults financially who have acquired hearing loss and do not benefit from a hearing aid.

6.2 Future direction

- The study was conducted with 19 participants. Further, the study can be conducted on more participants to generalize the findings.
- Studies can be conducted to see the difference in factors across various cochlear implant candidates for traditional bilateral cochlear implant candidates, unilateral cochlear implant candidates and electro-acoustic stimulation implant candidates.
- Future studies can be done to explore other factors, such as awareness and knowledge of audiologists about cochlear implants and how they affect the decision on adult cochlear implantation.

REFERENCES

Aldhafeeri, A., Alajlan, S., Alzhrani, F., & Halawani, R. (2019). Complications of post-cochlear implantation in 1027 adults and children. *Annals of Saudi Medicine*, *39*(2), 77–81. https://doi.org/10.5144/0256-4947.2019.77

Anderson, C. A., Cushing, S. L., Papsin, B. C., & Gordon, K. A. (2022). Cortical imbalance following delayed restoration of bilateral hearing in deaf adolescents. *Human Brain Mapping*, *43*(12), 3662–3679. https://doi.org/10.1002/HBM.25875

Appelbaum, E. N., Yoo, S. S., Perera, R. A., & Coelho, D. H. (2017). Duration of Eligibility Prior to Cochlear Implantation: Have We Made Any Progress? *Otology and Neurotology*, *38*(9), 1273–1277. https://doi.org/10.1097/MAO.0000000000001544

Athalye, S., Archbold, S., Mulla, I., Lutman, M., & Nikolopoulous, T. (2015). Exploring views on current and future cochlear implant service delivery: the perspectives of users, parents and professionals at cochlear implant centres and in the community. *Cochlear implants International*, *16*(5), 241–253. https://doi.org/10.1179/1754762815Y.0000000003

Baeza, F. L. C., Caldieraro, M. A. K., Pinheiro, D. O., & Fleck, M. P. (2010). Translation and cross-cultural adaptation into Brazilian Portuguese of the Measure of Parental Style (MOPS) - a self-reported scale - according to the International Society for Pharmacoeconomics and Outcomes Research (ISPOR) recommendations. *Brazilian Journal of Psychiatry*, *32*(2), 159–163. https://doi.org/10.1590/S1516-44462010000200011

Beaton, D. E., Bombardier, C., Guillemin, F., & Ferraz, M. B. (2000). Guidelines for the process of cross-cultural adaptation of self-report measures. In *Spine* (Vol. 25, Issue 24, pp. 3186–3191). https://doi.org/10.1097/00007632-200012150-00014

Beck, C. T., Bernal, H., & Froman, R. D. (2003). Methods to document semantic equivalence of a translated scale. *Research in Nursing & Health*, *26*(1), 64–73. https://doi.org/10.1002/NUR.10066

Bierbaum, M., McMahon, C. M., Hughes, S., Boisvert, I., Lau, A. Y. S., Braithwaite, J., & Rapport, F. (2019). Barriers and Facilitators to Cochlear Implant Uptake in Australia and the United Kingdom. *Ear and Hearing*, *41*(2), 374–385. https://doi.org/10.1097/AUD.0000000000000762

Boisvert, I., Reis, M., Au, A., Cowan, R., & Dowell, R. C. (2020). Cochlear implantation outcomes in adults: A scoping review. *PLOS ONE*, *15*(5), e0232421. https://doi.org/10.1371/JOURNAL.PONE.0232421

Breneman, A. I., Gifford, R. H., & DeJong, M. D. (2012). Cochlear implantation in children with auditory neuropathy spectrum disorder: Long-term outcomes. *Journal of the American Academy of Audiology*, *23*(1), 5–17. https://doi.org/10.3766/JAAA.23.1.2/BIB

Buchman, C. A., Fucci, M. J., & Luxford, W. M. (1999). Cochlear Implants in the Geriatric Population: Benefits Outweigh Risks. *Ear, Nose & Throat Journal*, *78*(7), 489–494. https://doi.org/10.1177/014556139907800710

Buchman, C. A., Gifford, R. H., Haynes, D. S., Lenarz, T., O'Donoghue, G., Adunka, O., Biever, A., Briggs, R. J., Carlson, M. L., Dai, P., Driscoll, C. L., Francis, H. W., Gantz, B. J., Gurgel, R. K., Hansen, M. R., Holcomb, M., Karltorp, E., Kirtane, M., Larky, J., … Zwolan, T. (2020). Unilateral Cochlear Implants for Severe,

Profound, or Moderate Sloping to Profound Bilateral Sensorineural Hearing Loss: A Systematic Review and Consensus Statements. *JAMA Otolaryngology–Head & Neck Surgery*, *146*(10), 942–953. https://doi.org/10.1001/JAMAOTO.2020.0998

Buchman, C. A., Herzog, J. A., McJunkin, J. L., Wick, C. C., Durakovic, N., Firszt, J. B., Kallogjeri, D., Herzog, J. A., McJunkin, J. L., Kallogjeri, D., Drescher, A., Holden, L., Dwyer, N., Beyer, L., Rathgeb, S., Potts, L., Mispagel, K., Peters, B., Hahn, Y., … Slager, H. (2020). Assessment of Speech Understanding After Cochlear Implantation in Adult Hearing Aid Users: A Nonrandomized Controlled Trial. *JAMA Otolaryngology–Head & Neck Surgery*, *146*(10), 916–924. https://doi.org/10.1001/JAMAOTO.2020.1584

Carlson, M. L., Breen, J. T., Gifford, R. H., Driscoll, C. L. W., Neff, B. A., Beatty, C. W., Peterson, A. M., & Olund, A. P. (2010). Cochlear implantation in the octogenarian and nonagenarian. *Otology and Neurotology*, *31*(8), 1343–1349. https://doi.org/10.1097/MAO.0B013E3181EDB69D

Castiglione, A., Benatti, A., Girasoli, L., Caserta, E., Montino, S., Pagliaro, M., Bovo, R., & Martini, A. (2015). Cochlear implantation outcomes in older adults. *Hearing, Balance and Communication*, *13*(2), 86–88. https://doi.org/10.3109/13625187.2015.1030885

Chen, D. S., Clarrett, D. M., Li, L., Bowditch, S. P., Niparko, J. K., & Lin, F. R. (2013). Cochlear Implantation in Older Adults: Long-term Analysis of Complications and Device Survival in a Consecutive Series. *Otology & Neurotology : Official Publication of the American Otological Society, American Neurotology Society [and] European Academy of Otology and Neurotology*, *34*(7), 1272. https://doi.org/10.1097/MAO.0B013E3182936BB2

Chundu, S., & Buhagiar, R. (2013). Audiologists' knowledge of cochlear implants and their related referrals to the cochlear implant centre: Pilot study findings from UK. *Cochlear Implants International*, *14*(4), 213–224. https://doi.org/10.1179/1754762812Y.0000000025

Chundu, S., & Stephens, N. (2013). Patients' involvement in choosing a cochlear implant. *Cochlear Implants International*, *14*(3), 165–168. https://doi.org/10.1179/1754762812Y.0000000010

Cohen, S. M., Labadie, R. F., Dietrich, M. S., & Haynes, D. S. (2004). Quality of Life in Hearing-Impaired Adults: The Role of Cochlear Implants and Hearing Aids. *Otolaryngology–Head and Neck Surgery*, *131*(4), 413–422. https://doi.org/10.1016/J.OTOHNS.2004.03.026

Cohen, S. M., Labadie, R. F., & Haynes, D. S. (2005). Primary care approach to hearing loss: The hidden disability. *Ear, Nose and Throat Journal*, *84*(1). https://doi.org/10.1177/014556130508400111

Cosetti, M. K., Pinkston, J. B., Flores, J. M., Friedmann, D. R., Jones, C. B., Roland, J. T., & Waltzman, S. B. (2016). Neurocognitive testing and cochlear implantation: Insights into performance in older adults. *Clinical Interventions in Aging*, *11*, 603–613. https://doi.org/10.2147/CIA.S100255

Cutler, H., Gumbie, M., Olin, E., Parkinson, B., Bowman, R., Quadri, H., & Mann, T. (2022). The cost-effectiveness of unilateral cochlear implants in UK adults. *European Journal of Health Economics*, *23*(5), 763–779. https://doi.org/10.1007/S10198-021-01393-Y/FIGURES/9

Davis, A. G., Hicks, K. L., Dillon, M. T., Overton, A. B., Roth, N., Richter, M. E., & Dedmon, M. M. (2023). Hearing health care access for adult cochlear implant

candidates and recipients: Travel time and socioeconomic status. *Laryngoscope Investigative Otolaryngology*, *8*(1), 296–302. https://doi.org/10.1002/LIO2.1010

De Raeve, L. (2016). Cochlear implants in Belgium: Prevalence in paediatric and adult cochlear implantation. *European Annals of Otorhinolaryngology, Head and Neck Diseases*, *133 Suppl 1*, S57–S60. https://doi.org/10.1016/J.ANORL.2016.04.018

De Raeve, L., Archbold, S., Lehnhardt-Goriany, M., & Kemp, T. (2020). Prevalence of cochlear implants in Europe: trend between 2010 and 2016. *Cochlear Implants International*, *21*(5), 275–280. https://doi.org/10.1080/14670100.2020.1771829

Dillon, B., & Pryce, H. (2020). What makes someone choose cochlear implantation? An exploration of factors that inform patient decision making. *International Journal of Audiology*, *59*(1), 24–32. https://doi.org/10.1080/14992027.2019.1660917

Dillon, M. T., Adunka, O. F., Anderson, M. L., Adunka, M. C., King, E. R., Buchman, C. A., & Pillsbury, H. C. (2015). Influence of Age at Revision Cochlear Implantation on Speech Perception Outcomes. *JAMA Otolaryngology–Head & Neck Surgery*, *141*(3), 219–224. https://doi.org/10.1001/JAMAOTO.2014.3418

Djalilian, H. R., King, T. A., Smith, S. L., & Levine, S. C. (2002). Cochlear implantation in the elderly: Results and quality-of-life assessment. *Annals of Otology, Rhinology and Laryngology*, *111*(10), 890–895. https://doi.org/10.1177/000348940211101005

Dornhoffer, J. R., Holcomb, M. A., Meyer, T. A., Dubno, J. R., & McRackan, T. R. (2020). Factors Influencing Time to Cochlear Implantation. *Otology & Neurotology : Official Publication of the American Otological Society, American Neurotology Society [and] European Academy of Otology and Neurotology*,

41(2), 173. https://doi.org/10.1097/MAO.0000000000002449

FDA. (2022). *Establishment Registration & Device Listing*. https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfrl/rl.cfm

Firszt, J. B., Holden, L. K., Reeder, R. M., Waltzman, S. B., & Arndt, S. (2012). Auditory Abilities after Cochlear Implantation in Adults with Unilateral Deafness: A Pilot Study. *Otology & Neurotology : Official Publication of the American Otological Society, American Neurotology Society [and] European Academy of Otology and Neurotology*, *33*(8), 1339. https://doi.org/10.1097/MAO.0B013E318268D52D

Flynn, M. C., Dowell, R. C., & Clark, G. M. (1998). Aided Speech Recognition Abilities of Adults With a Severe or Severe-to-Profound Hearing Loss. *Journal of Speech, Language, and Hearing Research*, *41*(2), 285–299. https://doi.org/10.1044/JSLHR.4102.285

Friedner, M. I. (2022). From Hoping to Expecting: Cochlear Implantation and Habilitation in India. *Cultural Anthropology*, *37*(1), 125–149–125–149. https://doi.org/10.14506/CA37.1.10

Garg, S., Singh, R., Chadha, S., & Agarwal, A. (2011). Cochlear implantation in India: A public health perspective. *Indian Journal of Medical Sciences*, *65*(3), 116–120. https://doi.org/10.4103/0019-5359.104786

Gaylor, J. M., Raman, G., Chung, M., Lee, J., Rao, M., Lau, J., & Poe, D. S. (2013). Cochlear Implantation in Adults: A Systematic Review and Meta-analysis. *JAMA Otolaryngology–Head & Neck Surgery*, *139*(3), 265–272. https://doi.org/10.1001/JAMAOTO.2013.1744

Goman, A. M., Dunn, C. C., Gantz, B. J., Lin, F. R., & Author, O. N. (2018). Prevalence of potential hybrid and conventional cochlear implant candidates based on audiometric profile hhs Public Access Author manuscript. *Otol Neurotol*, *39*(4), 515–517. https://doi.org/10.1097/MAO.0000000000001728

Gstoettner, W. K., Van De Heyning, P., Fitzgerald O'Connor, A., Morera, C., Sainz, M., Vermeire, K., McDonald, S., Cavallé, L., Helbig, S., García Valdecasas, J., Anderson, I., & Adunka, O. F. (2008). Electric acoustic stimulation of the auditory system: Results of a multi-centre investigation. *Acta Oto-Laryngologica*, *128*(9), 968–975. https://doi.org/10.1080/00016480701805471

Hansen, M. R., Gantz, B. J., & Dunn, C. (2013). Outcomes following cochlear implantation for patients with single-sided deafness, including those with recalcitrant Ménière's disease. *Otology & Neurotology : Official Publication of the American Otological Society, American Neurotology Society [and] European Academy of Otology and Neurotology*, *34*(9), 1681–1687. https://doi.org/10.1097/MAO.0000000000000102

Harrison, R. V., Gordon, K. A., Papsin, B. C., Negandhi, J., & James, A. L. (2015). Auditory neuropathy spectrum disorder (ANSD) and cochlear implantation. *International Journal of Pediatric Otorhinolaryngology*, *79*(12), 1980–1987. https://doi.org/10.1016/J.IJPORL.2015.10.006

Holder, J. T., Reynolds, S. M., Sunderhaus, L. W., & Gifford, R. H. (2018). Current Profile of Adults Presenting for Preoperative Cochlear Implant Evaluation. *Trends in Hearing*, *22*. https://doi.org/10.1177/2331216518755288

Holman, M. A., Carlson, M. L., Driscoll, C. L. W., Grim, K. J., Petersson, R. S., Sladen, D. P., & Flick, R. P. (2013). Cochlear implantation in children 12 months of age

and younger. *Otology and Neurotology*, *34*(2), 251–258. https://doi.org/10.1097/MAO.0B013E31827D0922

India - Household Social Consumption: Health, NSS 75th Round Schedule-25.0 :July 2017-June 2018. (2018). *Ministry of Statistics and Programme Implementation, Government of India*. http://microdata.gov.in/nada43/index.php/catalog/152

Jaiswal, A. S., Kumar, R., Kumar, R., Kairo, A. K., Raveendran, S., & Sagar, P. (2023). Cochlear Implantation in Adults with Post-lingual Hearing Loss: Clinico-Demographical Study and Outcomes in the Current Times. *Indian Journal of Otolaryngology and Head and Neck Surgery*, *75*(1), 548–551. https://doi.org/10.1007/S12070-022-03467-6/TABLES/2

Kaga, K. (2016). Auditory nerve disease and auditory neuropathy spectrum disorders. *Auris Nasus Larynx*, *43*(1), 10–20. https://doi.org/10.1016/J.ANL.2015.06.008

Kelsall, D. C., Arnold, R. J. G., & Lionnet, L. (2017). Patient-Reported Outcomes From the United States Clinical Trial for a Hybrid Cochlear Implant. *Otology and Neurotology*, *38*(9), 1251–1261. https://doi.org/10.1097/MAO.0000000000001517

Kothari, S., Keshree, N. K., & Bhatnagar, S. (2015). Pediatric cochlear implantation—why the delay. *Indian Journal of Otolaryngology and Head and Neck Surgery*, *67*(2), 165–169. https://doi.org/10.1007/S12070-015-0838-3/METRICS

Krabbe, P. F. M., Hinderink, J. B., & Van Den Broek, P. (2000). The effect of cochlear implant use in postlingually deaf adults. *International Journal of Technology Assessment in Health Care*, *16*(03), 864–873. https://doi.org/10.1017/S0266462300102132

Krishnamoorthy, K., Samy, R. N., & Shoman, N. (2014). The challenges of starting a cochlear implant programme in a developing country. *Current Opinion in Otolaryngology and Head and Neck Surgery*, *22*(5), 367–372. https://doi.org/10.1097/MOO.0000000000000088

Kumar, R. S., & Kameswaran, M. (2018). A sustainable model for cochlear implantation in the developing world: perspectives from the Indian subcontinent. *Current Opinion in Otolaryngology and Head and Neck Surgery*, *26*(3), 196–199. https://doi.org/10.1097/MOO.0000000000000447

Lassaletta, L., Castro, A., Bastarrica, M., De Sarriá, M. J., & Gavilán, J. (2006). Quality of life in postlingually deaf patients following cochlear implantation. *European Archives of Oto-Rhino-Laryngology*, *263*(3), 267–270. https://doi.org/10.1007/S00405-005-0987-1/METRICS

Leigh, J., Dettman, S., Dowell, R., & Briggs, R. (2013). Communication development in children who receive a cochlear implant by 12 months of age. *Otology and Neurotology*, *34*(3), 443–450. https://doi.org/10.1097/MAO.0B013E3182814D2C

Leigh, J., Rance, G., Dettman, S., & Dowell, R. (2009). Cochlear Implant Outcomes for Children With Auditory Neuropathy Spectrum Disorder. *Perspectives on Hearing and Hearing Disorders in Childhood*, *19*(2), 75–84. https://doi.org/10.1044/HHDC19.2.75

Lenarz, M., Sönmez, H., Joseph, G., Büchner, A., & Lenarz, T. (2012). Cochlear implant performance in geriatric patients. *The Laryngoscope*, *122*(6), 1361–1365. https://doi.org/10.1002/LARY.23232

Migirov, L., Taitelbaum-Swead, R., Drendel, M., Hildesheimer, M., & Kronenberg, J.

(2010). Cochlear Implantation in Elderly Patients: Surgical and Audiological Outcome. *Gerontology*, *56*(2), 123–128. https://doi.org/10.1159/000235864

Mosnier, I., Bebear, J. P., Marx, M., Fraysse, B., Truy, E., Lina-Granade, G., Mondain, M., Sterkers-Artières, F., Bordure, P., Robier, A., Godey, B., Meyer, B., Frachet, B., Poncet-Wallet, C., Bouccara, D., & Sterkers, O. (2015). Improvement of Cognitive Function After Cochlear Implantation in Elderly Patients. *JAMA Otolaryngology–Head & Neck Surgery*, *141*(5), 442–450. https://doi.org/10.1001/JAMAOTO.2015.129

Nassiri, A. M., Marinelli, J. P., Lohse, C. M., & Carlson, M. L. (2023). Incidence of Cochlear Implantation Among Adult Candidates in the United States. *Otology & Neurotology*, *44*(6), 549–554. https://doi.org/10.1097/MAO.0000000000003894

Nassiri, A. M., Marinelli, J. P., Sorkin, D. L., & Carlson, M. L. (2021). Barriers to Adult Cochlear Implant Care in the United States: An Analysis of Health Care Delivery. *Seminars in Hearing*, *42*(4), 311–320. https://doi.org/10.1055/S-0041-1739281/ID/JR00899-27/BIB

Nassiri, A. M., Sorkin, D. L., & Carlson, M. L. (2022). Current Estimates of Cochlear Implant Utilization in the United States. *Otology & Neurotology : Official Publication of the American Otological Society, American Neurotology Society [and] European Academy of Otology and Neurotology*, *43*(5), e558–e562. https://doi.org/10.1097/MAO.0000000000003513

NICE. (2009). *Cochlear implants for children and adults with severe to profound deafness*. London:NICE. https://www.nice.org.uk/guidance/ta166

Park, L. R., Gagnon, E. B., & Brown, K. D. (2021). The Limitations of FDA Criteria: Inconsistencies with Clinical Practice, Findings, and Adult Criteria as a Barrier to

Pediatric Implantation. *Seminars in Hearing*, *42*(4), 373–380. https://doi.org/10.1055/S-0041-1739370/ID/JR00905-31/BIB

Polit, D. F., Beck, C. T., & Owen, S. V. (2007). Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. *Research in Nursing & Health*, *30*(4), 459–467. https://doi.org/10.1002/NUR.20199

Polit, D., health, C. B.-R. in nursing &, & 2006, undefined. (2006). The content validity index: are you sure you know what's being reported? Critique and recommendations. *Wiley Online Libraryy*, *29*(5), 489–497. https://doi.org/10.1002/nur.20147

Raeve, L. De, & Hardeveld, R. van. (2013). Prevalence of cochlear implants in Europe:What do we know and what can we expect? *Journal of Hearing Science*, *3*(4), 9–16. https://doi.org/10.17430/889707

Roberts, D. S., Lin, H. W., Herrmann, B. S., & Lee, D. J. (2013). Differential cochlear implant outcomes in older adults. *The Laryngoscope*, *123*(8), 1952–1956. https://doi.org/10.1002/LARY.23676

Roush, P., Frymark, T., Venediktov, R., & Wang, B. (2011). Audiologic Management of Auditory Neuropathy Spectrum Disorder in Children: A Systematic Review of the Literature. *American Journal of Audiology*, *20*(2), 159–170. https://doi.org/10.1044/1059-0889(2011/10-0032)

Sahana, T, S., & Rajalakshmi, K. (2021). Analysis of causes of hearing loss in adults-a register based study. *Student Research at AIISH, Mysore (Articles Based on Dissertations Done at AIISH)*

Saiful, M., & Yusoff, B. (2019). ABC of Content Validation and Content Validity Index Calculation. *Education in Medicine Journal*, *11*(2), 49–54. https://doi.org/10.21315/eimj2019.11.2.6

Schaefer, S., Sahwan, M., Metryka, A., Kluk, K., & Bruce, I. A. (2021). The benefits of preserving residual hearing following cochlear implantation: a systematic review. *International Journal of Audiology*, *60*(8), 561–577. https://doi.org/10.1080/14992027.2020.1863484

Schwab, B., Gandolfi, M., Lai, E., Reilly, E., Singer, L., Kim, A. H., Schwab, B., Gandolfi, M., Lai, E., Reilly, E., Singer, L., & Kim, A. H. (2015). The Impact of Age on Cochlear Implant Performance. *International Journal of Otolaryngology and Head & Neck Surgery*, *04*(05), 329–337. https://doi.org/10.4236/IJOHNS.2015.45056

Shabashev, S., Fouad, Y., Huncke, T. K., & Roland, J. T. (2017). Cochlear implantation under conscious sedation with local anesthesia; Safety, Efficacy, Costs, and Satisfaction. *Cochlear Implants International*, *18*(6), 297–303. https://doi.org/10.1080/14670100.2017.1376423

Siau, D., Dhillon, B., Andrews, R., & Green, K. M. J. (2015). Bone-anchored hearing aids and unilateral sensorineural hearing loss: Why do patients reject them? *Journal of Laryngology and Otology*, *129*(4), 321–325. https://doi.org/10.1017/S0022215115000602

Skarzynski, H., Lorens, A., Piotrowska, A., & Anderson, I. (2006). Partial deafness cochlear implantation provides benefit to a new population of individuals with hearing loss. *Acta Oto-Laryngologica*, *126*(9), 934–940. https://doi.org/10.1080/00016480600606632

Sladen, D. P., Peterson, A., Schmitt, M., Olund, A., Teece, K., Dowling, B., DeJong, M., Breneman, A., Beatty, C. W., Carlson, M. L., Neff, B. A., Hughes-Borst, B., & Driscoll, C. L. (2017). Health-related quality of life outcomes following adult cochlear implantation: A prospective cohort study. *Cochlear Implants International*, *18*(3), 130–135. https://doi.org/10.1080/14670100.2017.1293203

Sorkin, D. L., & Buchman, C. A. (2016). Cochlear implant access in six developed countries. *Otology and Neurotology*, *37*(2), e161–e164. https://doi.org/10.1097/MAO.0000000000000946

Spitzer, E. R., Landsberger, D. M., & Friedmann, D. R. (2021). Assessing the Quality of Low-Frequency Acoustic Hearing: Implications for Combined Electroacoustic Stimulation With Cochlear Implants. *Ear and Hearing*, *42*(2), 475–486. https://doi.org/10.1097/AUD.0000000000000949

Straatman, L. V., Huinck, W. J., Langereis, M. C., Snik, A. F. M., & Mulder, J. J. (2014). Cochlear implantation in late-implanted prelingually deafened adults: Changes in quality of life. *Otology and Neurotology*, *35*(2), 253–259. https://doi.org/10.1097/MAO.0B013E3182A4758E

Teagle, H. F. B., Roush, P. A., Woodard, J. S., Hatch, D. R., Zdanski, C. J., Buss, E., & Buchman, C. A. (2010). Cochlear implantation in children with auditory neuropathy spectrum disorder. *Ear and Hearing*, *31*(3), 325–335. https://doi.org/10.1097/AUD.0B013E3181CE693B

Verma, R. R., Konkimalla, A., Thakar, A., Sikka, K., Singh, A. C., Khanna, T., Verma, R. R., Konkimalla, A., Thakar, A., Sikka, K., Singh, A. C., & Khanna, T. (2022). Prevalence of hearing loss in India. *The National Medical Journal of India*, *34*(4), 216–222. https://doi.org/10.25259/NMJI_66_21

Vickers, D., De Raeve, L., & Graham, J. (2016). International survey of cochlear implant candidacy. *Cochlear Implants International*, *17*, 36–41. https://doi.org/10.1080/14670100.2016.1155809

Vieira, S. de S., Bevilacqua, M. C., Ferreira, N. M. L. A., & Dupas, G. (2014). Cochlear Implant: the complexity involved in the decision making process by the family. *Revista Latino-Americana de Enfermagem*, *22*(3), 415–424. https://doi.org/10.1590/0104-1169.3044.2432

Wick, C. C., Kallogjeri, D., McJunkin, J. L., Durakovic, N., Holden, L. K., Herzog, J. A., Firszt, J. B., Buchman, C. A., Buchman, C. A., McJunkin, J. L., Drescher, A., Holden, L. K., Dwyer, N., Beyer, L., Rathgeb, S., Potts, L., Mispagel, K., Peters, B., Hahn, Y., … Slager, H. (2020). Hearing and Quality-of-Life Outcomes After Cochlear Implantation in Adult Hearing Aid Users 65 Years or Older: A Secondary Analysis of a Nonrandomized Clinical Trial. *JAMA Otolaryngology–Head & Neck Surgery*, *146*(10), 925–932. https://doi.org/10.1001/JAMAOTO.2020.1585

Wong, D. J. Y., Moran, M., & O'Leary, S. J. (2016). Outcomes after cochlear implantation in the very elderly. *Otology and Neurotology*, *37*(1), 46–51. https://doi.org/10.1097/MAO.0000000000000920

World Health Organization, R. O. for S.-E. A. (2018). *State of hearing and ear care*. Geneva:WHO Regional Office for South-East Asia. http://apps.who.int/iris/bitstream/handle/10665/205911/B1466.pdf?

Yang, Z., & Cosetti, M. (2016). Safety and outcomes of cochlear implantation in the elderly: A review of recent literature. *Journal of Otology*, *11*(1), 1–6. https://doi.org/10.1016/J.JOTO.2016.03.004

Zwolan, T. A., & Basura, G. (2021). Determining Cochlear Implant Candidacy in Adults: Limitations, Expansions, and Opportunities for Improvement. *Seminars in Hearing*, *42*(4), 331–341. https://doi.org/10.1055/S-0041-1739283/ID/JR00901-27/BIB

APPENDIX I

Questionnaire

Section 1- Demographic Details

Name:

Age:

DOB:

Gender:

Address:

Contact details:

Slab:

Urban/ Rural:

Education

Occupation:

Family (Nuclear/ Joint):

Current status of rehabilitation (Hearing aid/ sign language):

Language:

When do you think Hearing loss occurred? (Age)		
When was the hearing loss diagnosed? (Age)		
Do you use a hearing aid?	Yes	No
If yes to the above question, for how many years? (Duration)		
Is your hearing loss increasing day by day?	Yes	No
Do you have difficulty understanding with your current device?	Yes	No
Are you counselled about CI?	Yes	No
When were you counselled for a CI? (Date)		
Are you been tested for CI candidacy before?	Yes	No
Are you willing to go for a CI?	Yes	No

Section 2

Lifestyle/ Social Barriers

1. Does communication with others become difficult due to hearing impairment?

Very unlikely	Unlikely	Neutral	Likely	Very Likely
1	2	3	4	5

2. Do you find it challenging to converse with your family and friends without a hearing device?

Very unlikely	Unlikely	Neutral	Likely	Very Likely
1	2	3	4	5

3. Are you not willing to go for a cochlear implant due to your current job or other activities?

Very unlikely	Unlikely	Neutral	Likely	Very Likely
1	2	3	4	5

4. You do not want a cochlear implant due to its bigger size or due to its appearance?

Very unlikely	Unlikely	Neutral	Likely	Very Likely
1	2	3	4	5

5. Are you not willing to go for a cochlear implant because you have heard a negative story about cochlear implants?

Very unlikely	Unlikely	Neutral	Likely	Very Likely
1	2	3	4	5

Knowledge of cochlear implants

6. Do you feel a cochlear implant is only for children, are you aware that even adults can use cochlear implants?

Very much unaware	Unaware	Neither aware or unaware	aware	Very much Aware
5	4	3	2	1

7. Do you know how a cochlear implant works?

Very much unaware	Unaware	Neither aware or unaware	aware	Very much Aware
5	4	3	2	1

8. Do you know whom to approach for a cochlear implant assessment and surgery?

Very much unaware	Unaware	Neither aware or unaware	aware	Very much Aware
5	4	3	2	1

Surgery

9. Do you know about the surgery involved in Cochlear Implants?

Yes	No

If yes, does it affect your decision on the cochlear implant?

Very unlikely	Unlikely	Neutral	Likely	Very Likely
1	2	3	4	5

10. Are you aware of the risk involved in surgery?

Yes	No

If yes, does it affect your decision on cochlear implants?

Very unlikely	Unlikely	Neutral	Likely	Very Likely
1	2	3	4	5

11. Are you aware of centres for cochlear implants?

Yes	No

If no, do you feel that the lack of awareness of a centre affects your decision on cochlear implant?

Very unlikely	Unlikely	Neutral	Likely	Very Likely
1	2	3	4	5

12. Are you not willing to go for a Cochlear implant due to surgery?

Very unlikely	Unlikely	Neutral	Likely	Very Likely
1	2	3	4	5

13. Are you concerned about the cost of the device and the surgery?

Yes	No

Does the cost affect your decision on CI?

Very unlikely	Unlikely	Neutral	Likely	Very Likely
1	2	3	4	5

Family support

14. Do your family members agree to go for a Cochlear implant?

Never	Rarely	Sometimes	Often	Always
5	4	3	2	1

15. Would your family members support the decision on CI?

Never	Rarely	Sometimes	Often	Always
5	4	3	2	1

Employment

16. Do you wear a hearing aid at work?

Never	Rarely	Sometimes	Often	Always
5	4	3	2	1

17. Do you have difficulty hearing your co-workers at work?

Never	Rarely	Sometimes	Often	Always
5	4	3	2	1

18. Do you feel going for a CI can improve your communication at work?

Never	Rarely	Sometimes	Often	Always
5	4	3	2	1

Travel

19. Is the distance between your home and the CI centre a reason for not going for a CI?

Never	Rarely	Sometimes	Often	Always
1	2	3	4	5

20. Do you have limited access to cochlear implant services near your home?

Never	Rarely	Sometimes	Often	Always
1	2	3	4	5

21. Do you feel you have any other problems besides the previously asked questions that affect your decision on CI?

_____

_____

APPENDIX II

ಪ್ರಶ್ನಾವಳಿ

ವಿಭಾಗ 1- ಜನಸಂಖ್ಯಾ ವಿವರಗಳು

ಹೆಸರು:

ವಯಸ್ಸು:

DOB (ಹುಟ್ಟಿದ ದಿನ):

ಲಿಂಗ:

ವಿಳಾಸ:

ದೂರವಾಣಿ ಸಂಖ್ಯೆ:

ಆದಾಯ:

ನಗರ / ಗ್ರಾಮೀಣ:

ಶಿಕ್ಷಣ:

ಉದ್ಯೋಗ:

ಕುಟುಂಬ (ವಿಭಕ್ತ ಕುಟುಂಬ/ ಅವಿಭಕ್ತ ಕುಟುಂಬ):

ಪ್ರಸ್ತುತ ಚಿಕಿತ್ಸೆಯ ವಿಧ (ಶ್ರವಣ ಸಾಧನ/ ಸಂಕೇತ ಭಾಷೆ):

ನಿಮಗೇ ಶ್ರವಣ ದೋಷ ಯಾವಾಗ ಸಂಭವಿಸಿತು/ ಉಂಟಾಯ್ತು ಎಂದು ಯೋಚಿಸುತ್ತೀರಿ/ ಭಾವಿಸುತ್ತೀರಿ? (ವಯಸ್ಸು)		
ನಿಮ್ಮ ಶ್ರವಣದೋಷವನ್ನು ಯಾವಾಗ ಕಂಡುಹಿಡಿಯಲಾಯಿತು? (ವಯಸ್ಸು)		
ನೀವು ಶ್ರವಣ ಸಾಧನವನ್ನು ಬಳಸುತ್ತೀರಾ?	ಹೌದು	ಇಲ್ಲ
ಮೇಲಿನ ಪ್ರಶ್ನೆಗೆ ಹೌದಾದರೆ, ಎಷ್ಟು ವರ್ಷಗಳವರೆಗೆ ನೀವು ಶ್ರವಣ ಸಾಧನವನ್ನು ಬಳಸಿದಿರಿ?		
ನಿಮ್ಮ ಶ್ರವಣ ದೋಷ ದಿನದಿಂದ ದಿನಕ್ಕೆ ಹೆಚ್ಚುತ್ತಿದೆಯೇ?	ಹೌದು	ಇಲ್ಲ

ನಿಮ್ಮ ಪ್ರಸ್ತುತ ಶ್ರವಣ ಸಾಧನದಿಂದ ಅರ್ಥಮಾಡಿಕೊಳ್ಳಲು ನಿಮಗೆ ತೊಂದರೆ ಇದೆಯೇ?	ಹೌದು	ಇಲ್ಲ
ನಿಮಗೆ ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್ ಬಗ್ಗೆ ಸಲಹೆ ನೀಡಿದ್ದಾರ?	ಹೌದು	ಇಲ್ಲ
ನಿಮಗೆ ಯಾವಾಗ ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್ ಗೆ ಸಲಹೆ ನೀಡಿದ್ದರು? (ದಿನಾಂಕ)		
ಇಮೊದಲು ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್ ಅಭ್ಯರ್ಥಿ ತನಕ್ಕೆ ಪರೀಕ್ಷೆ ಮಾಡಿಸಿದ್ದೀರಾ ?	ಹೌದು	ಇಲ್ಲ
ನೀವು ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್ ಮಾಡಿಸಲು ಸಿದ್ಧರಿದ್ದೀರಾ?	ಹೌದು	ಇಲ್ಲ

Section 2 / ವಿಭಾಗ 2

ಜೀವನಶೈಲಿ/ಸಾಮಾಜಿಕ ಅಡೆತಡೆಗಳು

1.ನಿಮ್ಮ ಶ್ರವಣ ದೋಷದಿಂದಾಗಿ ಇತರರೊಂದಿಗೆ ಸಂವಹನ ಕಷ್ಟವಾಗಿದೆಯೇ ?

ತೀರಾ ಸಾಧ್ಯವಿಲ್ಲ	ಸಾಧ್ಯವಿಲ್ಲ	ಸಾಧಾರಣ	ಸಾಧ್ಯ	ಬಹಳ ಸಾಧ್ಯ

2.ಶ್ರವಣ ಸಾಧನವಿಲ್ಲದೆ ನಿಮ್ಮ ಕುಟುಂಬ ಮತ್ತು ಸ್ನೇಹಿತರೊಂದಿಗೆ ಸಂಭಾಷಣೆ ಮಾಡುವುದು ನಿಮಗೆ ಕಷ್ಟವಾಗುತ್ತಿದೆಯೇ ?

ತೀರಾ ಸಾಧ್ಯವಿಲ್ಲ	ಸಾಧ್ಯವಿಲ್ಲ	ಸಾಧಾರಣ	ಸಾಧ್ಯ	ಬಹಳ ಸಾಧ್ಯ

3.ನಿಮ್ಮ ಪ್ರಸ್ತುತ ಕೆಲಸ ಅಥವಾ ಇತರ ಚಟುವಟಿಕೆಗಳಿಂದಾಗಿ ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್ ಮಾಡಿಸಲು ನೀವು ಸಿದ್ಧರಿಲ್ಲವೇ?

ತೀರಾ ಸಾಧ್ಯವಿಲ್ಲ	ಸಾಧ್ಯವಿಲ್ಲ	ಸಾಧಾರಣ	ಸಾಧ್ಯ	ಬಹಳ ಸಾಧ್ಯ

4.ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್ನ ದೊಡ್ಡ ಗಾತ್ರ ಅಥವಾ ಅದರ ನೋಟದ ಕಾರಣದಿಂದಾಗಿ ನೀವು ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್ಗೆ ಒಳಗಾಗಲು ಬಯಸುವುದಿಲ್ಲವೇ?

ತೀರಾ ಸಾಧ್ಯವಿಲ್ಲ	ಸಾಧ್ಯವಿಲ್ಲ	ಸಾಧಾರಣ	ಸಾಧ್ಯ	ಬಹಳ ಸಾಧ್ಯ

5.ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್ನ ಬಗ್ಗೆ ಒಳ್ಳೆ ಅಭಿಪ್ರಾಯ ಕೇಳದ ಕರಣ ನೀವು ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್ ಮಾಡಿಸಿಕೊಳ್ಳಲು ಸಿದ್ಧರಿಲ್ಲವೇ?

ತೀರಾ ಸಾಧ್ಯವಿಲ್ಲ	ಸಾಧ್ಯವಿಲ್ಲ	ಸಾಧಾರಣ	ಸಾಧ್ಯ	ಬಹಳ ಸಾಧ್ಯ

ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್ ಜ್ಞಾನ

6.ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್ ಮಕ್ಕಳಿಗೆ ಮಾತ್ರ ಎಂದು ನೀವು ಭಾವಿಸುತ್ತೀರಾ, ಅಥವಾ ವಯಸ್ಕರು ಸಹ ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್ ಅನ್ನು ಬಳಸಬಹುದು ಎಂದು ನಿಮಗೆ ತಿಳಿದಿದೆಯೇ?

ಸಂಪೂರ್ಣವಾಗಿ ತಿಳಿದಿಲ್ಲ	ಅರಿವಿಲ್ಲ	ಸಾಧಾರಣ	ಅರಿವಿದೆ	ಸಂಪೂರ್ಣ ಅರಿವಿದೆ

7.ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್ ಹೇಗೆ ಕೆಲಸ ಮಾಡುತ್ತದೆ ಎಂದು ನಿಮಗೆ ತಿಳಿದಿದೆಯೇ?

ಸಂಪೂರ್ಣವಾಗಿ ತಿಳಿದಿಲ್ಲ	ಅರಿವಿಲ್ಲ	ಸಾಧಾರಣ	ಅರಿವಿದೆ	ಸಂಪೂರ್ಣ ಅರಿವಿದೆ

8.ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್ ಮೌಲ್ಯಮಾಪನ ಮತ್ತು ಶಸ್ತ್ರಚಿಕಿತ್ಸೆಗೆ ಯಾರನ್ನು ಸಂಪರ್ಕಿಸಬೇಕು ಎಂದು ನಿಮಗೆ ತಿಳಿದಿದೆಯೇ?

ಸಂಪೂರ್ಣವಾಗಿ ತಿಳಿದಿಲ್ಲ	ಅರಿವಿಲ್ಲ	ಸಾಧಾರಣ	ಅರಿವಿದೆ	ಸಂಪೂರ್ಣ ಅರಿವಿದೆ

ಶಸ್ತ್ರ ಚಿಕಿತ್ಸೆ

9.ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್‌ನಲ್ಲಿ ಒಳಗೊಂಡಿರುವ ಶಸ್ತ್ರಚಿಕಿತ್ಸೆಯ ಬಗ್ಗೆ ನಿಮಗೆ ತಿಳಿದಿದೆಯೇ?

ಹೌದು	ಇಲ್ಲ

ಹೌದು ಎಂದಾದರೆ, ಇದು ನಿಮ್ಮ ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್ ನಿರ್ಧಾರದ ಮೇಲೆ ಪರಿಣಾಮ ಬೀರುತ್ತದೆಯೇ?

ತೀರಾ ಸಾಧ್ಯವಿಲ್ಲ	ಸಾಧ್ಯವಿಲ್ಲ	ಸಾಧಾರಣ	ಸಾಧ್ಯ	ಬಹಳ ಸಾಧ್ಯ

10.ಶಸ್ತ್ರಚಿಕಿತ್ಸೆಯಲ್ಲಿನ ಅಪಾಯದ ಬಗ್ಗೆ ನಿಮಗೆ ತಿಳಿದಿದೆಯೇ?

ಹೌದು	ಇಲ್ಲ

ಹೌದು ಎಂದಾದರೆ, ಇದು ನಿಮ್ಮ ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್ ನಿರ್ಧಾರದ ಮೇಲೆ ಪರಿಣಾಮ ಬೀರುತ್ತದೆಯೇ?

ತೀರಾ ಸಾಧ್ಯವಿಲ್ಲ	ಸಾಧ್ಯವಿಲ್ಲ	ಸಾಧಾರಣ	ಸಾಧ್ಯ	ಬಹಳ ಸಾಧ್ಯ

11.ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್ ಕೇಂದ್ರಗಳ ಬಗ್ಗೆ ನಿಮಗೆ ತಿಳಿದಿದೆಯೇ?

ಹೌದು	ಇಲ್ಲ

ಇಲ್ಲದಿದ್ದರೆ, ಕೇಂದ್ರದ ಅರಿವಿನ ಕೊರತೆಯು ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್‌ನ ನಿಮ್ಮ ನಿರ್ಧಾರದ ಮೇಲೆ ಪರಿಣಾಮ ಬೀರುತ್ತದೆ ಎಂದು ನೀವು ಭಾವಿಸುತ್ತೀರಾ?

ತೀರಾ ಸಾಧ್ಯವಿಲ್ಲ	ಸಾಧ್ಯವಿಲ್ಲ	ಸಾಧಾರಣ	ಸಾಧ್ಯ	ಬಹಳ ಸಾಧ್ಯ

12.ಶಸ್ತ್ರಚಿಕಿತ್ಸೆಯ ಕಾರಣದಿಂದಾಗಿ ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್‌ಗೆ ಹೋಗಲು ನೀವು ಸಿದ್ಧರಿಲ್ಲವೇ?

ತೀರಾ ಸಾಧ್ಯವಿಲ್ಲ	ಸಾಧ್ಯವಿಲ್ಲ	ಸಾಧಾರಣ	ಸಾಧ್ಯ	ಬಹಳ ಸಾಧ್ಯ

13.ಸಾಧನ ಮತ್ತು ಶಸ್ತ್ರಚಿಕಿತ್ಸೆಯ ಖರ್ಚು-ವೆಚ್ಚದ ಬಗ್ಗೆ ನಿಮಗೆ ಕಾಳಜಿ ಇದೆಯೇ?

ಹೌದು	ಇಲ್ಲ

ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್ ಬಗ್ಗೆ ನಿಮ್ಮ ನಿರ್ಧಾರವು ಅದರಲ್ಲಿ ಒಳಗೊಂಡಿರುವ ಖರ್ಚು-ವೆಚ್ಚವನ್ನು ಅವಲಂಬಿಸಿರುತ್ತದೆಯೇ?

ತೀರಾ ಸಾಧ್ಯವಿಲ್ಲ	ಸಾಧ್ಯವಿಲ್ಲ	ಸಾಧಾರಣ	ಸಾಧ್ಯ	ಬಹಳ ಸಾಧ್ಯ

ಕುಟುಂಬದ ಬೆಂಬಲ

14.ನೀವು ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್‌ಗೆ ಹೋಗಲು ನಿಮ್ಮ ಕುಟುಂಬ ಸದಸ್ಯರು ಒಪ್ಪುತ್ತಾರೆಯೇ?

ಯಾವಾಗಲು ಇಲ್ಲ	ಅಪರೂಪವಾಗಿ	ಕೆಲವೊಮ್ಮೆ	ಅಗ್ಗಾಗ	ಯಾವಾಗಲೂ

15.ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್ ಕುರಿತು ನಿಮ್ಮ ನಿರ್ಧಾರವನ್ನು ನಿಮ್ಮ ಕುಟುಂಬ ಸದಸ್ಯರು ಬೆಂಬಲಿಸುತ್ತಾರೆಯೇ?

ಯಾವಾಗಲು ಇಲ್ಲ	ಅಪರೂಪವಾಗಿ	ಕೆಲವೊಮ್ಮೆ	ಅಗ್ಗಾಗ	ಯಾವಾಗಲೂ

ಉದ್ಯೋಗ

16.ನೀವು ಕೆಲಸ ಅಥವಾ ಉದ್ಯೋಗದಲ್ಲಿ ಶ್ರವಣ ಸಾಧನವನ್ನು ಧರಿಸುತ್ತೀರಾ?

ಯಾವಾಗಲು ಇಲ್ಲ	ಅಪರೂಪವಾಗಿ	ಕೆಲವೊಮ್ಮೆ	ಅಗ್ಗಾಗ	ಯಾವಾಗಲೂ

17.ಕೆಲಸದಲ್ಲಿ ನಿಮ್ಮ ಸಹೋದ್ಯೋಗಿಗಳನ್ನು ಕೇಳಲು ನಿಮಗೆ ತೊಂದರೆ ಇದೆಯೇ ?

ಯಾವಾಗಲು ಇಲ್ಲ	ಅಪರೂಪವಾಗಿ	ಕೆಲವೊಮ್ಮೆ	ಅಗ್ಗಾಗ	ಯಾವಾಗಲೂ

18.ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್ ಮಾಡಿಸುವುದರಿಂದ, ಕೆಲಸದಲ್ಲಿ ನಿಮ್ಮ ಸಂವಹನವು ಉತ್ತಮವಾಗಬಹುದು ಎಂದು ನೀವು ಭಾವಿಸುತ್ತೀರಾ?

ಯಾವಾಗಲು ಇಲ್ಲ	ಅಪರೂಪವಾಗಿ	ಕೆಲವೊಮ್ಮೆ	ಅಗ್ಗಾಗ	ಯಾವಾಗಲೂ

ಪ್ರಯಾಣ

19.ನಿಮ್ಮ ಮನೆ ಮತ್ತು ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್ ಕೇಂದ್ರದ ನಡುವಿನ ಅಂತರವು ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್ ಗೆ ಹೋಗದಿರಲು ಕಾರಣವೇ ?

ಯಾವಾಗಲು ಇಲ್ಲ	ಅಪರೂಪವಾಗಿ	ಕೆಲವೊಮ್ಮೆ	ಅಗ್ಗಾಗ	ಯಾವಾಗಲೂ

20.ನಿಮ್ಮ ಪ್ರದೇಶದಲ್ಲಿ ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್ ಸೇವೆಗಳು ಲಭ್ಯತೆಯನ್ನು ನಿರ್ಬಂಧಿಸಿವೆಯೇ?

ಯಾವಾಗಲು ಇಲ್ಲ	ಅಪರೂಪವಾಗಿ	ಕೆಲವೊಮ್ಮೆ	ಅಗ್ಗಾಗ	ಯಾವಾಗಲೂ

21.ನಿಮ್ಮ ಕಾಕ್ಲಿಯರ್ ಇಂಪ್ಲಾಂಟ್ ಆಯ್ಕೆಯ ಮೇಲೆ ಪ್ರಭಾವ ಬೀರುವ ಹಿಂದಿನ ಪ್ರಶ್ನೆಗಳ ಜೊತೆಗೆ ನೀವು ಇತರ ಸಮಸ್ಯೆಗಳನ್ನು ಹೊಂದಿದ್ದೀರಿ ಎಂದು ನೀವು ಭಾವಿಸುತ್ತೀರಾ? ಹೌದಾದರೆ ವಿವರಿಸಿ ?

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