Reasons for use and non-use of hearing aids

Anoopa

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ALL INDIA INSTITUTE OF SPEECH AND HEARING

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MAY 2017

CERTIFICATE

This is to certify that the dissertation entitled '**Reasons for use and non-use of hearing aids**' is the bonafide work submitted in part fulfillment for the degree of Masterof Science (Audiology) of the student (Registration No. 15AUD002). 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.

Dr. S. R. Savithri

Director

Mysuru,

May, 2017.

AllIndiaInstituteof Speech and Hearing,

Manasagangothri, Mysuru- 570 006

CERTIFICATE

This is to certify that the dissertation entitled '**Reasons for use and non-use of hearing aids'** has been prepared under my supervision and guidance. It is also certified that this has not been submitted earlier in any other University for the award of any Diploma or Degree.

Dr. Manjula P

Professor

Department ofAudiology

AllIndiaInstituteof Speech and Hearing,

Manasagangothri, Mysur

Mysuru

May, 2017.

DECLARATION

Thisistocertify thatthisdissertationentitled '**Reasons for use and non-use of hearing aids'** isthe result of my own study under the guidance of Dr. Manjula P., Professor in Audiology Department of Audiology, All India Institute of Speech and Hearing, Mysuru, and hasnotsubmittedearlierinany otherUniversityfor the award of anyDiplomaor Degree.

Mysuru **RegisterNo.: 15AUD002**

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And He promises

"Never will I leave you or Forsake you"

(Hebrews 13:5)

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Abstract

Hearing impairment can have an adverse effect on communication, social and emotional life of a person. Majority of these issues can be resolved once the hearing impairment is treated effectively. However, it has been found that 10% to 29% of hearing aid owners never use their aids (Lupassako, Kautiainen, & Sulkava, 2005). Therefore, a probe in to the benefits from hearing aid and reasons behind non-use of hearing aids were investigated in the present study. To realize these objectives, the benefit was measured by subjective benefit measure using two questionnaires (viz., PEACH for children and SAHH for adults and older adults), and the reasons for non-use of hearing aids were probed using a questionnaire developed for the purpose, which was common to all the three age groups.

In children benefit is reported in domains such as awareness, speech in quiet and noise, speech initiation. In adults, the hearing aid was beneficial in recognition of voice, speech recognition in quiet and noise, and psychological aspects. In older adults, the benefit included voice recognition, speech recognition in quiet and noise.

Major reasons for non-use of hearing aids that were common to children, adults and older adults included lack of benefit, appearance and fit, and sound quality. These reasons can be resolved by insisting on frequent follow-up and counseling.

Key words: benefit, non-use, questionnaire.

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Chapter 1

Introduction

Hearing impairment can have an adverse effect on communication, social and emotional life of a person. This holds good for individuals with congenital and acquired hearing loss. In children, it can lead to a delay in the development of receptive and expressive communication skills. This will be followed by an overall deficit in language which further causes reduced academic achievement. Hearing impairment can lead to emotional instability leading to strained relationships, social withdrawal, and lack of self confidence, aggression and isolation (Steele, 2015; Carmen & Uram, 2002). In adults, major impact of untreated hearing loss is reduced job performance and earning capabilities.

Hearing impairment is the most common sensory deficit that affects about 250 million people in the world (Mathers, Smith, & Concha, 2000). Garg, Chadha, Malhotra, and Agarwal (2009) have reported that about 63 million of the Indian population is affected by hearing impairment. In the 58^{th} round of the National Sample Survey (2002), it was reported that hearing disability was the second most common cause of disability and the top most cause of sensory deficit.

In a nationwide survey in America on the impact of untreated hearing impairment, it was found that adults with hearing loss who were not using hearing aids, and their significant others, showed higher rates of depression, anxiety, and other psychosocial disorders (Kochkin & Rogin, 2000). In a study done on older adults by Lin, Metter, O'Brien, Resnick, Zonderman, and Ferrucci (2011), a positive correlation between untreated hearing loss and the risk for dementia was established.

Majority of these issues can be resolved once the hearing impairment is treated effectively. Children whose hearing impairment is identified and intervened early can develop speech and language skills on par with their normal hearing peers (Yoshinaga-Itano, Sedey, & Mehl, 1998). This will in turn increase the child's self-esteem, social interaction with peers, and academic success. Adults who use hearing aids were found to have better communication skills, more self confident, and socially functioning than those without hearing aids. Those adults who were using the hearing aids were able to reverse the social, emotional and communication dysfunctions and improve their personal relationships (Shield, 2006). A recent study showed that the use of hearing aids reduces the risk of cognitive decline in the older adults (Ameiva, Ouvrard, Giulioli, Meillon, Rullier, & Dartigues, 2015).

Thus, effective management of permanent hearing loss through hearing aid has the potential to improve both psychosocial health and quality of life. But it has been found that 10% to 29% of hearing-aid owners never use their aids (Lupassako, Kautiainen, & Sulkava, 2005; Vuoralho, Karinen, & Sorri, 2006). Therefore one of the main goals of hearing health care is to increase hearing aid uptake and use, as it is well known that disabilities that hinder communication affect the quality of life of an individual.

1.1 Need for the study

An important factor for the success in the implementation of any screening for a health condition is that an effective treatment is available, accessible, and complied with. The primary management measure for permanent hearing loss is the use of appropriate hearing aids. Various studies show that out of a large population of individuals who can get benefit from hearing aids, only a few use them on a regular basis (Sorri, Luotonen, & Laitakari, 1984). Only about 25% of those who could benefit from hearing aids actually use them (Kochkin, 2000; Meister, Walger, Brehmer, von Wedel, & von Wedel, 2008). Hence, it is necessary to identify the factors that affect the regular or continuous usage of hearing aid. Though recent technological advancements have led to an increase in the uptake of hearing aids (Kochkin, 2010), the regular use of the aids in daily life of these individuals is still less than satisfactory (Kochkin, 2012).

Several investigators have explored the barriers or reasons that may prevent those with hearing loss from choosing to purchase and use hearing aids to assist with their communication needs (Meister, *et al*., 2008). Among some of the barriers to hearing aid use are associated stigma , under-estimation of hearing loss by the individual, coping strategies, personality factors, low trust in hearing aid benefit, cognitive and functional restrictions, cost, false expectations (Kochkin, 1993 ; Meister, *et al.*, 2008), and communication styles (Franks & Beckmann, 1985; Helvik, Wennberg, Jacobsen, & Hallberg, 2008).

Only with a keen understanding of the problems faced by the individuals with hearing impairment and the reasons for the rejection of hearing aids, can an effective solution be evolved. Also the benefit that an individual gets from his/her hearing aid or a lack of it, is greatly influenced by the acoustic environment of individual (Gatehouse, Naylor, & Elberling, 2003). Since the Indian scenario is much different from the Western and European population, in terms of its socio economic levels, listening situations and the noise levels, a person is subjected to many other factors other than those reported in literature. Thus, a probe into the reasons for the non-use of the own/dispensed hearing aids and into the areas where there is a lack of benefit by the hearing aid is the need of the day.

Aim of the Study:

The aim of the study was to investigate the benefits of hearing aids among the hearing aid users and the reasons for the non-use of hearing aids.

Specific objectives:

The specific objectives included:

To determine the benefits obtained from hearing aid by regular users of hearing aids.

a. To determine the benefits obtained from hearing aid by children using hearing aids
b. To determine the benefits obtained from hearing aid by adults using hearing aids

c. To determine the benefits obtained from hearing aid by older adults using hearing aids

To identify the reasons for non-use of hearing aids among individuals who have discontinued using their hearing aid/s.

d. To identify the reasons for non-use of hearing aids among children who have discontinued using their hearing aid/s.
e. To identify the reasons for non-use of hearing aids among adults who have discontinued using their hearing aid/s.
f. To identify the reasons for non-use of hearing aids among older adults who have discontinued using their hearing aid/s.

To compare the benefits obtained from hearing aid among children, adults and older adults users of hearing aids.

To compare the reasons for non-use of hearing aids among children, adults and older adults who have discontinued using their hearing aid/s.

Chapter 2

Literature Review

The primary audiological management of permanent hearing loss is use of appropriate hearing aids. Individuals with permanent hearing impairment have been using hearing aids. However, the number of individuals who have been using hearing devices is far lesser compared to those who require one. Further, only a fraction of those who possess the device have been using it, while others have discontinued the use.

The aim of the present study was to obtain the reasons behind consistent or regular use of hearing aids or in other words, the benefit provided by the hearing aids to the client. Another aim was to understand the reasons behind the non-utilisation of hearing aid/s after the purchase. The relevant literature has been reviewed and given under the following different headings:

2.1. Benefits of using hearing aids

2.2. Negative effects of not using a hearing aid

2.3. Reasons for non-use of hearing aids

2.1. Benefits of using hearing aids

There have been documents in literature that when the hearing impairment is identified and intervened early, children develop speech and language skills on par with their normal hearing peers (Yoshinaga-Itano, Sedey, & Mehl, 1998). This increases the self-esteem, social interaction with peers, and academic success of the child. Hearing aids have been found to improve communication skills, self confidence, and social life among

adults. Those adults who were using the hearing aids were able to reverse the social, emotional, and communication problems; and improve their personal relationships (Shield, 2006). A recent study by Ameiva, Ouvrard, Giulioli, Meillon, Rullier, and Dartigues (2015) showed that the use of hearing aids reduced the risk of cognitive decline in the older adults.

2.1.1 Benefits from hearing aids in children: A longitudinal study was done on 38 children (mean age 7.71years) with mild hearing loss in the better ear and mild to severe hearing loss in the poorer ear. The children were divided into three groups on the basis of the amount of daily hearing aid use, namely, full-time users, part-time users, and non-users according to the average time of hearing aid usage. Analyses was done to see any significant difference between the amount of hearing aid usage and non-verbal cognition, aided and unaided Speech Identification Index, language abilities, and speech perception in noise. It was observed that there was a significant difference between full-time users and non-users in all parameters other than speech perception in noise (Walker, Holte, McCreery, Spratford, Page, & Moeller, 2015).

A retrospective survey study by McKay (2002) done on parents of 20 children (age from 2 to 17 years), with mild to moderately severe unilateral hearing loss after hearing aid fitting and a three-month trial period revealed that, 72% of parents felt their child improved or greatly improved in various listening situations after being fit with a hearing aid on the poorer ear. Furthermore, all of the parents were happy that they chose to fit their child with a hearing aid.

In a similar study by Wendorf (2010), the pre- and post- intervention speech perception scores after hearing aid fitment was assessed on children (age range from 7 to

12 years) with mild to severe unilateral hearing impairment. Qualitative assessments of the participants, their parents and teachers were done pre- and post- intervention. The results revealed that there was a significant improvement in the speech perception scores in quiet and in noise; and the qualitative assessment showed that the performance was better at home, in school, and in their general quality of life.

A longitudinal study by Bat-Chava, Martin, and Kosciw (2005) on 41 children (between 7 and13 years of age) with moderately severe to profound hearing loss was done to examine their communication and social skills through the administration of Vineland Scales which has communication and social abilities as its sub-tests. It was noticed that the social and communication scores seemed to increase with the hearing aid use.

2.1.2 Benefits in adults and older adults: Chisolm et al. (2007) reported improvement in health-related quality of life (HRQoL) after hearing aid use in adults by reducing psychological, social, and emotional effects of SNHL. A middle aged individual with more communication needs than an older adult would benefit more from a hearing aid to cope with the mental and social stress caused because of the hearing impairement (Hallberg & Carlsson, 1991).

Picou, Ricketts, and Hornsby (2013) conducted a study on 27 adults with an age range from 49 to 80 years. All participants had bilateral sensorineural hearing loss (SNHL). The listening effort was measured objectively using dual-task paradigm which included speech recognition scores in the presence of a background noise. The listening effort scores were obtained by getting the difference score of aided and unaided condition

for each task and it was found that use of hearing aids substantially reduced the listening effort although the benefit scores with the hearing aid for speech recognition in noise was poor. A similar finding was made by Hornsby in 2013, wherein the 16 adults (aged 47 to 69 years) with mild to severe sloping SNHL were assessed for any significant benefit provide by hearing aids to reduce the mental fatigue associated with sustained speech processing demands. A dual-task paradigm assessment for word recognition, word recall, and visual reaction times (RTs) was carried out to objectively quantify the listening effort and fatigue. Mental fatigue was defined as a reduction in the performance over the duration of experiment. Results of the study suggested that sustained speech processing demands can lead to mental fatigue in persons with hearing loss and hearing aid can alleviate this fatigue by reducing the listening effort.

In a study conducted by Gatehouse, Naylor, and Elberling (2003) on 50 individuals, the aided and unaided speech performance in quiet and in noise was examined. In addition, the aided benefit was correlated with the cognitive abilities of the subjects. It was found that speech recognition especially in noise was related to the cognitive abilities of the individual in that those with higher cognitive abilities are less affected by the adverse conditions and are more benefitted than the individuals with lesser cognitive abilities. A cohort study was done on 3670 older adults more than 65 years of age to investigate the relation between hearing loss, hearing aid use, and cognitive decline. Information on hearing loss was obtained using a self-report questionnaire and the cognitive abilities were determined using Mini-Mental State Examination (MMSE). The results revealed that increased hearing loss is positively related to cognitive decline in older adults and that

hearing aid use reduces such decline (Ameiva, Ouvrard, Giulioli, Meillon, Rullier, & Dartigues, 2015)

Dye and Peak (1983) conducted a study wherein 58 adults with an age range from 45 to 83 years were categorised into two groups depending on the severity of hearing loss as ‘more’ and ‘less’. The correlation between severity of hearing loss to psychological functioning pre- and post- amplification were examined. The psychological tests included assessments of mood, memory, and paranoia, which were done on the day they were fitted with hearing aids and then six weeks later. In majority of the tests, the more severely impaired group performed at a lower level at both times of testing. Both the groups showed improvements in scores over the six weeks after fitting. Whereas there were significant differences between the two groups at fitting, the more severely impaired showed greater improvements afterwards resulting in no significant difference between the groups after six weeks. These results show that the use of hearing aids can lead to reversing deterioration in psychological functioning as a result of hearing impairment. It is therefore important that hearing loss is diagnosed and treated with hearing aids as soon as possible to prevent further psychological deterioration, particularly for those with more severe losses.

In a study conducted by Van den Bogaert, Klasen, Moonen, Van Deun, and Wouters (2006), the horizontal localization skills of individuals with hearing impairment was compared with the aided and unaided condition across frequencies and it was observed that the performance with low frequency stimulus was better than high frequency stimulus in general; and a broad band signal (telephone ring) gave the best localization scores.

Further, the aided condition significantly improved the localization scores of the individuals.

A qualitative assessment was done on 91 elderly individuals (mean age being 74.8 years) with hearing impairment using Hearing Handicap Inventory for the Elderly (HHIE), once before hearing aid fitting and then after three weeks of the fitting. A significant reduction in the self-perceived handicap was noticed after the hearing aid fitting (Newman, Jacobson, Hug, Weinstein, & Malinoff, 1991).

A follow-up study was conducted by Stark and Louise to investigate the effect of hearing impairment on the quality of life of the individual and on their significant others. Individuals (N=131) with hearing impairment who ranged in age from 47 to 90 years along with their significant others took part in the study. Self-assessment questionnaires were provided to those with hearing impairment and their significant others before hearing assessment and hearing aid fitting. The same questionnaire was then given after three months of hearing aid fitting. When the results were compiled it was observed that there was a significant improvement in the quality of life of both the group of individuals.

2.3 Reasons for regular use of hearing aids

Surr, Schuchman, and Montgomery (1978) did a survey through mailed questionnaire to 430 individuals with an age range from 20 to 90 years. They aimed at studying the relationship between hearing aid usage and the age of the client, speech recognition threshold of the clients, and length of post fitting training. It was noted that as the age increased, the hearing aid usage decreased. This was attributed to the lesser

listening demands of the older individuals. It was also observed that those individuals with higher speech recognition scores wore the hearing aid for more hours than those with poorer scores. The reason for this is not specified. Another observation made was regarding the direct relation between the amount of hearing aid usage and the length of the post-fitting training. This was attributed to the opportunity for immediate and extensive daily use of the new instrument and an apparently smooth adjustment to amplification. Ewertsen (1974) collected data on the usage of hearing aids after their fitting from the interviewing 1006 participants with an age range from 15 to 90 years and their therapists / audiologists to investigate the relation between the satisfactory use of hearing aids and the client's age, speech recognition threshold, length of post-fitting training, gender, and type of hearing loss. An even distribution of men and women population was maintained in the study. An even distribution of males and females were maintained in the study. Even then it was observed that women tend to use their hearing aids a little more than do the men. In contrast to the study by Surr et al. in 1978, there was no relationship with age and hearing aid usage. It was also noted that people with conductive hearing loss wore the hearing aid more regularly than the other types of hearing aid. Also in consonance with Surr, Schuchman, & Montgomery (1978) study it was found that those people who attended training wore their hearing aids more regularly.

Hickson, Meyer, Lovelock, Lampert, and Khan (2014) administered questionnaires on 160 adults (mean average age of 73 years) with hearing impairment and degree of hearing loss varying from mild to profound. The study was conducted with an aim of extracting the reasons of successful hearing aid usage. Positive correlation to familial

support was observed to the amount of hearing aid usage. Furthermore, if the client was adept at using the advanced hearing aid features, then he/she had a positive attitude towards hearing aids, and had greater hearing handicap more successful hearing aid usage.

Kapteyn (1977) administered a self-report questionnaire on 160 individuals with hearing impairm to find the parameters responsible for the regular use of hearing aids. The results revealed that a fast adaptation to the hearing aid is a crucial factor in determining the regular use of hearing aids as is the sound quality or the naturalness of the sound through the hearing aid.

2.3 Negative effects of not using an aid

Hearing loss is a debilitating sensory impairment with many adverse consequences. The negative effects of not using a hearing aid would be to live with distressing effects of hearing loss. A nationwide survey of 4,000 adults with hearing loss compiled by the National Council on Aging (Kochkin & Rogin, 2000) found significantly higher rates of psychosocial disorders including depression and anxiety in individuals who were not wearing hearing aids.

Even a mild hearing loss can reduce the spoken language processing hence deteriorating the possibilities of meaningful communication (Agrawal, Platz, & Niparko, 2008). This difficulty in communication further affects work productivity, and the emotional and cognitive ability of the individuals thereby reducing their general quality of life (Herbst & Humphrey,1980; Gates, Cobb, Linn, Rees, Wolf, & D'agostino, 1996 Dalton, Cruickshanks, Klein, Klein, Wiley, & Nondahl, 2003; Olusanya, Ruben, & Parving,

2006). According to Barnett and Franks (1999), hearing loss also determines survival as in their study it was found that adults with post-lingual hearing loss had high mortality rate.

2.3.1 Negative effects of not using a hearing aid in children: Through many studies, it has been found that the speech and language skills of those with a pre- lingual hearing impairment are drastically different from normally hearing children, if left untreated (Wirz, Subtelny, & Whitehead 1981; Seyfried, Kricos, Schow, & Nerbonne, 1996).

Poor classroom acoustics would exacerbate the perceptual difficulties faced by these children further reducing success in academics (Davis & Davis, 1987). In a similar study by Crandell and Smaldino (2000) it was reported that signal-to-noise ratio (SNR) of a classroom varies from +5 to -7 dB; and SNR requirement for above 50% correct speech recognition by children having normal hearing is +6 dB, while children having SNHL require SNR of +15 dB or more for correct speech recognition. Both these studies support the finding that children with untreated hearing loss had reduced vocabulary, learning capacity; and their academic skills were markedly poor when compared to their normal hearing peers (Briscoe, Bishop, & Norbury, 2001; Bunch & Clark , 1978; Templin, 1966). Even children with minimal or mild hearing loss lag behind academically or in social and emotional competence when compared to their age matched peers (Davis et al., 1987; Bess, Dodd-Murphy, & Parker,1998; Blair 1985). Klee and Davis-Dansky (1986) compared a group of 25 children with normal hearing (aged 6 to 13 years) with a group of aged matched children with unilateral hearing loss ranging in degree from mild to profound in terms of their Intelligence Quotient (IQ) and their language abilities. No significant

differences were noticed in their language abilities but it was found that the IQ of the children with hearing impairment were lesser than their age matched peers with the least verbal IQ obtained by the children with severe to profound hearing impairment which was then correlated with their observed academic failures.

Bess and Gibler (1986) assessed the horizontal sound localization and syllable recognition skills in a group of children with unilateral sensorineural hearing loss and a matched group of normal hearing children. The degree of hearing loss ranged from mild to profound and it was found that even in the cases of mild unilateral hearing impairment, the localization skills and the speech recognition abilities especially that in noise were affected when compared to their age matched counterparts with normal hearing.

In a comparison study done by Bidadi, Nejadkazem, & Naderpour (2008) on the social skills of hearing impaired children with chronic otitis media and their age matched normal hearing counter parts it was found that the hearing impaired individuals scored significantly lower scores in the social skills than the control group with bilateral chronic otitis media patients scoring the poorest scores. Also it was observed that with increasing degree of hearing loss the social skills scores decreased. In a study were the language abilities and sustained attention skill, parent- child communication and behavioural problems of the hearing impared children were assessed using parent-reported questionnaires, videotaped tasks, psychosocial questionnaires, and parental reports of quality of life, an indirect effect of language on behavior problems via sustained attention deficits were established in the hearing impaired individuals(Barker, Quittner, Fink, Eisenberg, Tobey, & Niparko, 2009).It has been observed in a study done by Mark and

Carolien (2004) that the behavioural problems seen in hearing impaired children were mainly because of a breakdown of normal parent child communication especially in cases with normal hearing parent and hearing impaired child. Behavioural problems observed in children with hearing impairment is also believed to stem from a lack of confidence and self esteem because of their low competence level (Stevenson, Pimperton, Worsfold, & Kennedy, 2015) Bottom of Form

In addition, hearing loss may also increase the parental stress and a high parental stress is associated with frequent socio emotional problems in children, thus calling for an early intervention (Hintermair, 2006; Lederberg, 2002).

2.3.3 Negative effects of not using hearing aids in adults*:* Tambs (2004) studied a large cohort of >50,000 subjects of 20 years and over and found younger (20 to 44 years) and middle-aged participants (44 to 65 years) reporting higher levels of anxiety and depression, lower self-esteem, and subjective well-being compared with normally hearing peers. Moreover, among young and middle-aged adults with a hearing impairment, the impact on psychosocial health was larger than among the oldest adults (older than 65 years) with a hearing impairment. This may be because among elderly people, decreased hearing is usually acknowledged as being part of the ageing process, young and middle-aged adults often attach a stigma to hearing impairment. Consequently, a hearing impairment may have greater personal impact in younger adults. Their results also demonstrated that loneliness, in particular, seemed to be higher in the young adult group. Knutson and Lansing in 1990 reported comparable findings and concluded that limited communication with family and friends may lead to extreme levels of loneliness. In a focus group interview done by

Laroch and Barrette (2001), in adults with hearing impairment who were employed and did not use a hearing aid, reported that the most challenging workplace situations were group situations such as departmental and staff meetings, training sessions, and work-related social functions and that these situations are important for career maintenance or advancement. The same study reported the barriers to communication was in the necessity of telephone use, background noise in the workplace, and the use of auditory rather than visual alerting signals.

In a study done by Lalande, Lambert, and Riverin (1988) on 65 adults in the age range from 30 to 50 years with minimal to mild high frequency noise induced hearing loss, it was noted that they were not able to monitor sounds like telephone or bell ringing, they had difficulty in phone conversations, while viewing television, and also while listening to speech when there was any background noise. Due to these reasons there was an increased feeling of incompetence and frustration which led to social withdrawal in many of the individuals interviewed.

According to report by NIOSH, (1988) employees with noise induced hearing loss may face several problems in a noisy production area such as communication difficulties, reduced capacity to monitor changes in machinery sounds, and the inadequate audibility of potential safety hazards. These might be interpreted as reductions in job performance which may cost the person her/his job. Kochkin in 2007 did a study on the monthly income of aided and unaided individuals with hearing impairment and it was observed that individuals with hearing impairment who did not use a hearing aid suffered losses due to under employment. Without aided hearing, the individuals with hearing impairment can

be expected to suffer losses in compensation due to underemployment, may make mistakes on the job, experience higher rates of unemployment and in general may experience an overall reduction in quality of life (i.e., anxiety, depression, social isolation, social paranoia, medical health, emotional stability, cognitive functioning, etc.) which may negatively impact job performance. Comparisons between 73 individuals with hearing impairment and 96 controls, well-matched for socio-demographic variables, were performed using the HHIA, MOS 36-Item Short Form Health Survey (SF-36) and SFQ questionnaires scores. This revealed that the former experience a higher level of perceived hearing handicap and a deterioration of health-related quality of life while investigating emotional and socio-situational domains than the latter ($p < 0.005$). While investigating the psychological distress dimension of the subjects with hearing impairment by means of the Symptom Check List (SCL-90-R), it emerged that they are more prone to depression, anxiety, interpersonal sensitivity, and hostility than subjects with no hearing problems ($p < 0.05$). It is argued that the sensory impairment, with its associated disability, may discourage individuals with hearing impairment from exposing themselves to socially challenging situations, producing isolation that leads to depression, irritability, and feelings of inferiority (Monzani., Galeazzi, Genovese, Marrara, & Martini, 2008) .

2.3.4 Negative effects of not using hearing aid in older adults: Herbst and Humphrey (1980) examined the mental state of 153 older adults and any relation that the mental state has to the hearing loss. The study was done through detailed questionnaire and it was observed that 85 out of the 153 individuals suffered from depression and that there was a significant correlation between hearing loss and depression.

Weinstein and Ventry in 1982 did a study on 80 older adults with hearing impairment and correlated the audiometric results with subjective and objective social isolation scale scores. It was observed that the audiometric scores were significantly correlating with the subjective isolation scores. A survey of 2069 hearing impaired individuals with a mean age of 75 and their family members revealed that those who used hearing aids led a more socially active life while those without a hearing aid suffered from depression, anxiety, worry, paranoia, insecurity, and poor interpersonal relationship (Kochkin & Rogin, 2000).

In addition to peripheral hearing loss, central auditory processing disorders usually coexist with increasing age. The combined effect of the central and peripheral sensory deficits in these individuals are more evident when listening to fast speech or in noisy or reverberant conditions or in impaired sound source localization (Helfer & Wilber, 1990; Koehnke, & Besing,2001; Gordon-Salant, Fitzgibbons, & Friedman, 2007).

A cohort study of 1984 older adults with a mean age of 77.4 years was done and wherein the cognitive impairment and its correlation with hearing loss was examined through routine audiometric testing and administration of Mini Mental States test on the individuals for the following six years. It was found that individuals with hearing loss had an accelerated cognitive decline when compared to normal hearing adults (Lin, Yaffe, Xia, Xue, Harris, Purchase-Helzner, & Simonsick, 2012).

In a study done by McCoy, Tun, Cox, Colangelo, Stewart, and Wingfield (2005), the recall abilities of a group of older adults with hearing impairment were compared with that of the age matched individuals with normal hearing. All the individuals were asked to recall the final and non-final three words of a running memory task. The hearing impaired

individuals and individuals with normal hearing sensitivity were able to recall the final three words without any significant difference in their responses. But the hearing impaired individuals found the recall of non-final words significantly difficult than the control group which pointed to reduced memory for speech content because of increased listening effort.

2.4 Reasons for the non-use of hearing aids.

A population-based survey was conducted in Finland where a total of 601 people (aged 75 years or older) participated. Out of the total hearing aid owners twenty-five percent were non-users. Reasons for the non-use of hearing aids were obtained through open-ended questions. The major reasons for the non-use of HAs were that the aid did not help at all, the aid was broken, or it was too complicated to use (Lupsakko, Kautiainen, & Sulkava, 2005).

A study was conducted in Switzerland by mailing questionnaires to 8706 hearing impaired individuals to collect the data of their usage or non-usage of hearing aids. A combination of subjective and statistical analysis yielded the results for the reasons of non-use of hearing aids in decreasing order of their importance which included ineffective benefit in noise or no benefit , unpleasant side effects (rashes, itching, pain, builds up wax), poor sound quality , difficulties with management, and poor fit and comfort. It was also noted that those individual with advanced age of above 65 years, or with monaural fitting and with more difficulties with management of hearing aids had a tendency to reject hearing aids (Bertoli,Staehelin, Zemp, Schindler, Bodmer, & Probst, 2009).

Meister, Walger, Brehmer, von Wedel, and von Wedel (2008) administered a pre-fitting questionnaire among hearing impaired individuals with a mean age of 68 years. A

follow-up was done after six months to avail information about the number of people who bought a hearing aid and started to use them. It was found that the three major aspects predicted hearing aid ownership and its subsequent use. Individual's expectation towards a better quality of life, stigmatization and self-rated hearing abilities wherein a person with over expectations, increased negative attitude towards hearing aids and who underestimates her/his actual disability was likely to not own or use a hearing aid.

In a qualitative assessment done by Oberg, Marcusson, Nagga, and Wressle (2012) through administration of questionnaire on 345 hearing impaired individuals with hearing loss, it was found that 14% of these individuals were hearing aid owners who were not using it. A separate questionnaire was provided to them to extract the major reasons for rejecting the procured behind-the-ear digital hearing aids. The reasons as chosen by the individuals were difficulty in handling the hearing aids, disappointment with the aids, lack of comfort, and perceived absence of handicap in the decreasing order of importance.

In another study where the reasons were extracted through interviewing 40 individuals (mean age =74 years) who were not using their hearing aids, the major reasons indicated were difficulty of insertion of ear mould, amplification of noise, hearing aid being too loud, perceived lack of handicap, lesser audiometric thresholds, fewer listening situations and in very few cases hearing aid seemed to increase tinnitus.

Kochkin, in 2000, did an extensive research on the reasons for the non-use of hearing aids. This was done by a survey which identified the hearing aid non-users. These individuals were then mailed a letter requesting them to mail an open letter about the reasons for their non-use. The major reasons extracted through this research were lack of

benefit especially in noise, inappropriate fit, various negative side effects like itching and pain, expense, and a perceived lack of handicap.

In summary:

One of the most known benefit of hearing aid is as an aid in the normal speech and language development of a hearing impaired child, provided the child receives early intervention (Yoshinago-Itano et al, 1998). It has also proved to increase self confidence and self-esteem in the child. In addition, it has been found that children who are regular users of hearing aids are more benefitted by it thus increasing their overall quality of life (Wendorf, 2010).

In adults and older adults it have proved to reduce listening effort and mental fatigue caused by the hearing loss (Hornsby, 2013; picou et al, 2013; Amieva et al, 2015).Hearing aids have also been found to increase the overall well being of the user (Hallberg & Carlson, 1991).

Some of the negative effects of not using a hearing aid in children are under developed speech and language skills, Poor academic performance due to less than optimum classroom acoustics and affected localization abilities even in mild degree of hearing loss (Wirz et al, 1981; Bess & Gibler , 1986; Davis &Davis, 1987). In adults high levels of anxiety and social withdrawal have been reported mainly due to a discrimination in the work settings (NIOSH,1988). In older adults too similar findings of reduced social activities have been reported (Kochkin & Rogin, 2000). A decline in cognition and memory is another well researched negative effect of not using a hearing aid in older adults (McCoy et al, 2005).

Through a population survey in Finland, some of the major reasons of not using hearing aids were a lack of benefit from the hearing aid, broken hearing aid and complicated to use (Lupasakko et al, 2005). In a study done by Bertoli et al (2009) it was noted that the likelihood of hearing aid non-use increases among older adults more than 65 years of age and in individuals who were fitted monaurally. Kochkin (2000) through an extensive survey on older population reported many reasons for non-use and some of the major ones are not beneficial in noisy environment, negative side effects and amplification of noise.

Chapter 3

Method

The aim of the study was to investigate the benefits from hearing aids and the reasons for the non-use of hearing aids. The specific objectives were:

1. To determine the benefits obtained from hearing aid by regular users of hearing aids.
    a. To determine the benefits obtained from hearing aid by children using hearing aids
    b. To determine the benefits obtained from hearing aid by adults using hearing aids
    c. To determine the benefits obtained from hearing aid by older adults using hearing aids
2. To identify the reasons for non-use of hearing aids among individuals who have discontinued using their hearing aid/s.
    a. To identify the reasons for non-use of hearing aids among children who have discontinued using their hearing aid/s.
    b. To identify the reasons for non-use of hearing aids among adults who have discontinued using their hearing aid/s.
    c. To identify the reasons for non-use of hearing aids among older adults who have discontinued using their hearing aid/s.
3. To compare the benefits obtained from hearing aid among children, adults and older adult users of hearing aids.

4. To compare the reasons for non-use of hearing aids among children, adults and older adults who have discontinued using their hearing aids.

To attain the objectives of the study, the following method was designed. The research design utilized was qualitative research design.

2.1 Participants

The participants (N=61) were divided into three groups, viz., Group I with children (n=21) in the age range from >5.0 to <14.11 years, Group II with 20 young adults (n=20) belonging to the age range from >20.0 to <39.11 years, and Group III with 20 older adults (n=20) in the age range from >60.0 to <79.11 years; with 10 subjects in each group for each of the two objectives of the study. All of them were native speakers of Kannada language which is a Dravidian language spoken in the state of Karnataka. They had bought their Behind-The-Ear hearing aids under the Hearing Device Dispensing Unit (HDDU) of All India Institute of Speech & Hearing, Mysore. The participants had purchased their hearing aids at least three months prior to data collection. This was to satisfy the criterion which included only those clients with an acclimatization of at least three months (Gatehouse, 1992; Cox, Alexander, Taylor, & Gray, 1996; Surr, Cord, & Walden, 1998; Glista, Scollie, & Sulkers, 2012).

The demographic data of the clients which include age of the clients who participated in the study, their mean pure tone average (PTA) threshold, speech detection/reception thresholds (SRT), speech identification scores (SIS) are provided in the Table 3.

Table 3.1 Demographic data of the participants

Parameter	***Age group Yrs.***	***Degree of hearing loss***	***SDT/SRT dBHL***	***SIS***	***UCL for speech dBHL***	***Tympanogram Type***	***Reflex***
Benefit	5 to 7 (n=10)	Moderately severe to profound hearing loss	SDT ranging from 70 – 95dBHL	-	>100	A in 6 ears, As in 12 ears, Cs in 1 ear, B in 1 ear	Present in 1 ear Absent in 19 ears
	23 to 37 (n=10)	Moderate to profound hearing loss	-	0 to 100%	> 80 dB in 2 ears, > 90 dB in 2 ears, >100 dB in 16 ears	A type in 9 ears, Ad type in 2 ears, As type in 2 ears, Cd type in 1 ear, B type in 6 ears	Present in 2 ears, Absent in 18 ears.

	62 to 78 (n=10)	Mild to profound hearing loss	-	20% to 100%	>80 dB in 2 ears, > 90dB in 4 ears, >100 in 14ears	A type in 6 ears, Ad type in 2 ears, As type in12 ears	Present in 5 ears, Absent in 15 ears
Non-use	5-15 (n=11)	Mild to profound hearing loss	60 dB in 4 ears, 90dB in 4 ears	46% to 92%	>100 dB in 19 ears, > 90dB in 3 ears	A type in 14 ears, As type in 7 ears, B type in 2 ears	Present in 5 ears, Absent in 17 ears
	20-39 (n=10)	Mild to profound hearing loss	-	0% to 100%	>100 dB in 13 ears, At 90 dB in 7 ears	A type in10 ears, As type in 6 ears, Ad type in 2 ears, B type in 2 ears	Present in 1ear, Absent in 19 ears

60-79 (n=10)	Mild to profound - hearing loss	20% to 100%	>100 dB in 12 ears, > 90 dB in 8 ears	A type in 8 ears, As type in 9 ears B type in 1ear, Cs in 2 ears	Present-6 ears Absent-14 ears

2.2 Tools Used

Separate questionnaires were used, one for measuring the benefit derived from hearing aids and the other for knowing the reasons for non-use of hearing aid, in the three groups of participants.

2.2.1 For collecting information on benefits from hearing aids: Two questionnaires were used to collect information on benefits from hearing aids, one for children (Group I), and another that was common for adults (Group II) and older adults (Group III).

For children, the Parents' Evaluation of Aural/Oral Performance of Children (PEACH) questionnaire (Ching & Hill, 2005, given in Appendix A) was used for obtaining information on benefits from hearing aids in children. This questionnaire was validated by three experienced audiologists to ensure that all the questions included in the questionnaire are appropriate for the Indian population.

The Self Assessment of Hearing Handicap scale (SAHH scale) (Vanaja, 2000, given in Appendix B) was adapted and used for obtaining information on benefits from hearing aids in adults and older adults. The adaptations made were deletions of specific questions that were found to evaluate similar parameters as other questions. This was done in order to make the questionnaire more concise, thereby decreasing client's fatigue which in turn will increase the validity of answers provided by the client. The questions deleted were Q1g, Q1m, Q1p, Q2, Q3, Q4, Q16, Q17, and Q20.This was done with the consent of the investigator who developed the questionnaire.

The Self Assessment of Hearing Handicap scale (Vanaja, 2000) was administered with and without hearing aid to obtain information on the benefit provided by the hearing aid (Dillon, James, & Ginis, 1997) for the adult and older adult participants. The rating was changed from a three-point to a nine- point scale, as the same questionnaire was used to assess the benefits derived from hearing aids by obtaining the difference between the scores in unaided and aided conditions.

2.2.2 For collecting information on non-use of hearing aids: One common questionnaire was developed on reasons for non-use of hearing aids (given in Appendix C). This was used for obtaining information on reasons for non-use of hearing aids in children, adults and older adults. This questionnaire was validated by three experienced audiologists before utilizing it for all the three groups of participants.

Thus, a total of three questionnaires were used. These included a questionnaire for assessing the benefit from hearing aids in children, a questionnaire for assessing the benefit from hearing aids in adults and older adults, and a questionnaire to collect information on non-use of the hearing aid. It was ensured that the questionnaires were appropriate to the three groups of participants. `

The questionnaire to assess the reasons for non-use of hearing aids was developed by compiling information from the literature and validating the same. The questionnaire on the non-use of hearing aid was developed by accumulating the factors contributing for non-use of hearing aids mentioned in studies in the literature (Sorri Luotonen, & Laitakari, 1984 ; Kochkin, 2000; Shield, 2006; Bertoli, Staehelin, Zemp, Schindler, Bodmer, & Probst, 2009; Oberg, 2012; Mc Cormack & Fortnum, 2013).

2.3 Procedure

The administration of the questionnaires was through interview, either telephonic or face-to-face interview. The questionnaire for children required information to be elicited from the parent/care giver unless the child had enough skills to answer. The questionnaires that were used for the adults or older adults required the participant themselves to answer the questions, either through telephone or face-to-face interview. The reliability check was performed for 10% of the population in each of the three groups, wherein the questionnaire was administered twice - with an interval of one to two weeks in between.

2.4 Responses and Scoring

The scoring was different for each of the three questionnaires, i.e, two questionnaires for assessment of benefit (PEACH, SAHH scale) and one questionnaire for non-use of hearing aid.

2.4.1 Scoring for PEACH questionnaire: The care giver was given five alternatives for each question, viz., never (0%), seldom (1-25%), sometimes (26-50%), often (51-75%), and always (75-100%). The scoring was done to assess the benefit separately, in quiet and noisy situations. The overall benefit with the aid was elicited as the sum of the benefit in quiet and noisy listening situations.

2.4.2 Scoring for SAHH scale: The scoring of the responses for SAHH scale was similar to that of Abbreviated Profile of Hearing Aid Benefit (Cox & Alexander, 1995). The person had to choose from nine alternatives for each question, viz., 99% of the time, 87% of the time, 75% of the time, 63% of the time, 50% of the time, 38% of the time, 25%

of the time, 12% of the time, and 1% of the time. A 9-point rating scale was used as it was proved to increase the intra-subject reliability and validity (Bendig, 1954; Peryam, 1998; Preston, 2000; Lozano, 2008) because of equal categorical spacing between the responses. The responses were taken for unaided and aided listening situations. The benefit scores were obtained by computing the difference in the response in the unaided and the aided situation, depending on the content of the question.

2.4.3 Scoring for reasons for non-use questionnaire: A Likert 5-point rating scale was utilized. The 5-point rating scale was used because of its high level of internal consistency and validity (Osteras et al., 2008). The rating scale used was a continuous rating scale with '5' representing the major reason and '1' representing minor important or not a reason. Ratings from three to five will therefore be considered major reasons for non-use of hearing aids. The reasons were extracted by analyzing the accumulated responses of all the participants.

Prior to the analyses of data, the demographic data along with answers to the questionnaires were tabulated for each participant. The data for the purpose of the study included information on benefit from children, adults and older adults; information on non-use of hearing aids from children, adults and older adults. The statistical package for Social Sciences (SPSS) software (version 23for Windows) was used for analyses of the data.

2.5 Statistical analysis:

The data obtained through administration of PEACH in the children was subjected to descriptive statistics. The median was extracted through this, which gave an estimation of benefit that the children received in various aspects of hearing aid use. It also gave an estimation of those areas where the children were not sufficiently benefitted. The frequency data provided information as to how many children out of the total are getting benefitted through the hearing aid in a specific aspect of hearing aid use.

In a similar way, the median and frequency data were extracted through descriptive statistics done on the results obtained in the adult and older adult populations separately. In order to compare the benefit received across the adult and older adult populations, the combined data were initially subjected to Shapiro-Wilk test to check for normality of the distribution. Since the data did not follow a normal distribution, a non parametric test, namely. Mann Whitney U test was applied to see the significant difference between the groups.if any

The frequency and median where extracted in order to estimate the reasons for non-use in all three populations separately through descriptive statistics. To compare the reasons for non-use of hearing aids among children, adults and older adults, their combined data were then subjected to Shapiro-Wilk's test for checking the normality of distribution. As the data was found to be not normally distributed, it was subjected to Kruskal Wallis

test to check for any significant difference seen among any of the three populations. Since a significant difference was found among certain parameters, these parameters were then subjected to Mann Whitney U test.

Chapter 4

Results

The aim of the present study was to find the benefits received by the regular users of hearing aid and also to find the reasons behind the non-use of hearing aids after procuring it. The specific objectives were:

- To find the benefits from hearing aids received by children, adults and older adults
- To find the reasons for the non-use after procuring BTE hearing aids among children, adults and older adult population.
- To compare the hearing aid benefits received among the three age groups.
- To compare the reasons for non-use of hearing aids among the three age groups.

The results are provided under the following headings:

4.1. Hearing aid benefits in children, adults, and older adults.

4.2. Reasons for the non-use of hearing aids in children, adults, and older adults.

4.3. Comparison of the hearing aid benefits among children, adults, and older adults.

4.4. Comparison of the reasons for non-use of hearing aids among children, adults, and older adults.

Data from 61 individuals were collected for the purpose of the study (N=61). Out of them, data from 31 participants were collected for the hearing aid benefit (n=31) and from 30 participants for non-use (n=30) of hearing aids.

4.1 Hearing aid benefits in children, adults and older adults.

Benefits derived from hearing aids have been tabulated and analysed in three different age groups, viz. children, adults, and older adults.

4.1.1. Hearing aid benefits in children.

The information derived from the Parents' Evaluation of Aural/Oral performance of CHildren (PEACH) was tabulated for each child and analysed. Table 4.1 provides information on the number of children getting benefitted from hearing aids out of the total number of children assessed (n = 10) on different aspects of hearing aid use.

Table 4.1. Number of children getting hearing aid benefit in different listening situations.

S.No.	*Questions*	*n = 10 children*				
		Never 0%	*Seldom 1-25%*	*Sometimes 26-50%*	*Often 51-75%*	*Always 75-100%*
1	Hearing aid usage	-	-	-	3	7
2	Upset by loud sounds	1	1	5	3	
3	Responds to name call in quiet situation	-	-	2	2	6

4	Follows simple instructions in quiet situation	-	-	5	2	3
5	Responds to name call in noisy situation	-	3	3	3	1
6	Follows simple instructions in noisy situations	-	1	2	7	-
7	Attends to stories/songs in quiet situations	1	1	6	1	1
8	Initiates / Participates in conversation in quiet situation	1	1	3	1	4
9	Initiates / Participates in conversation in noisy situation	-	-	5	3	2
10	Understands what is being said in car / bus / train	-	1	2	3	4

11	Recognises voice of people without seeing them	-	3	3	2	2
12	Successfully uses a telephone	3	3	2	2	-
13	Responds to sounds other than voices	-	-	5	3	2

The mean benefit from hearing aids in children was calculated. The benefit was obtained as ratings. This was converted into percentages by adding the ratings given for each questions in a specific parameter and dividing the sum with the maximum score, for eg: speech in quiet parameter is evaluated by two questions with a maximum rating of four each. Therefore the maximum rating possible in this parameter will be eight. If a parent rated two for one question and four for the other, then the percentage score for that individual for the parameter of speech will be sum of two and four (6) divided by the maximum score eight multiplied by 100,i.e. 0.75 * 100 = 75%. Similarly scores for all ten individuals were calculated. This was then entered in SPSS and after descriptive analysis the median value for each parameter was taken as the mean percentage for that parameter. This is depicted in Figure 4.1

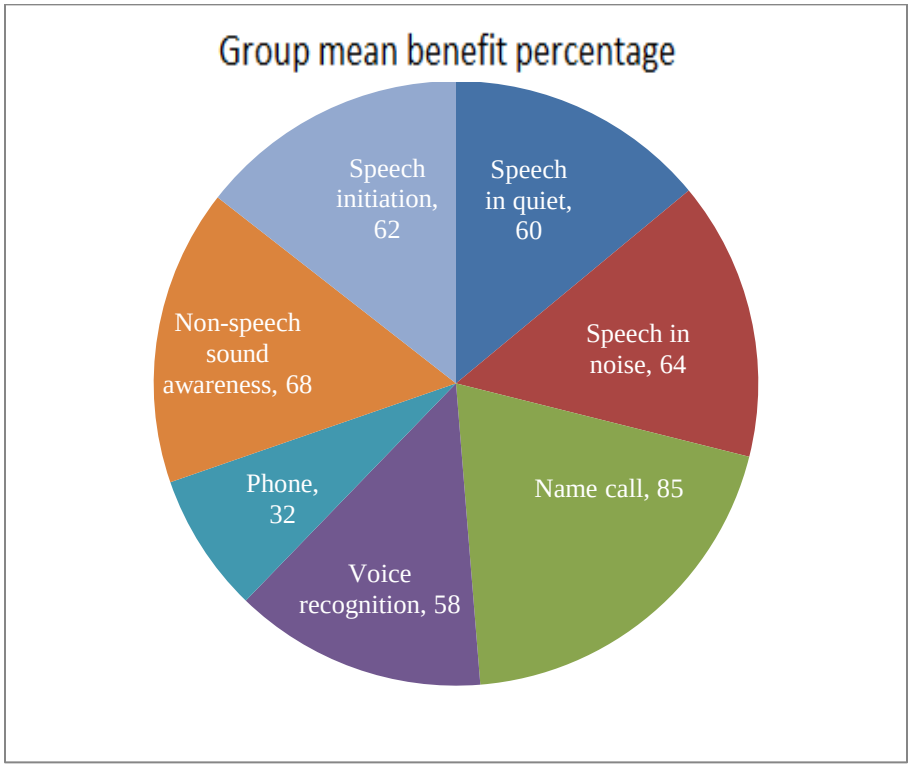

Figure 4.1: Pie chart representing the mean hearing aid benefit (in %) in children across seven listening categories.

From Table 4.1 and Figure 4.1, it was noted that 7/10 children wore their hearing aids always, i.e., 75% - 100% of the time. Three of them wore the hearing aid often, i.e., 51% - 75% of the time. It was also found that three of the ten children often (51% to 75%) complained that the hearing aid was loud and causing discomfort.

Majority of the children (6/10) were able to respond to name call in quiet situation for 75% to 100% of the time. In a noisy situation, only 4/10 children were able to respond to name call for more than 50% of the time.

Only 3/10 children were able to follow simple instructions in quiet situations for more than 75% of the time; while 5/10 had difficulty following instructions for 50% of the time. Four out of ten children were found to initiate or participate in conversation in a quiet situation for more than 75% of the time. Six out of the ten children had difficulty paying attention to passage being read in quiet, whereas only one of them could attend for more than 75% of the time.

Majority of the children (7/10) were able to follow an instruction given in a noisy situation up to 75% of the time. Five out of ten children were able to initiate or participate in conversation in a noisy situation for more than 50% of the time. Majority of the children (7/10) were able to understand what is being said in car/bus/train for more than 50% of the time.

Only 4/10 children were able to recognise the voices of people without seeing them for more than 50% of the time. Five out of ten children were able to recognise sounds other than voices for over 50% of the time.

The least benefit through the hearing aid was noted for phone conversations as only 2/10 children were able to successfully use the hearing aid for telephone conversation 50 - 75% of the time.

4.1.2. Hearing aid benefits in adults.

The information on benefit was obtained by using the Self Assessment of Hearing Handicap (SAHH) questionnaire. For the ease of interpretation of the questionnaire, the questions were divided into six categories, viz., name call, awareness of non-speech sounds & voice recognition, speech in quiet, speech in noise, phone conversations, localization, and psychological benefits. The results will therefore be mentioned under these categories.

Name Call, Awareness of non-speech sounds, & Voice Recognition:

Two questions were used to evaluate name call parameter, i.e., one to assess the benefit in quiet situation and the other to assess the benefit in noisy situation. For the assessment of benefit in the awareness of non-speech sounds, a total of nine questions were used which depicted different non-speech sounds from varying distances. The benefit obtained by the number of individuals out of the 10 adults and their amount of benefit is provided in Table 4.2

Table 4.2 Hearing aid benefit for name call and non-speech sounds in adults

S.No.	*Situations*	*0 - <20%*	*≥2 - <40%*	*≥40 - <60%*	*≥60 - <80%*	*≥80 - 100%*
Name call						

1	In a quiet situation, can hear somebody calling from a distance of 18-20 ft	-	4	3	2	1
2	Hear somebody calling from behind (from a distance of 6-8 ft), if the TV is on at normal volume	-	1	3	5	1
	Awareness of non-speech sounds					
1	Telephone ringing from 6-8 ft distance	2	1	1	6	-
2	Knock on the door from 6-8 ft distance	-	1	4	5	-
3	A dog barking from 6-8 ft distance	-	3	6	1	-
4	Sound of footsteps from 6-8 ft distance	-	5	3	2	-
5	A tap running from 6-8 ft distance	2	3	1	4	-
6	Hiss of a pressure cooker from 6-8 ft distance	-	4	3	3	-

7	A bus horn from 18-20 ft distance	-	4	4	2	-
8	A telephone ringing from 18-20 ft distance	-	2	3	5	-
9	Hiss of pressure cooker from 18-20 ft distance	-	3	4	3	-

From Table 4.2 it can be observed that only 3/10 adults are getting more than 60% benefit for name call from 18-20 feet distance in quiet situation, but 6/10 adults are getting more than 60% for name call from 6-8 feet distance in noisy situations.

Awareness of non-speech sounds:

Further, from Table 4.2, it can be noted that in almost all situations, at least six individuals out of ten were getting more than 40% benefit, except for sound of footsteps (from 6-8 ft distance) and a tap running from (6-8 ft distance) where only 5/10 individuals were getting the same amount of benefit (≤40% benefit).

Voice recognition:

Figure 4.2 depicts the amount of hearing aid benefit for recognition of voice of a familiar person. To evaluate this parameter only a single question was used.

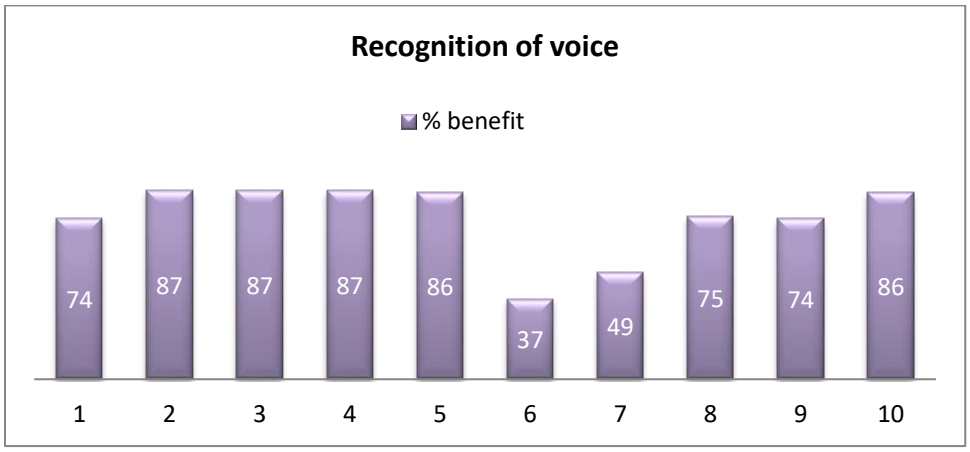

Figure 4.2: The bar graph showing mean percentage of benefit from hearing aid for voice recognition of a familiar person by adults (n=10).

From the Figure 4.2 it can be noted that majority of the adults tested (8/10) got more than 70% benefit in voice recognition with hearing aid use.

Understanding speech in quiet:

A total of ten questions were employed for evaluating understanding of speech in quiet.

Table 4.3. Number of adult hearing aid users who benefitted for understanding speech in quiet (n = 10).

S.No.	Situations	*0-<20%*	*≥20 -<40%*	*≥40-<60%*	*≥60-<80%*	*≥80-100%*

1	While conversing with a family member (without visual cues)	-	-	-	8	2
2	While conversing with a familiar male (without visual cues at 6-8 ft distance)	-	-	-	8	2
3	While conversing with a familiar female (without visual cues at 6-8 ft distance)	-	-	-	7	3
4	While conversing with a family member (without visual cues at 10-12 ft distance)	-	1	-	5	4
5	While watching TV at normal volume at 6-8 ft distance	-	-	-	6	4
6	While listening to radio at a normal volume at 3 ft distance	-	-	-	7	3
7	While watching movie in theatre	-	-	-	7	3
8	While listening to whispering at 6" from the ear	-	-	-	6	4
9	While conversing with unfamiliar person standing beside the person	-	-	-	5	5

10	While conversing with a person seated opposite at 3 ft distance	-	-	-	5	5

From Table 4.3 it can be noted that all ten individuals obtained more than 60% in all areas mentioned under the category of understanding speech in quiet except for one person in a specific aspect (While conversing with a family member (without visual cues at 10-12 ft distance).

Understanding speech in noise:

A total of eight questions evaluated this parameter. The number of adults benefitted out of the total population (n = 10), and the extent of benefit they received in specific areas of hearing aid use under the mentioned category is tabulated in Table 4.3.

Table 4.4: Number of adults able to understand speech in noise in specific situations.

S.No.	*Situations*	*0-<20%*	*≥20 -<40%*	*≥40-<60%*	*≥60-<80%*	*≥80-100%*
1	Watching TV when there are people talking in the same room	-	-	2	8	-
2	Conversing with conductor in a crowded bus	-	-	1	7	2
3	Conversing with a friend standing beside you on a crowded railway platform	-	1	3	5	1
4	Conversing with a salesman in a busy shop	-	-	2	5	3
5	Conversing with a friend in a restaurant	-	-	-	8	2

6	Conversing with a familiar person seated beside you in a wedding hall	-	-	-	8	2
7	Conversing with a person seated beside you when there is TV/radio playing in the same room	-	-	-	9	1
8	Conversing with a small group of people at home	-	-	1	6	3

From the Table 4.4 it can be noted that at least 8/10 adults are getting more than 60% benefit in all the situations except while conversing with a friend standing beside on a crowded railway platform, wherein only six participants out of ten were able to get more than 60% of benefit.

Telephone conversations:

A single question was used to evaluate this parameter. Figure 4.3 shows the percentage of benefit (Y-axis) from hearing aid for telephone conversation for each of the ten participants.

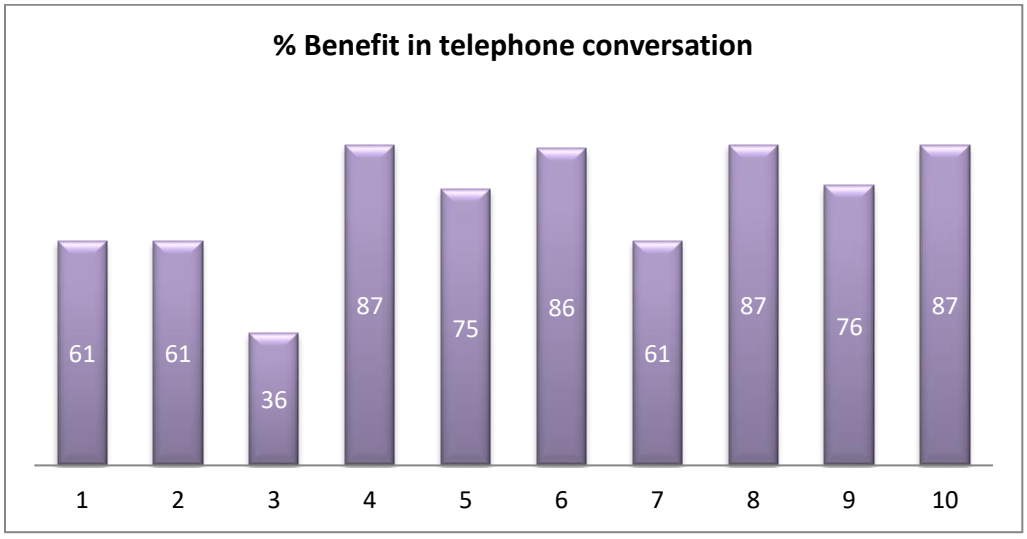

Figure 4.3: The bar graph representing hearing aid benefit for telephone conversation in ten adults.

From the Fig 4.3 it can be observed that majority of the people had more than 60% benefit with hearing aids for conversation through telephone.

Psychological benefits:

This parameter was evaluated using six questions. Table 4.5 depicts the number of adults who showed benefits from hearing aids in psychological aspects.

Table 4.5. Number of adults who obtained benefit on psychological aspects

S.No.	*Questions*	*0-<20%*	*≥20 -<40%*	*≥40-<60%*	*≥60-<80%*	*≥80-100%*
1	Avoids talking to people because of the hearing problem	-	1	2	5	2
2	Hesitates to meet strangers because of the hearing problem	-	1	1	6	2
3	Feels left out among a group of people because of the hearing problem	-	-	2	4	4

4	Listens to TV/radio less because of the hearing problem	-	-	3	5	2
5	Gets frustrated when what is being said by others are not understood	-	2	-	6	2
6	Feels that family members get annoyed when what they say are not understood by the person.	1	1	2	5	1

From Table 4.5 it can be noted that 7/10 adults are having at least 60 % benefit in the parameter on psychological benefits in all situations except for the family members getting annoyed when they are not understood by the hearing aid user wherein 6/10 people had more than 60% benefit.

Localization:

This parameter was evaluated using two questions. The number of adults who benefitted in localization and the extent of benefit are given in Table 4.6.

Table 4.6 Number of adults who benefitted in localization of sounds

S.No.	*Questions*	*0-<20%*	*≥20 -<40%*	*≥40-<60%*	*≥60-<80%*	*≥80-100%*
1	Identification of the direction from which the automobile horn is heard while walking	2	5	1	1	1
2	Identification of the location of the speaker when conversing with a group of people	2	4	2	-	2

It can be noted from Table 4.6 that majority of the individuals (7/10) are getting less than 40% benefit through hearing aid in terms of non-speech sounds localization (automobile horn), and 6/10 individuals got less than 40% benefit when localising to a speaker while having a group conversation. However, this finding has to be interpreted with caution, as majority of them (7/10) were using monaural hearing aids with one of them having normal hearing in the better ear and another person having mild hearing loss in the better ear.

Others:

There were two items in the questionnaire that did not fit in the categories mentioned earlier. Table 4.7 states the number of adults who benefitted when spoken slowly or required repetitions.

Table 4.7 Number of adults who benefitted when spoken slowly and with repetitions.

S.No.	*Questions*	*0-<20%*	*≥20 -<40%*	*≥40-<60%*	*≥60-<80%*	*≥80-100%*
1	Understand better when spoken slowly	1	3	2	3	1
2	Needs repetitions when people speak	-	-	3	7	-

Only 4/10 individuals received at least 60% benefit when spoken to slowly; and 7/10 individuals received at least 60% benefit when repetitions were used.

The mean benefit (in percentage) was computed by obtaining the difference score for each individual entering the data in SPSS and obtaining the median for each question. The sum of the median of the questions specific to a specific parameter was obtained which was then divided by the number of questions to obtain the group mean percentage for that specific parameter. Figure 4.4 provides a graph that depicts the group mean percentage benefit from hearing aid received by adults.

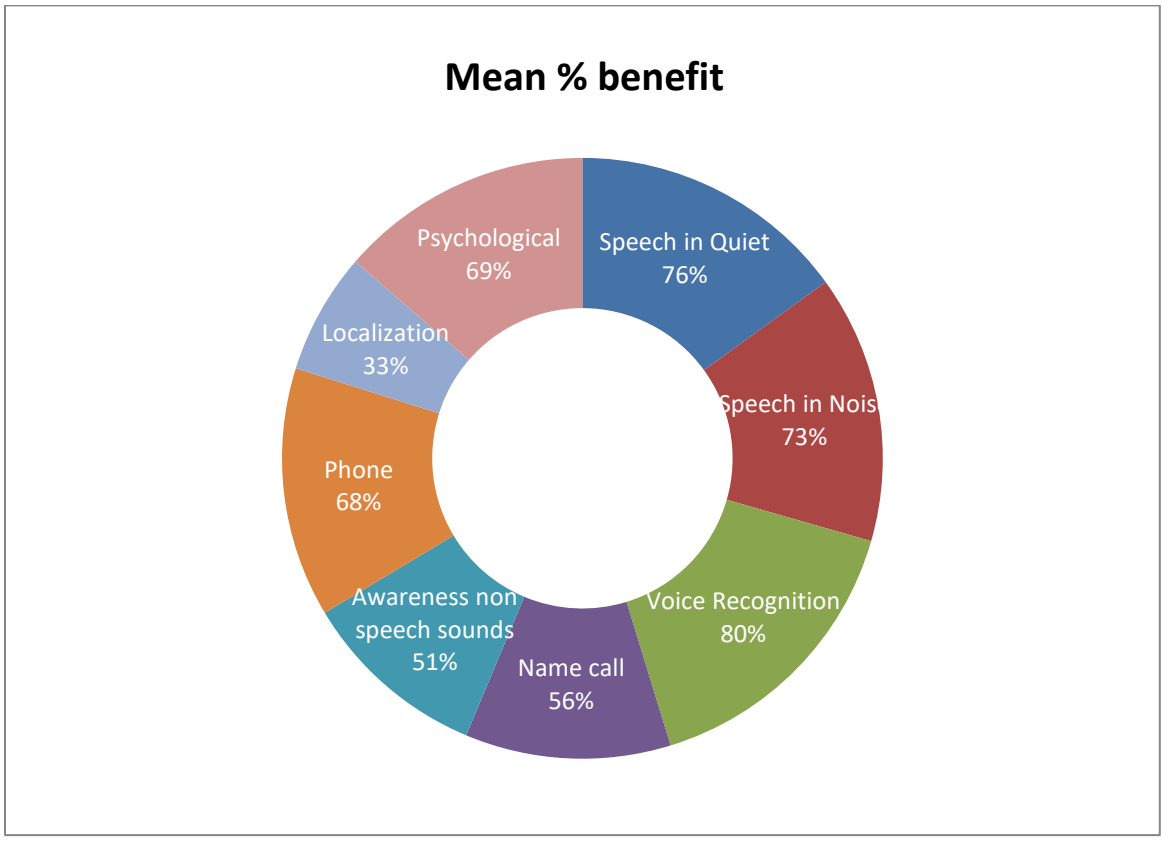

Fig 4.4: Mean percentage benefit in different parameters in adults (n=10).

4.1.3 Benefit received by Older Adults:

The information collected through SAHH is mentioned under the eight categories of name call, awareness of non-speech sounds and voice recognition, speech in quiet, speech in noise, telephone conversations, psychological benefits, and localization.

Name call and Non-speech sound awareness:

Two questions were used to evaluate name call parameter, i.e., one to assess the benefit in quiet situation and the other to assess the benefit in noisy situation. For the assessment of benefit in the awareness of non-speech sounds a total of nine questions were used which depicted different non-speech sounds at varying distances from the listener. The benefit obtained by the number of individuals out of the 10 older adults and their amount of benefit is provided in Table 4.8.

Table 4.8 Hearing aid benefit for name call and non-speech sounds awareness in older adults.

S.No.	*Questions*	*0-<20%*	*≥20 -<40%*	*≥40-<60%*	*≥60-<80%*	*≥80-100%*
	Name call					
1	In a quiet situation, can hear somebody calling from a distance of 18-20 ft	-	4	4	2	-
2	Hear somebody calling from behind (from a distance of 6-8 ft), if the TV is on at normal volume	-	1	3	4	2

	Awareness of non-speech sounds					
1	Telephone ringing from 6-8 ft distance	1	5	1	3	-
2	Knock on the door from 6-8 ft distance	-	2	4	2	2
3	A dog barking from 6-8 ft distance	-	1	3	4	2
4	Sound of footsteps from 6-8 ft distance	-	-	3	3	4
5	A tap running from 6-8 ft distance	-	-	2	4	4
6	Hiss of a pressure cooker from 6-8 ft distance	2	5	1	2	-
7	A bus horn from 18-20 ft distance	-	2	3	4	1
8	A telephone ringing from 18-20 ft distance	-	-	2	6	2

9	Hiss of pressure cooker from 18-20 ft distance	1	1	3	3	2

From Table 4.8, it can be observed that only very few people are getting benefit for name call in quiet (from 18-20 feet), i.e., only 2/10 individuals are getting more than 60% benefit; and in noisy situation (6-8 feet) 6/10 individuals are getting more than 60% benefit.

Voice recognition

This parameter was evaluated using a single question. The results of which are represented in the Figure 4.5.

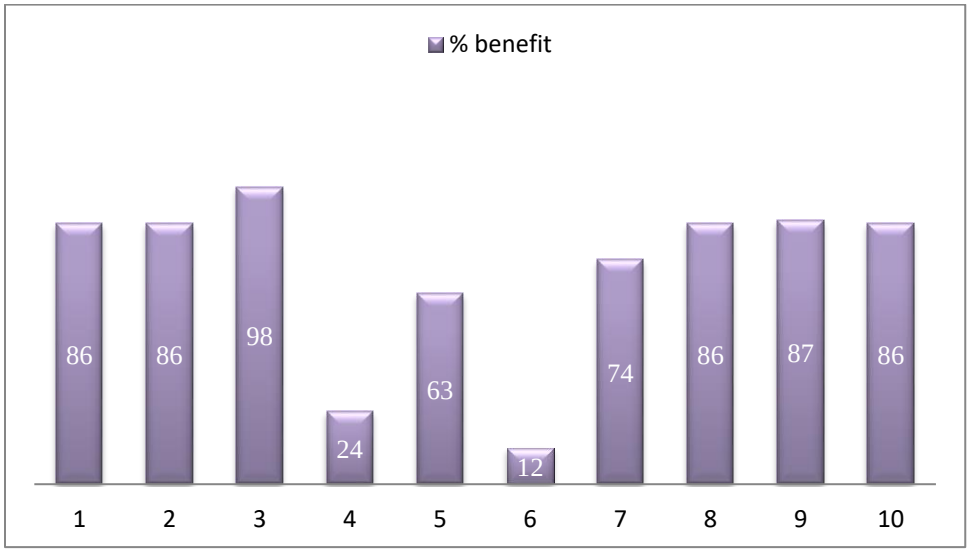

Figure 4.5: Bar graph representing the benefit (in %) from hearing aids for voice recognition in older adults (n=10).

From Figure 4.5 it can be observed that 6/10 individuals are getting more than 80% benefit in voice recognition with hearing aid use.

Speech in quiet:

A total of ten questions were employed for evaluating speech in quiet. Table 4.9 depicts the number of individuals out of the total number of individuals who were benefitted in each aspect of the parameter and the amount of benefit received by them.

Table 4.9: Number of older adults who benefitted for understanding speech in quiet with hearing aid (n = 10).

S.No.	*Questions*	*0-<20%*	*≥20 -<40%*	*≥40-<60%*	*≥60-<80%*	*≥80-100%*
1	While conversing with a family member (without visual cues)	-	1	-	3	6
2	While conversing with a familiar male (without visual cues at 6-8ft dist.)	-	2	-	1	7
3	While conversing with a familiar female (without visual cues at 6-8ft dist.)	-	1	1	2	6
4	While conversing with a family member (without visual cues at 10-12ft dist.)	-	1	1	2	6
5	While watching TV at normal volume at 6-8ft dist.	-	-	-	2	8
6	While listening to radio at a normal volume at 3ft dist	-	1	1	2	6
7	While watching movie in theatre	-	-	1	5	4
8	While listening to whispering at 6inch from the ear	-	1	2	3	4
9	While conversing with unfamiliar person standing beside the person	-	1	1	3	5

10	While conversing with a person seated opposite at a distance of 3ft	-	1	1	4	4

From Table 4.9 it can be noted that seven or more than seven individuals out of ten were able to get more than 60% benefit in understanding speech in quiet through the hearing aid.

Speech in Noise:

A total of eight questions were used for evaluating this parameter. Table 4.10 shows the number of individuals out of the total number of individuals who obtained benefit in understanding speech in noise and the amount of benefit received by them.

Table 4.10: Number of older adults able to understand speech in noise in specific situations.

S.No.	*Questions*	*0-<20%*	*≥20 -<40%*	*≥40-<60%*	*≥60-<80%*	*≥80-100%*
1	Watching TV when there are people talking in the same room	-	1	1	5	3
2	Conversing with conductor in a crowded bus	1	-	2	4	3
3	Conversing with a friend standing beside you on a crowded railway platform	1	1	1	5	2
4	Conversing with a salesman in a busy shop	-	1	1	7	1

5	Conversing with a friend in a restaurant	-	2	1	2	5
6	Conversing with a familiar person seated beside you in a wedding hall	-	1	-	5	4
7	Conversing with a person seated beside you when there is TV/radio playing in the same room	-	1	1	4	4
8	Conversing with a small group of people at home	-	1	-	5	4

From Table 4.10 it can be noted that at least 7/10 individuals were able to get more than 60% benefit in understanding speech in noise through the hearing aid.

Telephone conversations:

Only a single question was used for evaluation of this parameter. The results for the same are represented in the Figure 4.6.

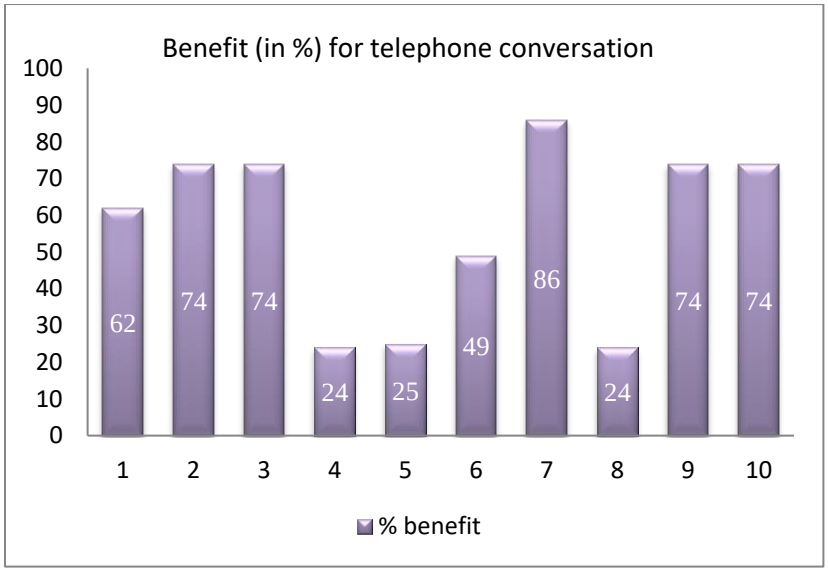

Fig 4.6: The bar graph depicting the benefit (in %) for telephone conversation in older adults.

From Figure 4.6, it can be observed that 6/10 individuals were getting more than 60% benefit in this parameter.

Psychological benefits:

For evaluation of this parameter six questions were used. The Table 4.11 shows the number of individuals out of the total number of individuals (n=10) who got psychological benefit from hearing aids.

Table 4.11: Number of older adults who benefitted in the psychological dimension.

S.No.	*Questions*	*0-<20%*	*≥20 -<40%*	*≥40-<60%*	*≥60-<80%*	*≥80-100%*
1	Avoids talking to people because of the hearing problem	3	2	1	1	3
2	Hesitates to meet strangers because of the hearing problem	2	3	1	-	4
3	Feels left out among a group of people because of the hearing problem	2	2	2	1	3
4	Listens to TV/radio less because of the hearing problem	1	2	-	5	2
5	Gets frustrated when what is being said by others are not understood	2	2	-	3	3
6	Feels that family members get annoyed when what they say are not understood by the person.	2	2	1	4	1

From Table 4.11 it can be noted that four to seven individuals out of ten individuals are getting more than 60% benefit on different aspects of the said parameter.

Localization:

Two questions were used to evaluate this parameter, one for evaluating non- speech sound localization and the other to assess localization of speech sounds. Table 4.12 shows the number of individuals out of the total number of individuals who were benefitted in each aspect of the parameter and the amount of benefit received by them.

Table 4.12: Number of individuals benefitted in localization tasks

S.No.	*Questions*	*0-<20%*	*≥20 -<40%*	*≥40-<60%*	*≥60-<80%*	*≥80-100%*
1	Can identify the direction from which the automobile horn is heard while walking	6	2	1	1	-
2	When conversing with a group of people, can identify the location of the speaker	1	5	2	1	1

From Table 4.12 it can be observed that only a few individuals are getting benefit for localization.

Others:

There were two items in the questionnaire that did not fit in the categories mentioned earlier. Table 4.13 states the number of adults who benefitted when spoken slowly or required repetitions.

Table 4.13: Number of individuals who were benefitted with slow speaking and repetitions while using hearing aids

S.No.	*Questions*	*0-<20%*	*≥20 -<40%*	*≥40-<60%*	*≥60-<80%*	*≥80-100%*
1	Do you feel that you understand better when you talk slowly?	-	2	1	3	4
2	Do you ask for repetitions when people speak to you?	-	2	-	1	7

From Table 4.13 it can be noted that at least seven individuals out of ten are able to get more than 60% benefit from the hearing aid and in the situations depicted above, i.e., slow rate of speech and repetitions.

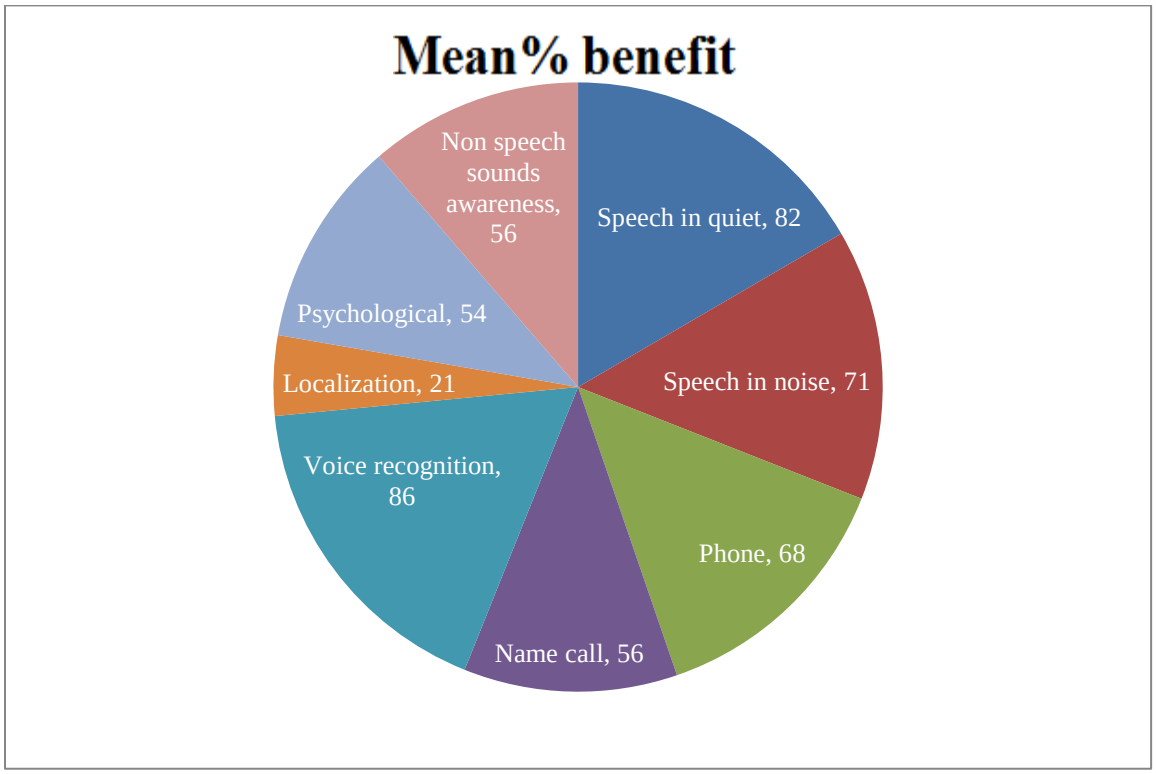

Figure 4.7: The pie chart representing mean benefit (in %) on different parameters of hearing aid usage in older adults.

4.2 Reasons for the non-use in different age groups

The reasons for the non-use of procured hearing aid were obtained from children, adults and older adults. For the purpose of ease in interpretation, the questions in the hearing aid non-use questionnaire were divided into nine categories, viz., benefit, sound quality, appearance and fit, psychological issues, physical abilities, expense, knowledge, facilities nearby, and others. The rating scale used was a continuous rating scale with the number five representing the major reason and the number one representing the least

important/ minor reason. The results are therefore discussed under these categories for all the three specific age groups.

4.2.1. Reasons for the non-use of hearing aids in children:

Reasons for the non-use are discussed under nine major categories as mentioned earlier and the results obtained are depicted on a graph. The number of children rating the different parameters of non-use is depicted in Figure 4.8. The ratings are colour coded and the mean number of individuals who rated each parameter are given in the illustration. For obtaining the mean number of individuals initially frequency table for each question was obtained. To obtain the number of individuals in a specific parameter say sound quality assessed by questions 10 and 11, the frequency table with the number of people who rated a specific rating was taken. All the people who rated one for question 10 and 11 were added and divided by the number of questions (2) to get the mean number of people who rated 1 for the parameter of sound quality. Similarly the sum of all the individuals who rated two for the questions 10 and 11 were taken and divided by the number of questions (2) to get the group mean number of people who rated 1 for the parameter of sound quality. Similar calculations were done for all the five ratings in each parameter to get the mean number of individuals who rated each of the five ratings for all the different parameters.

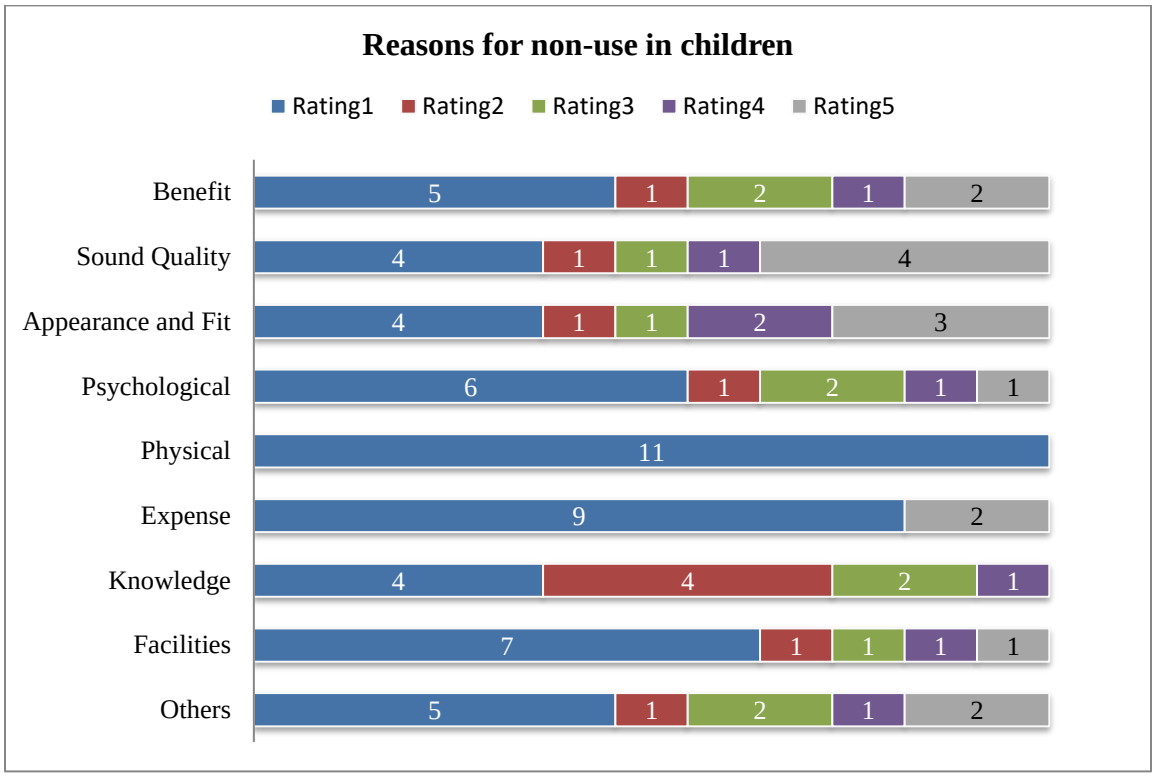

Fig 4.8 : Bar graph depicting the ratings for each parameter for non-use in children (n=11).

From the Figure 4.8, it appeared that the major reasons (rating from 3 to 5) for non-use of hearing aids among the children include sound quality, appearance and fit, lack of benefit, and aspects related to 'others' category

Benefit:

There were nine questions evaluating the benefit as a reason for non-use of hearing aids. Table 4.14 lists out these items among the eleven children for not using the hearing

aid. The reasons along with the number of people who rated it are given in Table 4.14. In the rating scale with five points, '5' represented the major reason and '1' represented the least important/ minor reason. Those reasons that majority of individuals rated as being an important reason of non-use are highlighted in bold.

Table 4.14 Reasons for lack of benefit leading to non-use of hearing aids in children .

S.No.	*Reasons*	*n=11*				
		5	*4*	*3*	*2*	*1*
1	Hearing aid not effective in understanding speech in quiet	-	3	2	3	3
2	**Hearing aid is not effective in noise**	4	2	2	1	2
3	**Whistling and feedback is a persisting problem**	3	2	1	-	5
4	Hearing aid is too loud	-	1	3	3	4
5	**Hearing aid does not work on telephone**	2	2	2	3	2
6	Tinnitus is not helped	-	-	1	-	10
7	Encounters very less listening situations	-	-	-	-	11
8	Not able to identify location of sound through hearing aid	1	-	2	1	7
9	**Hearing aid amplifies noise**	3	1	4	1	2

Note: 5 = major reason; 1 = minor reason/not applicable

From Table 4.14 it can be noted that the major reasons for non-use in children are hearing aid not being effective in noise or not useful during telephone conversations or because there is continuous whistling sounds impeding listening and that the hearing aid is amplifying too much noise.

Sound Quality:

Two questions assessed reasons related to sound quality leading to non-use of hearing aid in children (Table 4.15).

Table 4.15 Reasons related to the sound quality leading to non-use of hearing aid

S.No.	**Reasons**	**Number of people for specific rating**				
		5	**4**	**3**	**2**	**1**
1	**Hearing aid has poor quality**	3	1	2	1	4
2	**Speech sounds unnatural (hollow, muffled, harsh)**	4	2	-	1	4

Note: 5 = major reason; 1 = minor reason/ not applicable

From Table 4.15, it can be noted that poor quality and unnatural sounds were the major reasons for non-use of hearing aids in 6/11 participants.

Appearance and fit

Factors related to appearance and fit of hearing aids leading to non-use of the hearing aid is given in Table 4.16.

Table 4.16 Reasons related to appearance and fit of hearing aid leading to non-use of hearing aid.

S.No.	*Reasons*	*5*	*4*	*3*	*2*	*1*
1	Comfort and fit are not appropriate	2	1	1	3	4
2	**Lacks cosmetic appeal**	3	2	1	1	4
3	**Hearing aid feels like ear plugs**	2	4	-	-	5

Note: 5 = major reason; 1 = least important/ minor reason/ not applicable

From Table 4.16 it can be observed that the major reasons for the non-use were lack of cosmetic appeal and feeling like a ear plug in the ear when hearing aid is worn.

Psychological aspect:

Factors related to psychological aspects for non-use of hearing aids in children are depicted in Table 4.17.

Table 4.17 Reasons related to psychological issues for non-use of hearing aids in children

S.No.	*Reasons*	*5*	*4*	*3*	*2*	*1*
1	Hearing aid does not meet expectation	-	-	-	1	10
2	Feeling that "I do not need help"	2	1	-	3	5
3	**Hearing aid is annoying and a nuisance**	2	3	2	1	3
4	Society has a negative attitude towards hearing aids.	-	3	2	1	5
5	Forgets using hearing aids.	-	-	2	-	9
6	**Lack of support from family and friends.**	4	-	2	2	3
7	Misplaces the hearing aids frequently and finding them is difficult.	-	-	1	1	9
8	**"**Wearing hearing aids make me feel old".	-	-	-	-	11
9	"Wearing hearing aids make me feel inferior".	1	1	2	2	5
10	**"Wearing hearing aids make me feel disabled''.**	1	3	2	1	4
11	**"On wearing hearing aids people treat me differently''.**	4	2	1	2	2
12	Over promises by the dispenser not met/ unrealistic expectations.	-	-	1	1	9

Note: 5 = major reason; 1 = minor reason/ not applicable

From Table 4.17 it can be observed that the major reasons in psychological issues for non-use are the hearing aid being perceived as annoying or a nuisance, lack of support from family and friends, feeling of 'disabled' 'people treat differently'.

Physical Abilities

Factors related to physical abilities contributing to non-use of hearing aids in children are depicted in Table 4.18.

Table 4.18 Reasons related to the physical abilities of clients leading to non-use of hearing aid

S.No	*Reasons*	*5*	*4*	*3*	*2*	*1*
1	Controls of hearing aid are too small for handling.	-	-	-	-	11
2	Vision is too weak for handling hearing aid	-	-	-	-	11
3	Lack of somebody to assist with the manual control of hearing aids	-	-	-	1	10

Note: 5 = major reason; 1 = least important/ minor reason/ not applicable

From Table 4.18 it can be observed that physical abilities was not a reason for non-use among children.

Expense:

Reasons related to expenditure on hearing aids, related to maintenance,contributing as a reason for non-use of hearing aids (Table 4.19).

Table 4.19 Reasons related to expenditure on hearing aids

S.No.	*Reasons*	*5*	*4*	*3*	*2*	*1*
1	Repair and maintenance is expensive	1	-	-	-	10
2	Batteries cost too much and the battery life is too short	1	-	-	-	10

Note: 5 = major reason; 1 = minor reason/ not applicable

From Table 4.19 it can be noted that for majority of the children (10/11) this parameter was not a reason for non-use of hearing aid except for one child in whom this was a major reason for non-use.

Knowledge on hearing aid usage*:*

The reasons related to the knowledge on hearing aid usage may contribute to the non-use of hearing aid. This is given in Table 4.20.

Table 4.20 Reasons related to knowledge on hearing aid usage

S.No.	*Reasons*	*5*	*4*	*3*	*2*	*1*
1	Do not know how to wear the hearing aids.	-	-	1	3	7
2	Do not know how to use the hearing aids.	-	-	3	5	2

Note: 5 = major reason; 1 = least important/ minor reason/ not applicable

From Table 4.20 it can be noted that 1/11 rated not knowing how to wear the hearing aid and 3/11 rated not knowing how to use a hearing aid as important reasons for them not using their hearing aids.

Facilities nearby:

The reasons related to the facilities nearby and their access which may contribute to the non –use of hearing aids are listed in Table 4.21

Table 4.21 Reasons related to hearing aid facilities nearby.

S.No.	*Reasons*	*5*	*4*	*3*	*2*	*1*
1	Lack of facilities nearby	1	1	1	1	7
2	Transportation difficult to the facilities available	-	-	4	-	7

Note: 5 = major reason; 1 = least important/ minor reason/ not applicable

From Table 4.21 it can be observed that 3/11 individuals found lack of facilities nearby, and 4/11 reported transportation difficulties as important reasons for them to not using their hearing aids

Others factors contributing to non-use of hearing aids:

Other reasons which cannot be confined in the above tables but can contribute to non-use of hearing aid are listed in the Table 4.22

Table 4.22 Miscellaneous factors related to non-use of hearing aids

S.No.	*Reasons*	*5*	*4*	*3*	*2*	*1*
1	**Rashes, itching or pain on wearing ear mould/hearing aid**	3	3	2	2	1
2	Ear wax frequently accumulates	1	-	-	-	10
3	Difficult to handle in humid climates due to sweat and grime	-	-	2	3	6
4	**Gets headache on using hearing aids**	3	3	3	-	2

Note: 5 = major reason; 1 = least important/ minor reason/ not applicable

From Table 4.22 it can be noted that majority of the children (6/11) did not use their hearing aids because of itching or pain or headache due to the ear mould or hearing aid.

4.2.2 Reasons for the non-use of hearing aids in adults:

Reasons for the non-use are discussed under nine major categories. The bar graph Figore 4.10 represents the results obtained across each of the nine parameters .

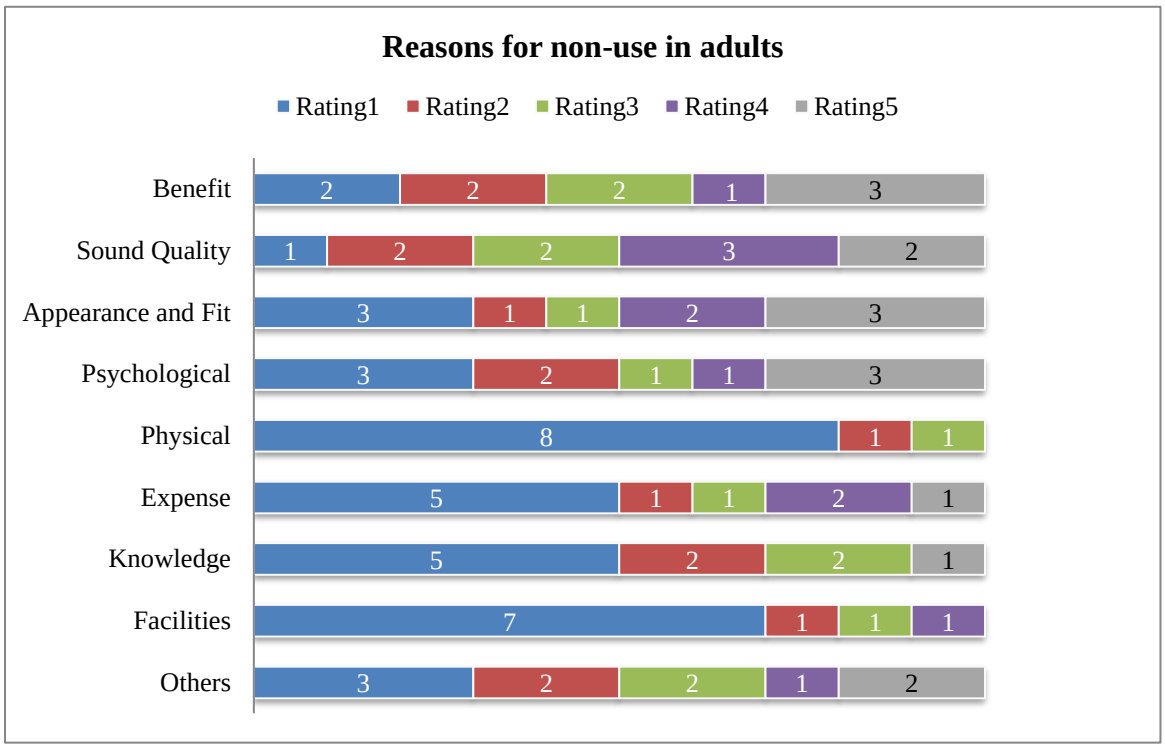

Fig 4.9: Bar graph depicting the number of adults (n=10) and their ratings on nine different parameters.

From the Figure 4.9 it can be noted that the major reasons for non-use among the adults are included in the categories of sound quality, a lack of benefit, appearance and fit, psychological, and others .

The ratings given for each reason along with the number of people who rated are tabulated. The reasons that majority of individuals rated as being influential as a reason of non-use are highlighted in bold.

Benefit:

Not getting any major benefit from hearing aids and other factors for non-use are given in Table 4.23

Table 4.23 Reasons for lack of benefit leading to non-use of hearing aids in adults. .

S.No.	*Reasons*	*5*	*4*	*3*	*2*	*1*
1	**Hearing aid not effective in understanding speech in quiet**	2	1	4	1	2
2	**Hearing aid is not effective in noise**	8	-	-	2	1
3	Whistling and feedback is a persisting problem	1	2	1	4	2
4	**Hearing aid is too loud**	2	1	4	1	2
5	**Hearing aid does not work on phone**	5	-	2	2	2
6	Tinnitus is not helped	1	-	-	1	8
7	Encounters very less listening situations	-	-	1	2	7
8	Not able to identify location of sound through hearing aid	1	-	2	4	3
9	**Hearing aid amplifies noise**	6	2	3	-	1

Note: 5 = major reason; 1 = minor reason/ not applicable

From Table 4.23 it can be noted that the major reasons for non-use are hearing aid not being effective in quiet and in noise or not useful during telephone conversations or because hearing aid is too loud or that the hearing aid is amplifying noise.

Sound Quality:

Reasons related to sound quality for non-use of hearing aid in adults are given in Table 4.24.

Table 4.24 Reasons related to the sound quality for non-use of the hearing aid

S.No.	*Reasons*	*5*	*4*	*3*	*2*	*1*
1	**Hearing aid has poor quality**	1	2	3	3	1
2	**Speech sounds unnatural(hollow, muffled, harsh)**	2	3	2	2	1

Note: 5 = major reason; 1 = minor reason/ not applicable

From Table 4.24 it can be noted that poor quality and unnatural sound were the major reasons for non-use of hearing aids.

Appearance and fit:

Factors related to appearance and fit of hearing aids leading to non-use of the hearing aid are given in Table 4.25

Table 4.25: Reasons related to appearance and fit leading to non-use of hearing aid.

S.No.	*Reasons*	*5*	*4*	*3*	*2*	*1*
1	The comfort and fit are not appropriate	-	1	1	3	5
2	**Lacks cosmetic appeal**	4	2	-	3	1
3	**Hearing aid feels like ear plugs**	5	-	1	1	3

Note: 5 = major reason; 1 = minor reason/ not applicable

It can be observed from Table 4.25 that the major reasons were lack of cosmetic appeal and feeling og plugging sensation in the ear.

Psychological aspects:

Factors related to psychological aspects of non-use of hearing aids in adults are depicted in Table 4.26.

Table 4.26: Reasons related to psychological barriers leading to non-use in adults

S.No.	*Reasons*	*5*	*4*	*3*	*2*	*1*
1	Hearing aid does not meet expectation	1	-	2	7	-
2	"I do not need help"	2	-	2	1	5
3	**Hearing aid is annoying and a nuisance**	8	2	-	-	-
4	**Society has a negative attitude towards hearing aids.**	2	2	2	-	4
5	Forgets using hearing aids.	1	-	1	1	7
6	Lack of support from family and friends.	1	-	2	2	5
7	Misplaces the hearing aids frequently and finding them is difficult.	1	1	-	2	6
8	**"Wearing hearing aids make me feel old".**	1	2	3	1	3
9	**"Wearing hearing aids make me feel inferior".**	5	1	1	-	3
10	**"Wearing hearing aids make me feel disabled".**	5	2	-	2	1
11	**"On wearing hearing aids people treat me differently".**	4	1	-	3	2
12	Over promises by the dispenser not met.	-	-	-	6	4

Note: 5 = major reason; 1 = minor reason/ not applicable

From Table 4.26 it can be observed that the major reasons for non-use in this parameter are the hearing aid being perceived as annoying or a nuisance, a negative attitude of society towards hearing aids, sense of feeling as disabled , and treated differently by people.

Physical abilities:

Factors related to physical abilities contributing to non-use of hearing aids in adults are depicted in Table 4.27

Table 4.27 Reasons related to the physical abilities leading to non-use in adults

S.No.	*Reasons*	*5*	*4*	*3*	*2*	*1*
1	The controls of hearing aid are too small for handling.	-	-	-	2	8
2	Vision is too weak for handling hearing aid	-	-	-	-	10
3	Lack of somebody to assist with the manual control of hearing aids	-	-	1	1	8

From Table 4.27 it can be observed that only 1/10 individual found lack of assistance with the controls of hearing aid as an important reason for not using his/her hearing aid.

Expense:

Reasons related to maintenance expenditure on hearing aids that may contribute to the non-use of hearing aids is listed in the Table 4.28.

Table 4.28: Reasons related to expenditure on hearing aids

S.No.	*Reasons*	*5*	*4*	*3*	*2*	*1*
1	Repair and maintenance is expensive.	1	2	-	2	5
2	Batteries cost too much and the battery life is too short.	-	2	1	1	6

Note: 5 = major reason; 1 = minor reason/ not applicable

It can be noted from Table 4.28 that repair and maintenance of hearing aid being too expensive and the battery consumption being too fast to be important reasons for the non-use of hearing aid among 3/10 adults.

Knowledge on hearing aid usage:

The reasons related to the knowledge on hearing aid usage leading to non-use of hearing aid are listed in Table 4.29

Table 4.29: Reasons related to knowledge on hearing aid usage leading to non-use of hearing aid in adults

S.No.	*Reasons*	*5*	*4*	*3*	*2*	*1*
1	Do not know how to wear the hearing aids.	1	-	1	3	5
2	**Do not know how to use the hearing aids.**	1	-	4	-	5

Note: 5 = major reason; 1 = least important/ minor reason/ not applicable

From Table 4,29 it can be noted that 2/10 individuals rated not knowing how to wear the aid and 5/10 individuals rated not knowing how to use a hearing aid as important reasons for them not using their hearing aids.

Facilities nearby:

The reasons related to the lack of hearing aid facilities nearby and their access which may contribute to the non –use of hearing aids are listed in the Table 4.30.

Table 4.30: Reasons related to lack of hearing aid facilities nearby leading to non-use of hearing aids in adults. **.**

S.No.	*Reasons*	*5*	*4*	*3*	*2*	*1*
1	Lack of facilities nearby.	-	-	2	2	6
2	Transportation difficult to the facilities available.	-	1	1	-	8

Note: 5 = major reason; 1 = least important/ minor reason/ not applicable

From the Table 4.30 it can be observed that 2/10 individuals reported lack of facilities nearby and transportation difficulties as important reasons for them to not using their hearing aids.

Others:

Other reasons which cannot be confined in the earlier tables but can contribute to non-use of hearing aid are listed in the Table 4.31.

Table 4.31: Miscellaneous (other) factors related to non-use of hearing aids

S.No.	*Reasons*	*5*	*4*	*3*	*2*	*1*
1	**Rashes, itching or pain on wearing ear mould/hearing aid.**	4	2	1	3	-
2	Ear wax frequently accumulates.	-	-	-	2	8
3	Difficult to handle in humid climates due to sweat and grime.	-	-	2	3	5
4	**Gets headache on using hearing aids.**	6	1	3	-	-

Note: 5 = major reason; 1 = least important/ minor reason/ not applicable

From Table 4.31 it can be noted that majority of the individuals (6/10) did not use their hearing aids because of itching or pain and 7/10 adults did not use the aids because of headache.

4.2.3 Reasons for non-use of hearing aids in older adults

Reasons for the non-use of hearing aids are discussed under nine major categories and the results obtained are depicted in the bar graph (Figure 4.11).

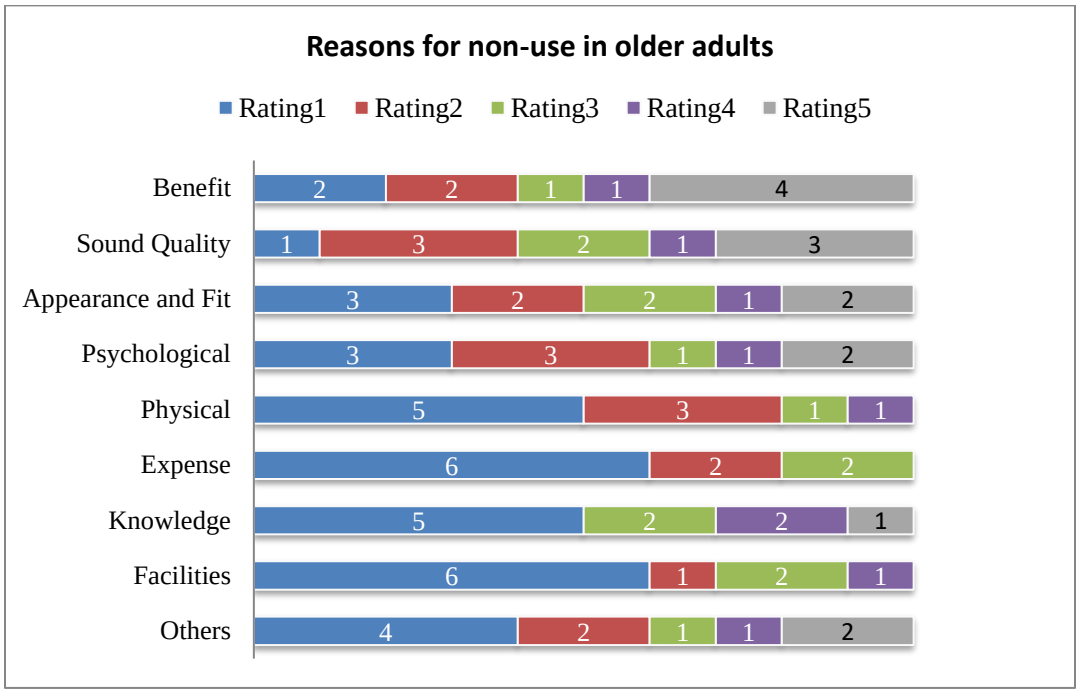

Figure 4.10 Bar graph depicting the number of older adults (n=10) and their ratings on nine different parameters.

From the Figure 4.10 it can be noted that the major reasons for non-use among the older adults are a lack of benefit, disturbing sound quality, appearance and fit of the aid, ear mold, knowledge of how to use and wear them, psychological factors, and aspects included in the category of 'others'.

The ratings given for each reason along with the number of people who rated are provided in Table 4.32. Those reasons that majority of individuals rated as being an important reason of non-use are highlighted in bold.

Benefit:

Not getting any significant benefit from hearing aids leading to non-use are given in Table 4.32

Table 4.32: Reasons for non-use of hearing aids in older adults due to a lack of benefit.

S.No.	Reasons	5	4	3	2	1
1	**Hearing aid not effective in understanding speech in quiet**	5	-	2	4	3
2	**Hearing aid is not effective in noise**	9	-	-	1	-
3	**Whistling and feedback is a persisting problem**	3	2	1	2	2
4	**Hearing aid is too loud**	3	1	2	3	1
5	**Hearing aid does not work on phone**	3	2	2	3	-
6	Tinnitus is not helped	-	-	1	1	8
7	**Encounters very less listening situations**	3	2	1	3	1
8	**Not able to identify location of sound through hearing aid**	2	-	4	1	3
9	**Hearing aid amplifies noise**	7	-	-	2	1

Note: 5 = major reason; 1 = minor reason/ not applicable

From Table 4.32 it can be noted that all the reasons in this parameter other than tinnitus not being helped are major contributors of non-use of hearing aids.

Sound Quality:

Reasons related to sound quality for non-use of hearing aid in older adults are given in Table..4.33

Table 4.33: Reasons related to the sound quality leading to non-use of the hearing aid in older adults

S.No.	*Reasons*	*5*	*4*	*3*	*2*	*1*
1	**Hearing aid has poor quality**	3	3	1	2	1
2	**Speech sounds unnatural(hollow, muffled, harsh)**	3	2	1	4	-

Note: 5 = major reason; 1 minor reason/ not applicable

From Table 4.33 it can be noted that poor quality as well as unnatural speech are major reasons for non-use of hearing aids.

Appearance and fit:

Factors related to appearance and fit of hearing aids leading to non-use of the hearing aid is given in Table 4.34.

Table 4.34: Reasons related to the appearance and fit leading to non-use of hearing aid in older adults.

S.No.	*Reasons*	*5*	*4*	*3*	*2*	*1*
1	The comfort and fit are not appropriate	2	-	1	1	6
2	**Lacks cosmetic appeal**	3	1	3	2	1
3	**Hearing aid feels like ear plugs**	2	1	2	4	1

Note: 5 = major reason; 1 minor reason/ not applicable

From Table 4.34 it can be observed that the major reasons for the non-use in this parameter are lack of cosmetic appeal and plugging feeling in the ear.

Psychological aspects:

Factors related to psychological aspects for non-use of hearing aids in older adults are depicted in Table 4.35

Table 4.35: Reasons related to psychological aspects leading to non-use of hearing aids in older adults

S.No.	*Reasons*	*5*	*4*	*3*	*2*	*1*
1	**Hearing aid does not meet expectation**	1	1	3	2	3
2	**"I do not need help"**	2	1	1	2	4
3	**Hearing aid is annoying and a nuisance**	5	1	1	3	-
4	**Society has a negative attitude towards hearing aids.**	2	1	2	3	2
5	Forgets using hearing aids.	-	1	-	3	6
6	Lack of support from family and friends.	-	1	-	2	7
7	Misplaces the hearing aids frequently and finding them is difficult.	-	1	-	2	7
8	"Wearing hearing aids make me feel old".	3	-	1	4	2
9	"Wearing hearing aids make me feel inferior".	3	1	-	4	2
10	**"Wearing hearing aids make me feel disabled".**	3	1	1	2	3
11	**"On wearing hearing aids people treat me differently".**	4	1	-	3	2
12	Over promises by the dispenser not met.	1	-	-	6	3

Note: 5 = major reason; 1 = minor reason/ not applicable

From Table 4.35 it can be observed that the major reasons for non-use are the expectations of the client being not met, perceived lack of handicap, hearing aid being perceived as annoying or a nuisance, the negative attitude of society towards hearing aids,

or “Wearing hearing aids make me feel disabled” and “On wearing hearing aids people treat me differently”.

Physical Abilities:

Factors related to physical abilities contributing to non-use of hearing aids in older adults are depicted in Table 4.36

Table 4.36: Reasons related to the physical abilities leading to non-use in older adults

S.No.	*Reasons*	*5*	*4*	*3*	*2*	*1*
1	The controls of hearing aid are too small for handling.	-	1	1	4	4
2	Vision is too weak for handling hearing aid	-	-	2	2	6
3	Lack of somebody to assist with the manual control of hearing aids	-	-	1	2	7

Note: 5 = major reason; 1 = minor reason/ not applicable

It can be noted from Table 4.36 that 2/10 individuals rated controls of the hearing aid being too small / vision being too weak to handle and 1/10 individuals found lack of assistance with the manual controls of hearing aid as important contributors to non-use of their hearing aids.

Expense:

Reasons related to maintenance expenditure on hearing aids that contribute to the non-use of hearing aids in older adults is listed in the Table 4.37.

Table 4.37: Reasons related to expenditure leading to non-use of hearing aids in older adults

S.No.	*Reasons*	*5*	*4*	*3*	*2*	*1*
1	Repair and maintenance is expensive.	-	-	3	1	6
2	Batteries cost too much and the battery life is too short.	-	-	1	3	6

Note: 5 = major reason; 1 = least important/ minor reason/ not applicable

From Table 4.37 it can be noted that for 3/10 individuals, repair and maintenance was felt to be expensive and for 1/10 individual battery life being too short and the cost being too expensive were important reasons for non-use of their hearing aid.

Knowledge on hearing aid usage:

The reasons related to the knowledge on usage of hearing aids among older adult users might have contributed to the non-use of hearing aid. (Table 4.38).

Table 4.38: Reasons related to knowledge on usage leading to non-use of hearing aids

S.No.	*Reasons*	*5*	*4*	*3*	*2*	*1*
1	Do not know how to wear the hearing aids.	1	1	-	3	5
2	**Do not know how to use the hearing aids.**	1	3	1	-	5

Note: 5 = major reason; 1 = minor reason/ not applicable

From Table 4.38 it can be noted that 2/10 rated not knowing how to wear the aid and 5/10 rated not knowing how to use a hearing aid as important reasons for them not using their hearing aids.

Facilities nearby:

The reasons related to the facilities nearby and their access which might have contributed to the non- –use of hearing aids among older adults are listed in Table 4.39.

Table 4.39: Reasons related to facilities nearby and their access leading to non-use in older adults.

S.No.	*Reasons*	*5*	*4*	*3*	*2*	*1*
1	Lack of facilities nearby.	-	1	2	2	5
2	Transportation difficult to the facilities available.	-	1	2	-	7

Note: 5 = major reason; 1 = least important/ minor reason/ not applicable

From Table 4.39 it can be observed that 3/11 individuals found lack of facilities nearby and transportation difficulties as important reasons for them to not using their hearing aids.

Others:

Other reasons which cannot be confined in the earlier tables but can contribute to non-use of hearing aid are listed in the Table 4.40

Table 4.40: Other factors related to non-use of hearing aids in older adults

S.No	*Reasons*	*5*	*4*	*3*	*2*	*1*
1	**Rashes, itching or pain on wearing ear mould/hearing aid.**	4	1	-	-	5
2	Ear wax frequently accumulates.	1	-	-	4	5
3	Difficult to handle in humid climates due to sweat and grime.	1	-	1	4	4
4	Gets headache on using hearing aids.	2	1	-	2	5

Note: 5 = major reason; 1 = minor reason/ not applicable

From Table 4.40 it can be noted that 5/10 did not use their hearing aids because of itching or pain on wearing the ear mold, 3/10 rated headache due to hearing aid , 2/10 rated difficulty to handle in humid climate due to sweat and grime, and 1/10 rated wax accumulation as major contributors of non-use of hearing aids.

4.3 Comparison of benefit in three age groups:

To realize this objective, the questions from the two different questionnaires (SAHH and PEACH) were grouped into six common categories, namely, awareness of speech sounds and awareness of non-speech sounds, speech in quiet in auditory mode, speech in noise in auditory mode, voice recognition, and telephone conversations. The Figure 4.12 depicts the mean percentage of benefit in the six categories.

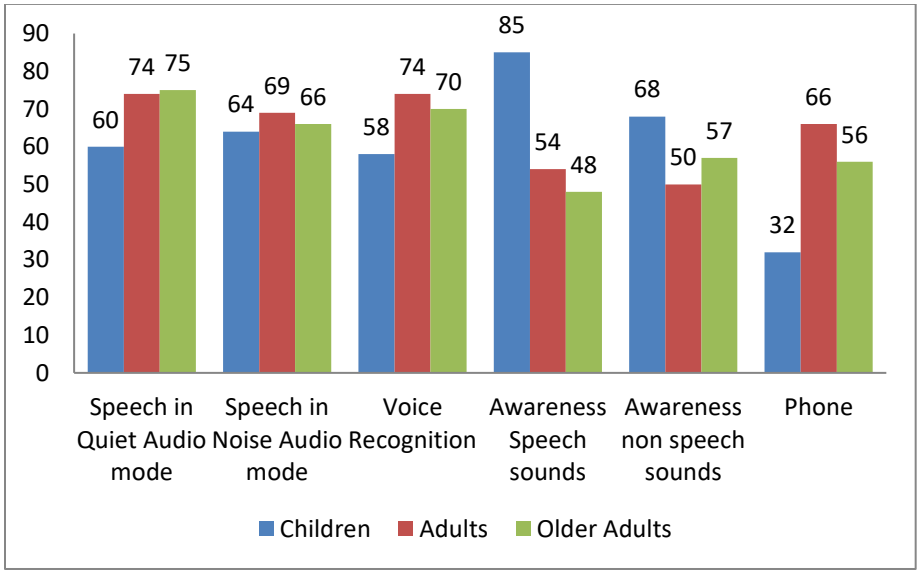

Fig 4.11: Mean percentage benefit in different categories in three age groups

From Figure 4.11 it can be observed that out of the six parameters, children are comparatively less benefitted in four parameters, namely, speech in quiet, speech in noise,

voice recognition and tele phone conversations. It can also be noted that the mean percentage benefit in adults and older adults across the parameters are comparable. In order to know of the three groups differed significantly on different parameters of benefit, non-parametric test were administered.

Comparison of benefit across children and adults:

Mann Whitney U test results revealed that out of the six categories compared, only two, speech in quiet and awareness of speech sounds had difference in terms of benefit received by adults and children; wherein the adults received better benefit in speech in quiet and children received better benefit for awareness of speech sounds (i.e., name call).

Comparison of benefit across children and older adults:

Mann Whitney U test results revealed that out of the six categories compared, only two, speech in quiet and awareness of speech sounds had difference in terms of benefit received by older adults and children; wherein the older adults received better benefit in speech in quiet and children received better benefit for awareness of speech sounds (name call).

The significance value and Z value on Man Whitney U test for speech in quiet is given in the Table 4.41

Table 4.41 Significance value and Z value on Manwhitney U test for speech in quiet in audio mode

Groups	*Speech in Quiet*	
	Z - value	*p- value*
Children vs. Adults	-2.164	0.030*
Children vs. Older Adults	-2.241	0.025*

Note: *:p<0.05

As it can be observed in Table 4.41, there is a significant difference between the children and adults; and children and older adults in understanding speech in quiet .

The significance value and Z-value of awareness of speech sounds is given in the Table 4.42

Table 4.42 Significance value and Z value on Manwhitney U test for awareness of speech

Awareness for speech sounds		
Groups	*p- value*	*Z - value*
Children vs, Adults	0.002**	-3.157
Children vs, Older Adults	0.001**	-3.315

Note: **:p<0.01

As it can be observed, there is a significant difference between the children and adults; and children and older adults for understanding speech in quiet.

Comparison of benefit across adults and older adults:

Mann Whitney U test results revealed that there was no significant difference in terms of benefit received by the adults and older adults in any aspect of hearing aid use.

4.4. Comparison of reasons for non-use of hearing aids across age groups

In Figure 4.13 Y- axis represents reasons for non-use in percentage and X-axis represents the nine categories that summarize the various reasons for non-use.

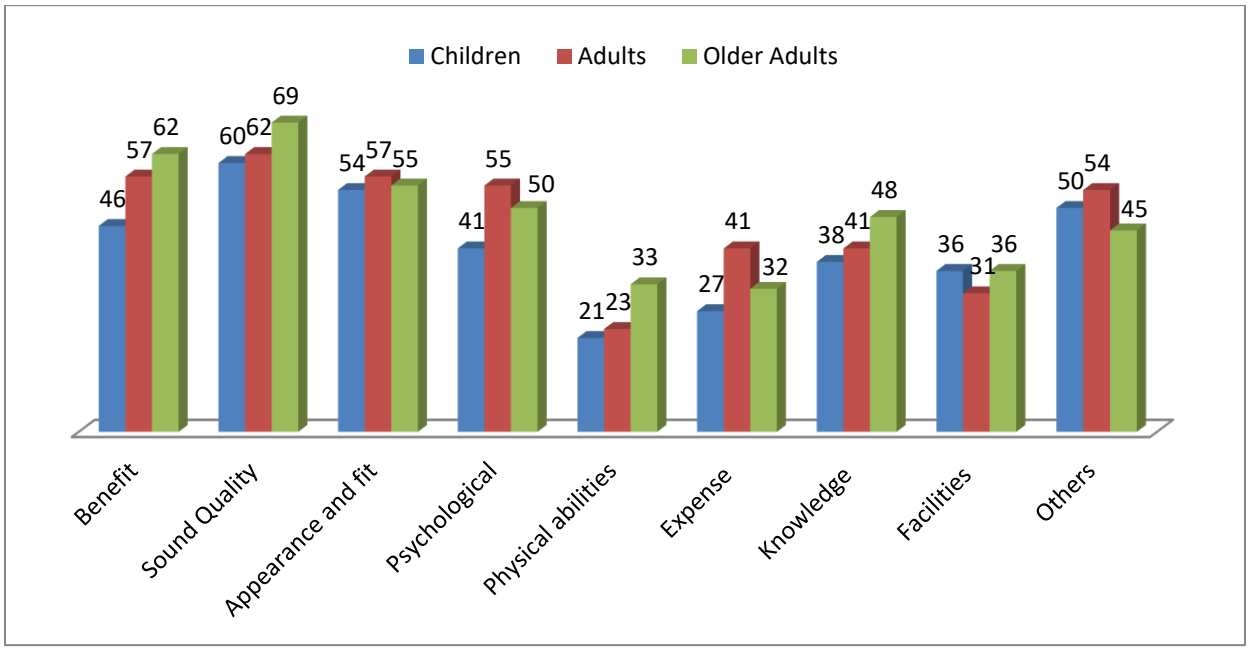

Figure 4.12: Comparison of reasons for non-use of hearing aid in three age groups

From Figure 4.12 it can be noted that the major factors leading to the non-use of procured hearing aids across the age groups are sound quality, lack of benefit, appearance and fit, psychological reasons, and reasons included in the ‘others’ category.

Kruskal Wallis test was done to examine any significant difference between the three groups for the reasons for non-use of hearing aids. Then the parameters found significantly different among the groups underwent Mann Whitney U test.

There was a significant difference found among adults and children for reasons for non-use wherein these reasons were not considered as an important reason for the non-use of hearing aid among children. The reasons along with their p-value and Z-value are given in the Table 4.43

Table 4.43 Reasons found significantly different for the non-use of hearing aid among children and adults.

Reasons	*p- value*	*Z-value*
Hearing aid does not meet expectations	0.000**	-3.822
Hearing aid is annoying and a nuisance	0.004**	-2.854
Wearing hearing aid makes the person feel old	0.002**	-3.113

Note: **: 0.01

The data were subjected to Mann Whitney U test to find the significant difference in the reasons given for non-use among children and older adults.The results obtained are provided in the Table 4.44

Table 4.44 Reasons found significantly different for non-use among children and older adults

Reasons	*p-value*	*Z-value*
Encounters less listening situations	0.000 **	-3.739
Hearing aid does not meet expectation	0.005 **	-2.784
Wearing the aid makes the person feel old	0.001 **	-3.346
The controls of hearing aid are too small for handling	0.005 **	-2.812
Vision is too weak for handling hearing aid	0.030 *	-2.166

Note: *: p<-.05; **: p<0.01

From the Table 4.44 it can be noted that all the reasons listed in the table were major reasons for non-use for hearing aids among older adults and not among children.

Similarly. Mann Whitney U test was done on the adult and older adult population to find any significant difference between their reasons for non-use. The results thus obtained are provided in terms of p-value and z-value in Table 4.45

Table 4.45 Reasons found significantly different among adults and older adults

Reasons	*p- value*	*Z-value*
Encounters less listening situations	0.003**	-2.920
Vision too weak	0.030*	-2.166
Gets headache on using hearing aid	0.010**	-2.565

Note: *: p<0.05; **:p<0.01

The first two of the reasons listed in the table were important reasons for non-use among older adults and the third was an important reason for non-use by adults.

In summary:

Table 4.46: Benefit from hearing aid in children, adults and older adults

Benefit		
Age groups	**Benefit observed**	**Lack of benefit**
Children	- Awareness of name call - Awareness of non-speech sounds - Speech recognition in quiet - Speech recognition in noise - Speech initiation	- Telephone conversation - Voice recognition
Adults	- Voice recognition - Speech in quiet - Speech in noise - Psychological benefit	- Awareness of non-speech sounds - Name call awareness from a distance of 18-20 feet - Localization - Telephone conversation
Older adults	- Voice recognition - Speech in quiet - Speech in noise	- Name call awareness from a distance of 18-20 feet - Awareness of non-speech sounds - Telephone conversation - Localization - Psychological benefit

Table : 4.47 Reasons for non-use of hearing aids in children, adults, and older adults:

Reasons for non-use		
Age groups	**Major reason**	**Minor reason**
Children	- Appearance and fit - Sound quality - Lack of benefit - Others (pain, itching etc.)	- Psychological aspects - Facilities available - Knowledge - Expense
Adults	- Sound quality - Lack of benefit - Appearance and fit - Psychological barriers - Others (i.e., pain, itching)	- Expense - Facilities available - Knowledge - Physical abilities
Older adults	- Lack of benefit - Sound quality - Appearance and fit - Knowledge	- Psychological barriers - Facilities available - Physical - Expense - Others (i.e., pain, itching)

Chapter 5

Discussion

The aim of the present study was to investigate the benefit provided by hearing aid to its users and to find out the reasons for its non-use among individuals who have procured it. In order to realize this objective, a total of three questionnaires were administered on specific populations and the data thus obtained were evaluated. These results are discussed in under the following subheadings:

5.1 Benefit received by children, adults and older adults.

5.2 Reasons for non-use in children, adults and older adults

5.3 Comparison between the benefit received by children, adults and older adults.

5.4 Comparison between the reasons for non-use of hearing aids among children, adults and older adults.

5.1 Benefit received by children, adults and older adults.

The results revealed that there was significant benefit received by the children in perception of speech in quiet and in noisy conditions. It was also noticed that those children who used their hearing aids more regularly and had more years of auditory training benefitted more with the hearing aids than the others. These results are in consonance with various other studies that had similar findings (McKay, 2002; Wendorf, 2010; Walker, Holte, McCreery, Spratford, Page, & Moeller, 2015). The maximum benefit was seen in the parameter of name call. This result is consistent with the study of Gallagher, Happé,

Brunswick, Fletcher, Frith, and Frith (2000), where it was found that there is a unique and robust brain activation that suggests more alertness for one's own name call that is comparatively much higher to the brain activation for a verbal or non-verbal task which requires speech perception through longer attention. Similar studies by Fletcher, Happe, Frith, Baker, Dolan, Frackowiak, and Frith (1995) and Carmody and Lewis (2006) support this finding. There was comparatively less benefit reaped in the parameters of voice recognition and telephone conversations. According to a study done by Van Lanker, Kreiman, and Emmorey (1985), in normal hearing individuals of various age groups it was observed that voice recognition is not a simple task of identifying the formants of the voice of an individual as it was previously known, rather it was a complex acoustic task of identifying set of acoustic patterns and features that include pitch, quality, melody etc. that are unique for each individual. They also found that voice identification scores increased with age with children and young adults below 20 years performing the poorest. This may be indicating the importance of acoustic experience and exposure in terms of years that help in the identification of the unique acoustic patterns specific to individuals. The results of the present study are in consonance with the findings of the study done by Van Lanker et al. It also points to the importance of auditory training for the same.

Speech through telephones is much degraded than natural speech due to lesser bandwidth, acoustic background noise, radio-channel distortion, channel interaction, etc. (Vaseghi, 2006). In a study done by Reynolds, Zissman, Quatieri, O'Leary, and Carlson (1995) where speech recognition in 630 individuals with normal hearing was assessed using clean speech and speech through telephone, it was found that speech recognition

scores using telephone speech was much lower than the clean speech. Thus, it can be construed that individuals with hearing impairment have more difficulty engaging in a telephone conversation as in addition to speech distortions there is an absence of visual cues and the distortion that is created by the hearing impairment and hearing aid. Moreover, majority of the individuals with hearing impairment will not be having an additional program for telephone or may not know how to use them to their advantage. The results of the present study therefore imply the importance of training the children on how to use telephone through their hearing aids as a part of auditory training.

Benefits received by adults and older adults:

The results under the sub-headings of benefit received by adults and older adults are discussed as one unit because of three reasons:

i) The results in terms of benefits received or lack of benefits in adults and older adults follow the same trend.

ii) Existing literature also follow the same trends.

iii) Very few of the existing literature have made the distinction between adults and older adults in terms of population selected for their studies.

The major benefit observed for the adult and older participants is in the domain of voice recognition where older adults had more benefit than adults. These results are in congruence with the existing literature wherein the participants were all normal hearing individuals. A study done by Van Lanker et al., in 1985, showed similar findings as that observed in the present study where the voice recognition benefit was higher in older adults than in adults. Maximum benefit in this parameter may be due to three reasons.

i) Voice recognition is a complex acoustic process but is not as demanding as a linguistic task like understanding an instruction in quiet or noisy situation (Sidtis & Kreiman, 2012).

ii) A linguistic task also requires more attention to detail than a voice recognition task (Plante-Hébert & Boucher, 2015).

iii) It should also be noted that all the participants in the present study had post-lingual hearing impairment who had normal acoustic development for voice recognition. All these factors would have contributed to maximum benefit of hearing aid in this parameter.

The next major benefit was in the domain of speech understanding in quiet followed by speech understanding in noise which is supported by a study done by Golabek, Nowakowska, Siwiec, and Stephens (1988) where 169 adults with a mean age of 52 years were assessed for benefits that they got from their hearing aids. An open-ended self report inventory was employed for the same and it was observed that majority of the individuals reported maximum benefit with the hearing aid for understanding speech in quiet situation (church, home etc.) and they received lesser benefit for understanding speech in noisy situations (conversing in a street, social gathering etc.). A common finding between the present study and the study done by Dillon, Birtles, and Lovegrove (1999) was that though the benefit received by the individuals in noise was lesser than that received in quiet situations it was not less than satisfactory (<60%). The similarities in results between the current study and that done by Dillon et al. (1999) may be because of the recruitment of

regular users of hearing aid in both studies. Studies with similar findings are reported by Cox and Alexander (1991), Hosford-Dunn, Halpern, and Kochkin (1996).

The only parameter that differs in adults and older adults is the amount of psychological benefit received by them. The results in the present study reveal that adults had more benefit in this parameter than older adults. This finding is supported by a similar finding in a study by Hosford-Dunn and Halpern (2001) wherein they administered Satisfaction with Amplification in Daily Life (SADL) questionnaire among individuals having hearing impairment with a wide age range and it was observed that psychological benefits reduced as the age increased. They argued that this may be due to a reduced benefit from hearing aids when compared to adults because of their fast declining cognitive abilities that decreases the perception of speech in quiet and especially in noisy situation which in turn would demand the listener to ask for greater number of repetitions leading to an embarrassing social situation further causing social isolation or withdrawal.

Reduced manual dexterity makes handling the small controls of behind the ear hearing aids a hassle leading to less than optimum benefit from hearing aid which would again lead to lesser psychological benefit. Lesser psychological benefit in older adults may also be because of a lack of motivation which stems from the fact that most of the older adults do not want the hearing aids and were forced to buy one due to familial pressure, they have higher expectations than the paediatric or adult population and the benefit received by them through hearing aids do not meet these expectations (Kemp, 1990). This calls for extensive counselling sessions, pre- and post- fitting, and a supportive hearing therapy with follow ups after hearing aid fitting. In contrast to this, adults get more

psychological benefit through hearing aids as is noted in a study done by Chisolm, Johnson, Danhauer, Portz, Abrams, Lesner, and Newman (2007) in which Hearing Handicap Inventory for adults and the Medical Outcomes Study Short Form 36, Self-evaluation of Life Function were used to assess the benefit received by those with hearing impairment (mean age=50) and it was observed that there was a significant benefit provided by the hearing aids in reducing the emotional and mental stress of the individuals. Another study that supports the present finding is a study conducted by Dye and Peak (1983) on 58 adults to compare between the psychological well-being before and after amplification. It was noticed that all of the participants had lesser psychological stress after amplification. Other supporting studies are by Kochkin and Rogin (2000) and Kochkin (2002).

There was a lack of benefit seen for the understanding of telephone conversation in both the adult and older adult populations. Similar benefit was seen in the qualitative study done by Golabek et al. (1988). Many other studies support the findings of the present study (Robillard & Gillain, 1996; & Dillon et al., 1999; Kochkin, 2002; Fitzpatrick & Leblanc, 2010). This may be because of the deterioration of speech signal through the telephone and because of a lack of knowledge on how to use the hearing aid to better perceive the speech by using a separate programme for telephone (Vaseghi, 2006; Desjardins & Doherty, 2009).

One of the parameters with reportedly least benefit through hearing aids was awareness of non-speech sounds. This finding is supported by a study done by Laroche, Garcia, and Barrette (2001) on 13 individuals with hearing impairment who were

employed. An open-ended method was utilized for collecting information regarding the barriers they face in their work environment that limits their working capabilities. One of the major barriers that the participants faced was the less than optimum benefit through hearing aids in the perception of awareness of non-speech sounds usually employed as warning signals (sound of gong or bells). The clients also found difficulty in perceiving telephone rings thereby increasing the possibilities of missing emergency calls. Such problems would be less in mobile phone users since there are modes in which the ring tone can be perceived in vibration mode. Other supporting studies with similar findings as that of the present study are Golabek et al. (1988) and Dillon et al. (1999). Lesser benefit non-speech sounds may be a reduced redundancy or a lack of context in these sounds. A higher degree of hearing loss especially in the high frequency region would further distort the incoming sounds.

The benefit received in perceiving name call was also less in comparison to the other parameters. It may be because the situations presented in the questionnaire (SAHH) used in the current study was that were highly demanding in terms of listening skills. The first situation was the perception of name call when the client is at a distance of 18 to 20 feet from the speaker. The second situation was perception of name call when the client is watching television. Majority of the clients reported that it was very difficult to attend to name call when they are attending to another stimulus (television) even with the help of a hearing aid.

The least benefit noticed for adults and older adults is in localization skills. This result is not necessarily because the hearing aid is not beneficial for the clients rather it is

because many of the clients did not suffer from deficits in localization in the unaided condition, i.e., they were able to localize accurately for more than 75 to 80% of the time (5/10 in older adult population and 4/10 in the adult population). The final results of the present study reveal that localization skills decrease with an increase in the degree of hearing loss. Another finding of the present study was that individuals with conductive components in their hearing loss had localization more affected than the others. Both these findings are in consonance with the results of a study done by Noble, Byrne, and Lepage (1994). Noble et al. (1994) assessed the horizontal and vertical localization abilities of 87 older adults (mean age = 62 years). In the same experiment the relation between the type of hearing loss and the localization abilities of these individuals were also investigated. They found that individuals with higher degrees of hearing loss (moderately severe to profound hearing loss) and with conductive component (conductive or mixed hearing loss) had more difficulty in localization. They reasoned that localization is affected in the higher degree of hearing loss due to lower audibility leading to lesser amount of interaural time and intensity cues being perceived and in case of a conductive component, there is a distortion of low-frequency interaural time cues. It was also noted that individuals who were aided bilaterally benefitted more in this aspect than those who were fitted monaurally. This is supported by a study done by Kobler, and Rosenhall (2002) on 19 individuals with mild to moderate hearing loss. In their study, they observed that bilateral amplification aided horizontal amplification while monaural fitting did not provide any benefit to the individual while in some cases it was seen to deteriorate the localization accuracy of the individual.

5.2 Non-use of hearing aids in children, adults and older adults

The reasons for non-use of hearing aids in children, adults and older adults are discussed in the following sections.

Non- use of hearing aids in children:

The major reasons for non-use of in children lies in the parameters of appearance and fit, lack of benefit, reduced sound quality, others, and psychological. In the present study it has been observed that children are reluctant in using their hearing aids mainly because of a lack of benefit in both quiet and noisy situation, or because the hearing aids amplify noise. The existing literature reports that those children with higher degree of hearing loss (moderately severe to profound) consistently use their hearing aids when compared to children with mild to moderate degree of hearing loss as the need of the hearing aid is more crucial in individuals with higher degree of hearing loss which also correlates with the benefit that they receive (Walker, Spratford, Moeller, Oleson, Ou, Roush, & Jacobs, 2013 ; Munoz, Preston, & Hicken, 2014; Marnane, & Ching, 2015). The results obtained in the present study do not show any such dependency of non-use of hearing aid on degree of hearing loss. This may be because of the small sample size and also because of various other factors contributing to the non-use of hearing aids in addition to a lack of benefit. Whistling and feedback was one such factor contributing to the non-use of hearing aid. This may be because of a lack of awareness about the continuous growth of ear canal that requires regular sittings for getting an appropriate fit of ear moulds (Mueller, Bright, & Northern, 1996). From this study it was observed that a lack of benefit of conversation over phone is another reason for non-use in children. There is no existing

literature with a similar finding. The procedural protocol for hearing aid programming in children recommends the use of only a single programme with wide bandwidth so that unintentional switching of channels might not disrupt the speech perception. The use of a programme for telephone in the hearing aid would not benefit children in their initial stages of language development as this has a very narrow bandwidth and it may cut off important information essential for acquiring language. The parents need to be counselled about this so that they can motivate the child to use the hearing aid more consistently.

A major contributor to the rejection of hearing aids was the psychological barriers. Because of increased anxiety of not wanting to be treated differently from their peers and because of a lack of awareness of the extent of consequences of their handicap, the child feels disabled on wearing the hearing aid. This may also be because normal hearing children do treat the children wearing hearing aids (Dengerink, & Porter, 1984). This implies that a widespread social awareness especially to the normal hearing children in inclusive educational set up is of paramount importance. Another important factor that led to the non-use of hearing aids is a lack of awareness among the parents about the consequence of the child's handicap in the quality of life of the child. In majority of the cases (6/11), the parents were of the impression that less than four hours of hearing aid usage was sufficient for the child. Hence many of these children were wearing their hearing aids only for their school hours, as reported by the parents. Also there was a lack of motivation among the parents to send the child for auditory training as some of them reported that they understand what the child communicates to them through gestures or that the child is proficient in sign language which is sufficient for the parents. In various

studies it has been noted that the maternal education is a predictor of non-use of hearing aids among the children, i.e, children of mothers who have a low educational background were more likely to not use their hearing aid(Walker, et al., 2013; Munoz, Preston, & Hicken, 2014; Gustafson, Davis, Hornsby & Bess, 2015; Marnane & Ching, 2015). This calls for intensive counselling for the mothers, especially in case of mothers from lower socio economic status and lower educational backgrounds, both before and after fitting of the hearing aid of the child and also regular follow ups which helps in ensuring the optimum use of hearing aids by the child (Munoz, et al. 2014).

Another reason for non-use was reduced sound quality of the hearing aids. Two of the participants were children with unilateral hearing loss. A comparison with the natural hearing and hearing through a hearing aid must have been a factor associated with rejection of their hearing aids. A similar finding was reported in an interview done by Watson, and Gregory, (2005) on seven hearing impaired children (age range being 6 to 10 years) with cochlear implants for the purpose of assessing the reasons for non-use of their implant, one of the major reason noted was aversiveness to the sound heard through the implant.

A lack of cosmetic appeal was another reason noted for the non-use of hearing aids in children. Majority of the children in the present study were in the age range of 6-15 years (10/11). It is at this very stage also known as middle childhood, that the child enters a stage of development where the child compares himself / herself with their peers (Eccles,1999). A child would therefore be hesitant in wearing a hearing aid as this would prevent him/her from fitting in with their peers.

It was also noticed that children rejected their hearing aids because of a feeling of occlusion. Similar kind of results was found in adults and older adults (Oberg, 2012; Kochkin, 2000). This problem can be tackled by introducing vents, or increasing the length of the ear mold (Mueller, Bright, & Northern, 1996).

For majority of the children (8/10) an important reason to not use their hearing aid was itching or pain on wearing the hearing aid and for 9/10 children it was an important reason was headache on using hearing aid. These problems need to be tackled by counselling the parents on the importance of visiting an audiologist for any such concerns, so that s/he can take an appropriate action like correcting an ill fitting ear mold or reducing the gain of the hearing aids that might be causing the headache or referring to a paediatrician to solve any allergies or middle ear infection that may be causing the pain or itching sensation(Cockerill, 1987; Alvord, Doxey, & Smith,1989).

5.3 Non- use in adults and older adults:

Since the reasons for non-use in adults and older adults are very similar they are discussed together. Few exceptions noted are also discussed separately. It was observed in the present study that one of the major reason for non- use of hearing aids among adults and older adults were a lack of benefit in both quiet and noisy situations. The participants of the study reported that they were able to perceive sounds but were not able to understand them. According to the present study, other reasons for non-use which contributes to a lack of benefit are amplification of noise, ineffectiveness of the hearing aid over phone and the hearing aid being too loud for comfort. Similar kind of results were found in various other studies (Bertoli et al, 2009; Oberg et al 2012; Kochkin, 2000; Franks and Beckmann,1985;

Surr, Schuchman, & Montgomery,1978). According to Kochkin (2000), in order to reduce the number of people not using their hearing aid due to a lack of benefit, an ongoing benefit outcome measure needs to be done after 30 and 90 days of hearing aid fitting. The utilization of a subjective outcome measure like Client Oriented Scale of Improvement (COSI) is important in this regard as the outcome through hearing aid in a clinical set up and real life setting may be very different (Cox, 2003, Weinstein, 1996). Employing hearing aids which are programmable with different programmes for quiet situation, noisy situation and for talking over phone have also shown to increase the perceived benefit of hearing aids (Walden, Surr, Cord, Edwards, & Olson, 2000; Humes, Ahlstrom, Bratt, & Peek, 2009).

In older adults in addition to the above mentioned reasons, reasons such as persisting whistling and feedback, not able to localize effectively, and encountering less listening situations, have also lead to non-use of their hearing aids. These results are in congruence with study done by Hickson, Clutterbuck, and Khan (2010), and Kochkin (2000). Higher chances of whistling and feedback may be due to wax accumulation in the ear that unseats the ear mould or an ill fitting ear mold which also has a high probability in older adults as many of them present with collapsed ear canals (Fook & Morgan, 2000). In the survey done by Kochkin in 2012, it was reported that majority of the older adult participants were not satisfied with the benefit of their hearing aid in the area of localization that is represented by the lesser satisfaction with the directionality feature in hearing aids. Noble, Ter-Horst, and Byrne (1995) reported that increased localization disability was

associated with greater experiences of handicap. This may further lead to the non-use of hearing aids.

All the participants in the present study were individuals who were retired and majority of them (8/10) were not active participants of any social activities which reduced their motivation in not wearing their hearing aids as there was reduced listening situations in their present lifestyle. Another major reason for non- use among adults and older adults are reduced sound quality of hearing aids. This is also one of the primary reason cited in many studies (Surr et al, 1978; Kochkin , 2000; Sorri, Luotonen, & Laitakari, 1984). In a study done by Rawls, & MacDonald (2014) to compare the sound quality of a basic digital hearing aid with a technologically advance analog to digital converter that was able to handle input levels of up to 113 dB without producing artifacts, it was found that the participants had better satisfaction with the second hearing aid. Fine tuning and employing multiple memories and appropriate assistive listening devices like inductive loops have also been found to improve sound quality (Kochkin, 2000).

A lack of cosmetic appeal and hearing aid causing occlusion (like ear plugs) was also observed to be a reason for non-use in both adults and older adults. The non-use because of satisfaction in its cosmetic appeal is mainly due to social stigma and a negative attitude of society towards hearing aids. It also depends on the client's motivation (Gianopoulos, Stephens, & Davis, 2002).It can be addressed through increasing the awareness about hearing impairment and its solution to the society and through extensive counselling(Brooks, 1979). Ears feeling plugged can be alleviated by using an appropriate

sized vent, increasing the canal length of the ear so that cartilaginous vibrations are reduced and also through counselling (Mueller, Bright, & Northern, 1996).

Psychological reasons are among the primary reasons for non-use in both adults and older adults. Both the populations found hearing aid to be annoying and a nuisance, and that wearing hearing aids would make them be perceived as disabled or inferior. The fear of being treated differently also was a reason common to both the population. In a study done by Hartley, Rochtchina, Newall, Golding, & Mitchell (2010) on older adults it was found that those individuals rejected their hearing aids because they found the hearing aid uncomfortable. These and few other authors suggest that a lack of knowledge on how to wear and use the hearing aids may make the individuals perceive the hearing aid as being bothersome, irritating or a hassle (Tomita, Mann, & Welch, 2001; Gopinath, Schneider, Hartley, Teber, McMahon, Leeder, & Mitchell, 2011; Oberg, Marcusson, Nägga, & Wressle, 2012). This problem therefore needs to be tackled with effective counselling. Kockin (1993) reported that 60% of individuals with hearing impairment in age an age range from 35 and 44 years and 30 % in the age range of 75 and 84 years felt reported stigma of the society towards people who wear hearing aids as the major reason for rejecting their hearing aids. This stigma of the society towards individuals who wear hear aids, known as the hearing aid effect, which makes them perceive individuals having hearing impairment with hearing aids as being disabled and treat them differently, exacerbates the feeling of inferiority in them (Johnson, Danhauer, & Edwards, 1982). The hearing aid effect is common to all age groups and it calls upon widespread awareness

about hearing aids in the society and extensive counselling (Brimacombe, Danhauer, & Mulac1983; Blood, 1997).

In addition to this, it was noted in the study that older adults reject their hearing aids due to their high expectations about the hearing aid not being met. Similar results have been reported by Kochkin (2000). In a study done by Meister et al. (2008) on individuals with hearing impairment with an age range of 32 to 90 years wherein the pre-fitting expectation levels were compared to the willingness to use the hearing aid post fitting. It was found that older adults had over expectations about the hearing aids which was correlated to their more irregular usage when compared to the adults. This may be attributed to a lack of awareness among the first time users about the benefit that can be provided through the hearing aid (Cox & Alexander, 2000). It was also observed that older adult population rejected the hearing aid because of a perceived lack of handicap or because of reduced listening situations. Similar findings were reported by other authors (Kochkin, 2000; Tomita et al., 2001; Oberg et al., 2012). This is attributed to the older individuals taking hearing impairment as a natural course of event. This with the fact that most of these individuals will be retired leading to lesser listening situations would further increase the chances of rejection of hearing aids (Hallberg & Carlsson, 1991).

In the present study it was noted that 1/10 adults and 2/10 older adults rated their reduced physical abilities hindering the use of hearing aids as a reason for rejecting their aids. This finding is in consonance with the study by Bertoli et al. (2009) where it was observed that visual difficulties reduced manual dexterity in older adults would impede their hearing aid usage. Automatic hearing aids or smart hearing aids that switches from

programme to another according to the listening situation of the client and hearing aids with remote control or other technologies like synchronised binaural system would prove to be helpful to these individuals (Kochkin, 2000).

In this study it was noticed that only 4/10 in the adult population and 2/10 in the older adult population were not using their hearing aids because they found the cost of batteries or repair to be too expensive. Also 3/10 individuals in older adult population and 2/10 in adult population found the facilities for maintenance and repair of hearing aids to be far away and the transportation to these facilities to be difficult thus hindering optimal use of their hearing aids. Counselling regarding the available facilities in their localities would help to tackle this problem.

One of the major reason for non use among 3/10 individuals in the adult population and 5/10 in the older adult population was a lack of knowledge on how to use their hearing aids. A similar observation was made by Vuorialho et al. (2006). In a study done by Desjardins et al. (2009) on adult and older adult population revealed that there is a high degree of variability in the amount of knowledge a person has regarding how to wear and use a hearing aid. This obstacle needs to be tackled by effective counselling (Brooks, 1979).

It was noted that of the major reasons for the non-use in hearing aids in adults is headache on wearing the hearing aid (10/10 individuals). Another important reason common to both adult and older adult population was rashes, itching and pain on wearing the ear mould/ hearing aid. These reasons were cited by Bertoli et al. (2009). The headache on using hearing aids may be because of ill fitted ear molds or if the hearing is programmed with a higher gain than necessary. Itching and rashes may be allergic reaction to the ear

mold material Cockerill, (1987). This is more common in individuals with middle or external ear infections (Alvord, Doxey, & Smith, 1989). This needs to be addressed by frequent otologic follow ups and using allergy resistant material like hard acrylic.

5.3 Comparison between the benefit received by children, adults and older adults.

In this study on comparing the benefit across children, adults and older adults it was found that children had less benefit when compared to adults and older adults in four parameter out of a total of six parameters. These four parameters are speech in quiet in audio mode alone, speech in noise in audio mode alone, voice recognition and phone conversations. In a study done Eisenberg, Shannon, Schaefer Martinez, Wygonski, and Boothroyd (2000) on comparing the speech recognition ability of normal hearing children (mean age = 11 years) and adults (mean age = 29 years) for spectrally distorted word and sentences, it was observed that children scored the poorest. This was attributed to incomplete cognitive development and requirement of long learning period for increasing the redundancy of the child. The results of this study can be extrapolated to support the findings of the present study as speech in noise and phone conversation are both distorted signals that would require an internal redundancy to perceive the speech which would be missing in these pre-lingual children while voice recognition needs an acoustic memory and other higher order cognitive processing that may require even more long learning periods.

Mann Whitney results revealed a significant difference in the benefit received in name call awareness among children and adults and older adults. Children were observed to have better benefit in the aspect of name call. There are no existing literature to report

this finding. It may be due to the fact that the question used to assess name call in adults and older adults specified a distance of 18-20ft across which they had to perceive the name call while no such specification in distance was provided for evaluating name call awareness in children.

5.4 Comparison for reasons for the non-use across age groups.

Results reveal that in comparison with the other age groups the older adults reject hearing aid mostly because of a lack of benefit, poor sound quality and lack of knowledge on how to wear or use the hearing aid. The first three reasons are due to over expectations and the third can be solely attributed to ineffective counselling (Kemp, 1990). The result obtained through this study suggests that the major reasons for adult rejecting their hearing aids are mainly because of poor sound quality, lack of benefit, aspects related to appearance and fit, psychological factors and aspects involved in the others category. This finding implies that on counselling the adults, the major focus should be on empowering them against the negative attitude of society as well as on the consequences of having over expectations.

The results on comparison show that children reject their hearing aids due to poor sound quality, lack of benefit, appearance and fit and psychological factors. For optimum use of hearing aid in children, intensive counselling needs to be given to the caregivers to motivate them and to make them aware about the consequence of an untreated hearing loss in the quality of life of the child. Counselling needs to be especially provided for mothers from low socio economic status and educational background as the children of these mothers have a high likelihood of not using their hearing aids as noted through the results

of the present study. Counselling sessions that make use of videos and models will prove to be more effective as this will last longer in the memory.

Mann Whitney U test revealed a significant difference between children and adults for three different reasons, namely, annoyance related to the hearing aid, over expectations and perception of feeling old on wearing hearing aid is more seen in adults rather than in children.

A significant difference between children and older adults was also noted wherein difficulty of handling the hearing aid, reduced visual abilities, over expectations and fewer listening situations are reasons mentioned by older adults than children.Reasons revealed to be significantly different in between adults and older adults are fewer listening situations, and reduced visual abilities that are more reported reasons by older adults while persisting headache on wearing hearing aids is a reason more reported by adults.

(Munoz, et al. 2014). Pediatric hearing aid use: How can audiologists support parents to increase consistency?. *Journal of the American Academy of Audiology*, *25*(4), 380-387..

Chapter 6

Summary and Conclusion

The aim of the present study was to obtain the reasons behind consistent or regular use of hearing aids or in other words, the benefit provided by the hearing aids, and also to understand the reasons behind the non-utilisation of hearing aid after the purchase.

The specific objectives were:

- To find the benefits from hearing aids received by children, adults and older adults
- To find the reasons for the non-use after procuring BTE hearing aids among children, adults and older adult population.
- To compare the hearing aid benefits received among the three age groups.
- To compare the reasons for non-use of hearing aids among the three age groups.

The study was done by utilizing the Parents' Evaluation of Aural/Oral Performance of Children (PEACH) questionnaire (Ching & Hill, 2005) to assess the children for the benefit received by them through hearing aids, and using the Self Assessment of Hearing Handicap scale (SAHH) questionnaire (Vanaja, 2000) for assessing benefit through hearing aids in adults and older adults. A questionnaire to collect information on non-use of hearing aid was developed through literature review and employed to assess the reasons for non-use in children, adults and older adults.

Benefit from hearing aid in children, adults and older adults

Benefit		
Age groups	**Benefit observed**	**Lack of benefit**

Children	- Awareness of name call - Awareness of non-speech sounds - Speech recognition in quiet - Speech recognition in noise - Speech initiation	- Telephone conversation - Voice recognition
Adults	- Voice recognition - Speech in quiet - Speech in noise - Psychological benefit	- Awareness of non-speech sounds - Name call awareness from a distance of 18-20 feet - Localization - Telephone conversation
Older adults	- Voice recognition - Speech in quiet - Speech in noise	- Name call awareness from a distance of 18-20 feet - Awareness of non-speech sounds - Telephone conversation - Localization - Psychological benefit

Reasons for non-use of hearing aids in children, adults, and older adults:

Reasons for non-use		
Age groups	**Major reason**	**Minor reason**
Children	- Appearance and fit - Sound quality - Lack of benefit - Others (pain, itching etc.)	- Psychological aspects - Facilities available - Knowledge - Expense
Adults	- Sound quality - Lack of benefit - Appearance and fit - Psychological barriers - Others (i.e., pain, itching)	- Expense - Facilities available - Knowledge - Physical abilities
Older adults	- Lack of benefit - Sound quality - Appearance and fit - Knowledge	- Psychological barriers - Facilities available - Physical - Expense - Others (i.e., pain, itching)

The findings on benefits derived from hearing aids in children, adults and older adults are as follows:

1. In children, benefit was reported in domains such as awareness of name call, awareness of non-speech sounds, speech recognition in quiet, speech recognition in noise, and speech initiation.
2. The benefit from hearing aid was limited in telephone conversation and recognition of voice in children.
3. In adults, the hearing aid was beneficial in recognition of voice, speech recognition in quiet, speech recognition in noise and psychological aspects.
4. The adults got limited benefit from hearing aids in awareness of non-speech sounds, awareness of name call from a distance of 18 to 20 feet, localization, and telephone conversation.
5. In older adults the benefit from hearing aids included recognition of voice, speech recognition in quiet, and speech recognition in noise
6. The older adults did not obtain benefit from hearing aids in awareness of name call from a distance of 18 to 20 feet, awareness of non-speech sounds, telephone conversation, localization, and psychological aspects.

The reasons for non-use of hearing aids in children, adults and older adults are as follows:

1. The major reasons for non-use of hearing aids in children included appearance and fit,

   sound quality, lack of benefit, and other reasons such as pain, itching etc. The minor reasons included psychological aspects, facilities available, knowledge on hearing aid usage and expenditure for maintenance of hearing aid.
2. The major reasons for non-use of hearing aids in adults included sound quality, lack of benefit, appearance and fit, psychological aspects, and others (i.e., pain, itching) The minor reasons were maintenance expenditure, facilities available, knowledge on hearing aid usage, and physical abilities.
3. The major reasons for non-use of hearing aids in older adults were lack of benefit, sound quality, appearance and fit, and knowledge. The minor reasons were psychological aspects, facilities available, physical, expense, and others (i.e., pain, itching)

Comparison of benefit received by children, adults, and older adults revealed that relatively lesser benefit is received by the children in parameters of speech in quiet and in noise, voice recognition, and telephone conversations.

Comparison of reasons among non-use revealed that there were three major reasons that were significantly different between children and adults. Adults had higher expectations than children, adults more often reported the hearing aid being a nuisance and

wearing the aids make the adult feel old. Among children and older adults, the comparison showed a significantly higher chance of the adult rejecting the hearing aid as they encounter very less demanding listening situations. They tend to have higher expectations about hearing aids than children. Eye sight being poorer weak and self perception of feeling ‘old’ on wearing the hearing aids are also reasons especially reported by older adults. Among adults and older adults, the reasons that had more weightage to older adults as a reason for non-use was found to be exposure to fewer listening situations and decreased vision.

6.1 Clinical implications

The study focuses on understanding the areas where benefits are accrued from the hearing aid, and identifying the areas where little or no benefit is availed by them. Rectification or resolution of such shortcomings could lead to improvement in the benefit and satisfaction obtained from hearing aids and thus improvement in the quality of life.

This study is also aimed at identifying the reasons that lead to the rejection of hearing aids so that the identification of the problem can call for appropriate clinical solutions to overcome the problem. For example, if the rejection of hearing aid is due to a lack of understanding of its usage and maintenance, an effective counselling would eliminate the chance of rejection of hearing aid due to this cause.

6.2 Future directions for research

This was a preliminary study done on a small sample. More extensive research on a large number of population would be fruitful in identifying areas where the listening experience of a client can be improved and also in identifying strategies to reduce the non-use of hearing aids. Research can also be conducted to find the effect of factors such as age, degree of hearing loss, or type of hearing loss on the benefit and non-use of hearing aids.

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Appendix A: Parents' evaluation of aurl/oral performance of children (PEACH), Ching and Hill, 2005

S.N		ಎಂದಿಗೂ ಇಲ್ಲ 0%	ವಿರಳ 1- 25%	ಕೆಲವು ಬಾರಿ 26-50%	ಸಾಮಾನ್ಯವಾಗಿ 51-75%	ಯಾವಾಗಲು 75–100%
01.	ನಿಮ್ಮ ಮಗು ಎಷ್ಟು ಬಾರಿ ಮೆಷಿನ್ ಧರಿಸಿದೆ (ಒಂದು ದಿನದಲ್ಲಿ)?					
02.	ಎಷ್ಟು ಬಾರಿ ನಿಮ್ಮ ಮಗು ಅತಿ ಜೋರು ಶಬ್ದಗಳಿಗೆ ಕಿರಿಕಿರಿ ವ್ಯಕ್ತಪಡಿಸಿದೆ?					
03.	ನಿಶ್ಯಬ್ದವಾದ ವಾತಾವರಣದಲ್ಲಿ ನೀವು ನಿಮ್ಮ ನಿಮ್ಮ ಮಗುವಿನ ಹೆಸರನ್ನು ಕರೆದಾಗ ನಿಮ್ಮ ಮಗು ಗಮನಕೊಡುತ್ತದೆಯೇ?					
04.	ನಿಶ್ಯಬ್ದವಾದ ವಾತಾವರಣದಲ್ಲಿ ನಿಮ್ಮ ಮಗು ನೀವು ಹೇಳಿದ ಸುಲಭವಾದ ಕೆಲಸವನ್ನು ಪಾಲಿಸುತ್ತದೆಯೇ?					
05.	ಗಲಾಟೆಯ ವಾತಾವರಣದಲ್ಲಿ ನಿಮ್ಮ ಮಗುವಿನ ಹೆಸರು ಕರೆದಾಗ,ಮುಖ ನೋಡದೆ ಹೆಸರಿಗೆ ಪ್ರತಿಕ್ರಯಿಸುತ್ತದೆಯೇ? ಉದಾ: ಮೇಲೆ ನೋಡುವುದು, ತಿರುಗುವುದು ಅಥವಾ ಉತ್ತರ ನೀಡುವುದು.					
06.	ಗಲಾಟೆಯ ವಾತಾವರಣದಲ್ಲಿ ನೀವು ಹೇಳಿದ ಸುಲಭವಾದ ವಾಕ್ಯಗಳನ್ನು ಪಾಲಿಸುತ್ತದೆಯೇ?					
07.	ನಿಶ್ಯಬ್ದವಾದ ವಾತಾವರಣದಲ್ಲಿ ನಿಮ್ಮ ಮಗುವಿನ ಜೊತೆ ಓದುತ್ತಿರುವಾಗ ನೀವು ಓದುತ್ತಿರುವುದನ್ನು ನಿಮ್ಮ ಮಗು ಎಷ್ಟು ಬಾರಿ ಗಮನಹೆಸುತ್ತದೆ? ಅಥವಾ ಸುತ್ತಮುತ್ತಲಿನ ವಾತಾವರಣ ಶಾಂತವಾಗಿದ್ದು, ನಿಮ್ಮ ಮಗು ಟಿ.ವಿ ಯಲ್ಲಿ ಹಾಡನ್ನು / ಕಥೆಯನ್ನು ಕೇಳುವಾಗ ಎಷ್ಟು ಬಾರಿ ಅರ್ಥ ಮಾಡಿಕೊಳ್ಳುತ್ತದೆ.					
08.	ಶಾಂತವಾದ ವಾತಾವರಣದಲ್ಲಿ ನಿಮ್ಮ ಮಗು ನಿಮ್ಮ ಜೊತೆ ಸಂವಹಿಸಲು ಎಷ್ಟು ಬಾರಿ ಮಾತನ್ನು ಪ್ರಾರಂಭಿಸುತ್ತದೆ / ಭಾಗವಹಿಸುತ್ತದೆ?					
09.	ಗಲಾಟೆಯ ವಾತಾವರಣದಲ್ಲಿ ನಿಮ್ಮ ಮಗು ನಿಮ್ಮ ಜೊತೆ ಸಂವಹಿಸಲು ಎಷ್ಟು ಬಾರಿ ಮಾತನ್ನು ಪ್ರಾರಂಭಿಸುತ್ತದೆ/ ಭಾಗವಹಿಸುತ್ತದೆ?					
10.	ನೀವು ಕಾರು /ಬಸ್ಸು /ಟ್ರೈಲಿನಲ್ಲಿ ಹೇಳಿದ ಮಾತನ್ನು ನಿಮ್ಮ ಮಗು ಎಷ್ಟು ಬಾರಿ ಅರ್ಥಮಾಡಿಕೊಳ್ಳುತ್ತದೆ?					
11.	ನಿಮ್ಮ ಮಗು ವ್ಯಕ್ತಿಯ ಮುಖವನ್ನು ನೋಡದೆ ಎಷ್ಟು ಬಾರಿ ಅವರ ಧ್ವನಿಯನು ಗುರುತ್ತಿಸುತ್ತದೆ?					
12.	ನಿಮ್ಮ ಮಗು ಫೋನ್ ಅನ್ನು ಎಷ್ಟು ಬಾರಿ ಯಶ್ಸ್ವಿಯಾಗಿ ಉಪಯೋಗಿಸುತ್ತದೆ?					
13.	ನಿಮ್ಮ ಮಗು ವ್ಯಕ್ತಿಯ ಧ್ವನಿಯನ್ನು ಬಿಟ್ಟು ಎಷ್ಟು ಬಾರಿ ಬೇರೆ ಶಬ್ದಗಳಿಗೆ ಪ್ರತಿಕ್ರಯಿಸುತ್ತದೆ? ಉದಾ: ಬಾಗಿಲ ಶಬ್ದ, ಕುಕ್ಕರ್ ಶಬ್ದ					

Appendix B: Self assessment of hearing handicap(SAHH) Vanaja, 2000

Appendix B: Kannada translated version of Self Assessment of Hearing Handicap
(Please Note: Only Questions from 1-7 & 22 were utilized in the present study)

	ಕೆಲವು ಸಂದರ್ಭಗಳು
1.	ಈ ಕೆಳಗೆ ಕೇಳಿರುವ ಸಂದರ್ಭಗಳಲ್ಲಿ ಮಾತನ್ನು ಅರ್ಥಮಾಡಿಕೊಳ್ಳಲು ನಿಮಗೆ ಎಷ್ಟು ಕಷ್ಟವಾಗುತ್ತದೆ?
a.	ನಿಮ್ಮ ಪಕ್ಕದಲ್ಲಿಯೆ ಕುಳಿತಿರುವ ನಿಮ್ಮ ಮನೆಯ ಸದಸ್ಯರ ಜೊತೆ ಮುಖ ನೋಡಿಕೊಂಡು ಮಾತನಾಡುವಾಗ
b.	6 ರಿಂದ 8 ಅಡಿ ದೂರದಿಂದ ನಿಮಗೆ ಪರಿಚಯವಿರುವ ವ್ಯಕ್ತಿಯ (ಪುರುಷ/ಗಂಡಸು) ಜೊತೆ ಮಾತನಾಡುವಾಗ
c.	6 ರಿಂದ 8 ಅಡಿ ದೂರದಿಂದ ನಿಮಗೆ ಪರಿಚಯವಿರುವ ವ್ಯಕ್ತಿಯ (ಮಹಿಳೆ/ಹೆಂಗಸು) ಜೊತೆ ಮಾತನಾಡುವಾಗ
d.	10 ರಿಂದ 12 ಅಡಿ ದೂರದಿಂದ ಯಾರಾದರು ಒಬ್ಬರು ಮನೆಯ ಸದಸ್ಯರೊಂದಿಗೆ ಮಾತನಾಡುವಾಗ
e.	ನಿಮಗೆ ಪರಿಚಯವಿರುವ ವ್ಯಕ್ತಿಯೊಂದಿಗೆ ಫೋನಿನಲ್ಲಿ ಮಾತನಾಡುವಾಗ
f.	ನಿಶ್ಯಬ್ಧವಾದ ಕೋಣೆ/ರೂಮಿನಲ್ಲಿ ಸುಮಾರು 6 ರಿಂದ 8 ಅಡಿ ದೂರದಿಂದ ಟೀವಿ ನೋಡುವಾಗ (ಚೆನ್ನಾಗಿ ಕೇಳಿಸಿಕೊಳ್ಳುವವರು ಇಟ್ಟಂಥಹ ವಾಲ್ಯೂಂನಲ್ಲಿ)
g.	[redacted]
h.	ನಿಶ್ಯಬ್ಧವಾದ ಕೋಣೆ/ರೂಮಿನಲ್ಲಿ ಸುಮಾರು 3 ಅಡಿ ದೂರದಿಂದ ರೇಡಿಯೋ ಕೇಳುತ್ತಿರುವಾಗ (ಚೆನ್ನಾಗಿ ಕೇಳಿಸಿಕೊಳ್ಳುವವರು ಇಟ್ಟಂಥಹ ವಾಲ್ಯೂಂನಲ್ಲಿ)
i.	6 ರಿಂದ 8 ಅಡಿ ದೂರದಿಂದ ಗದ್ದಲವಿರುವ ರೂಮಿನಲ್ಲಿ/ಕೋಣೆಯಲ್ಲಿ ಟೀವಿ ನೋಡುವಾಗ
j..	ಜನರಿಂದ ತುಂಬಿರುವ ಬಸ್ಸಿನಲ್ಲಿ ಕಂಡಕ್ಟರ್‌ನೊಂದಿಗೆ ಮಾತನಾಡುವಾಗ
k.	ತುಂಬಾ ಜನರಿರುವ ರೈಲ್ವೆ ಸ್ಟೇಷನ್ನಿನಲ್ಲಿ ನಿಮ್ಮ ಪಕ್ಕ ನಿಂತಿರುವವರ ಜೊತೆ ಮಾತನಾಡುವಾಗ
l.	ಬಿಡುವಿಲ್ಲದೆ/ತುಂಬಾ ಜನರಿರುವ ಅಂಗಡಿಯಲ್ಲಿ ಮಾಲೀಕನ ಜೊತೆ ಮಾತನಾಡುವಾಗ
m.	[redacted]

n.	ಹೋಟೆಲಿನಲ್ಲಿ ಎದುರಿನಲ್ಲಿ ಕುಳಿತಿರುವ ಪರಿಚಯವಿರುವ ವ್ಯಕ್ತಿಯ ಜೊತೆ ಮಾತನಾಡುವಾಗ
o.	ಮದುವೆ ಮನೆಯಲ್ಲಿ ನಿಮ್ಮ ಪಕ್ಕದಲ್ಲಿ ಕುಳಿತಿರುವ ವ್ಯಕ್ತಿಯ ಜೊತೆ ಮುಖ ನೋಡದೆ ಮಾತನಾಡುವಾಗ
p.	[redacted]
q.	ಟೀವಿ ಅಥವ ರೇಡಿಯೊ ಹಾಕಿರುವಾಗ ನಿಮ್ಮ ಪಕ್ಕದಲ್ಲಿರುವವರು ನಿಮ್ಮೊಂದಿಗೆ ಮಾತನಾಡಿದರೆ
r.	ಚಿತ್ರಮಂದಿರಲ್ಲಿ/ಥಿಯೇಟರ್‌ನಲ್ಲಿ ನಿಮ್ಮ ಪಕ್ಕ ಕುಳಿತಿರುವ ವ್ಯಕ್ತಿಯೊಂದಿಗೆ ಮುಖ ನೋಡದೆ ಮಾತನಾಡುವಾಗ
s.	ಸುಮಾರು 6 ಇಂಚು ದೂರದಿಂದ ಯಾರಾದರೂ ಪಿಸು ಮಾತಿನಲ್ಲಿ ನಿಮ್ಮೊಂದಿಗೆ ಮಾತನಾಡಿದರೆ
t.	ನಿಶಬ್ಧವಾದ ವಾತಾವರಣದಲ್ಲಿ ನಿಮ್ಮ ಪಕ್ಕದಲ್ಲಿರುವ ಅಪರಿಚಿತ ವ್ಯಕ್ತಿಯೊಂದಿಗೆ ಮಾತನಾಡುವಾಗ
u.	ಮನೆಯಲ್ಲಿ ಒಂದು ಸಣ್ಣ ಗುಂಪಿನಲ್ಲಿ ಮಾತನಾಡುವಾಗ
v.	ನಿಮ್ಮ ಮುಂದೆ 3 ಅಡಿ ದೂರದಲ್ಲಿ ಕುಳಿತಿರುವ ವ್ಯಕ್ತಿಯ ಜೊತೆ ಅವರ ಮುಖ ನೋಡಿಕೊಂಡು ಮಾತನಾಡುವಾಗ (ಕೋಣೆಯಲ್ಲಿ ಚೆನ್ನಾಗಿ ಬೆಳಕಿರುವಾಗ)
2.	[redacted]
3.	[redacted]
4.	[redacted]
5.	ನಿಮ್ಮ ಜೊತೆ ನಿಧಾನವಾಗಿ ಮಾತನಾಡಿದಾಗ ಅರ್ಥ ಮಾಡಿಕೊಳ್ಳಲು ಸುಲಭವಾಗುತ್ತದೆಯೇ?
6.	ನಿಮ್ಮ ಜೊತೆ ಮಾತನಾಡುವವರನ್ನು ಪದೇ ಪದೇ ಹೇಳುವಂತೆ ಕೇಳುತ್ತೀರೆ?
7.	ನಿಮ್ಮ ಹಿಂದೆಯಿಂದ ಮಾತನಾಡುತ್ತಿರುವ ಪರಿಚಯವಿರುವ ವ್ಯಕ್ತಿಯ ಧ್ವನಿಯನ್ನು ಗುರುತಿಸಲು ಕಷ್ಟವಾಗುತ್ತದೆಯೆ?
8.	ನೀವು ರಸ್ತೆಯಲ್ಲಿ ಹೋಗುವಾಗ ವಾಹನದ ಹಾರ್ನ್ ಯಾವ ಕಡೆಯಿಂದ ಬರುತ್ತಿದೆಯೆಂದು ಗುರುತಿಸಬಲ್ಲಿರೆ?
9.	ಒಂದು ಗುಂಪಿನಲ್ಲಿ ಮಾತನಾಡುವಾಗ, ಯಾರು ಎಲ್ಲಿಂದ / ಯಾವ ಕಡೆಯಿಂದ ಮಾತನಾಡಿದರು ಎಂದು ತಿಳಿಯುತ್ತದೆಯೆ?
10.	ನಿಮಗೆ ಶ್ರವಣ ತೊಂದರೆ ಇರುವುದರಿಂದ, ಜನರ ಜೊತೆ ಮಾತನಾಡದೆ ದೂರ ಉಳಿಯುತ್ತೀರೆ?
11.	ನಿಮಗೆ ಶ್ರವಣ ತೊಂದರೆ ಇರುವುದರಿಂದ, ಹೊಸಬರ ಜೊತೆ ಮಾತನಾಡಲು ಹಿಂಜರಿಯುತ್ತೀರ?

n.	ಹೋಟೆಲಿನಲ್ಲಿ ಎದುರಿನಲ್ಲಿ ಕುಳಿತಿರುವ ಪರಿಚಯವಿರುವ ವ್ಯಕ್ತಿಯ ಜೊತೆ ಮಾತನಾಡುವಾಗ
o.	ಮದುವೆ ಮನೆಯಲ್ಲಿ ನಿಮ್ಮ ಪಕ್ಕದಲ್ಲಿ ಕುಳಿತಿರುವ ವ್ಯಕ್ತಿಯ ಜೊತೆ ಮುಖ ನೋಡದೆ ಮಾತನಾಡುವಾಗ
p.	[redacted]
q.	ಟೀವಿ ಅಥವ ರೇಡಿಯೊ ಹಾಕಿರುವಾಗ ನಿಮ್ಮ ಪಕ್ಕದಲ್ಲಿರುವವರು ನಿಮ್ಮೊಂದಿಗೆ ಮಾತನಾಡಿದರೆ
r.	ಚಿತ್ರಮಂದಿರಲ್ಲಿ/ಥಿಯೇಟರ್‌ನಲ್ಲಿ ನಿಮ್ಮ ಪಕ್ಕ ಕುಳಿತಿರುವ ವ್ಯಕ್ತಿಯೊಂದಿಗೆ ಮುಖ ನೋಡದೆ ಮಾತನಾಡುವಾಗ
s.	ಸುಮಾರು 6 ಇಂಚು ದೂರದಿಂದ ಯಾರಾದರೂ ಪಿಸು ಮಾತಿನಲ್ಲಿ ನಿಮ್ಮೊಂದಿಗೆ ಮಾತನಾಡಿದರೆ
t.	ನಿಶಬ್ಧವಾದ ವಾತಾವರಣದಲ್ಲಿ ನಿಮ್ಮ ಪಕ್ಕದಲ್ಲಿರುವ ಅಪರಿಚಿತ ವ್ಯಕ್ತಿಯೊಂದಿಗೆ ಮಾತನಾಡುವಾಗ
u.	ಮನೆಯಲ್ಲಿ ಒಂದು ಸಣ್ಣ ಗುಂಪಿನಲ್ಲಿ ಮಾತನಾಡುವಾಗ
v.	ನಿಮ್ಮ ಮುಂದೆ 3 ಅಡಿ ದೂರದಲ್ಲಿ ಕುಳಿತಿರುವ ವ್ಯಕ್ತಿಯ ಜೊತೆ ಅವರ ಮುಖ ನೋಡಿಕೊಂಡು ಮಾತನಾಡುವಾಗ (ಕೋಣೆಯಲ್ಲಿ ಚೆನ್ನಾಗಿ ಬೆಳಕಿರುವಾಗ)
2.	[redacted]
3.	[redacted]
4.	[redacted]
5.	ನಿಮ್ಮ ಜೊತೆ ನಿಧಾನವಾಗಿ ಮಾತನಾಡಿದಾಗ ಅರ್ಥ ಮಾಡಿಕೊಳ್ಳಲು ಸುಲಭವಾಗುತ್ತದೆಯೇ?
6.	ನಿಮ್ಮ ಜೊತೆ ಮಾತನಾಡುವವರನ್ನು ಪದೇ ಪದೇ ಹೇಳುವಂತೆ ಕೇಳುತ್ತೀರೆ?
7.	ನಿಮ್ಮ ಹಿಂದೆಯಿಂದ ಮಾತನಾಡುತ್ತಿರುವ ಪರಿಚಯವಿರುವ ವ್ಯಕ್ತಿಯ ಧ್ವನಿಯನ್ನು ಗುರುತಿಸಲು ಕಷ್ಟವಾಗುತ್ತದೆಯೆ?
8.	ನೀವು ರಸ್ತೆಯಲ್ಲಿ ಹೋಗುವಾಗ ವಾಹನದ ಹಾರ್ನ್ ಯಾವ ಕಡೆಯಿಂದ ಬರುತ್ತಿದೆಯೆಂದು ಗುರುತಿಸಬಲ್ಲಿರೆ?
9.	ಒಂದು ಗುಂಪಿನಲ್ಲಿ ಮಾತನಾಡುವಾಗ, ಯಾರು ಎಲ್ಲಿಂದ / ಯಾವ ಕಡೆಯಿಂದ ಮಾತನಾಡಿದರು ಎಂದು ತಿಳಿಯುತ್ತದೆಯೆ?
10.	ನಿಮಗೆ ಶ್ರವಣ ತೊಂದರೆ ಇರುವುದರಿಂದ, ಜನರ ಜೊತೆ ಮಾತನಾಡದೆ ದೂರ ಉಳಿಯುತ್ತೀರೆ?
11.	ನಿಮಗೆ ಶ್ರವಣ ತೊಂದರೆ ಇರುವುದರಿಂದ, ಹೊಸಬರ ಜೊತೆ ಮಾತನಾಡಲು ಹಿಂಜರಿಯುತ್ತೀರ?

Appendix C: Questionnaire for non-use of hearing aid

		ಉಪಯೋಗಿಸದ ಕಾರಣಗಳು				
		ಪ್ರಮುಖ ←				→ ಕಡಿಮೆ
S.No.		5	4	3	2	1
1	ನಿಶ್ಯಬ್ದವಾದ ವಾತಾವರಣದಲ್ಲಿ ಮೆಷೀನು ಮಾತನ್ನು ಅರ್ಥಮಾಡಿಕೊಳ್ಳಲು ಉಪಯೋಗಕರ ಯಂತ್ರವಲ್ಲ.					
2.	ಮೆಷೀನು ಸುತ್ತಲೂ ಬೇರೆ ಶಬ್ದಗಳಿದ್ದರೆ ಅರ್ಥಮಾಡಿಕೊಳ್ಳಲು ಉಪಯೋಗಕರವಲ್ಲ.					
3.	ಮೆಷೀನಿನ ಒಳಗೆ ಬರುವ ಬೇರೆ ಬೇರೆ ಶಬ್ದಗಳು ಉದಾಹರಣೆಗೆ (ಸೀಟೀ ಹೊಡೆಯುವ ಶಬ್ದ) ತುಂಬಾ ಕಂಡುಬರುವ ತೊಂದರೆ.					
4.	ಮೆಷೀನಿನ ಶಬ್ದವು ತುಂಬಾ ಜೋರಾಗಿರುತ್ತದೆ.					
5.	ದೂರವಾಣಿಯ (ಫೋನ್) ಮೂಲಕ ಮಾತನಾಡಲು ಮೆಷೀನು ಉಪಯೋಗಕರವಲ್ಲ.					
6.	ಕಿವಿಯ ಗುಯ್ಗುಡುವ ಶಬ್ದಕ್ಕೆ ಮೆಷೀನು ಸಹಕಾರಿಯಲ್ಲ.					
7.	ನಾನು ಕೇಳಿಸಿಕೊಳ್ಳುವ ಸಂದರ್ಭಗಳು ಕಡಿಮೆ, ಅದಕ್ಕೆ ನನಗೆ ಮೆಷೀನು ಬೇಡ.					
8.	ಶಬ್ದವು ಯಾವಕಡೆಯಿಂದ ಬರುತ್ತಿದೆಯೆಂದು ಮೆಷೀನಿನ ಮೂಲಕ ಗೊತ್ತಾಗುವುದಿಲ್ಲ.					
9.	ಬೇರೆ ಬೇಡವಾದ ಶಬ್ದಗಳನ್ನು ಜಾಸ್ತಿ ಮಾಡುತ್ತದೆ.					
10.	ಶಬ್ದಗಳ ಸ್ಪಷ್ಟತೆ ಕಡಿಮೆ.					
11.	ಮಾತು ಅಸಹಜವಾಗಿ ಕೇಳುತ್ತದೆ. (ಧ್ವನಿ ತಗ್ಗಿಸಿದಂತೆ, ಕರ್ಕಶವಾಗಿ)					
12.	ನನ್ನ ಕಿವಿಗೆ ಸರಿಯಾಗಿ ಕೂರುವುದಿಲ್ಲ.					
13.	ನೋಡಲು ಚೆನ್ನಾಗಿ ಕಾಣಿಸುವುದಿಲ್ಲ.					
14.	ಮೆಷೀನು ಹಾಕಿದಾಗ ಕಿವಿಗಳು ತುಂಬುವಂತಿರುತ್ತದೆ.					
15.	ಮೆಷೀನು ಬಯಸಿದಂತೆ ಇಲ್ಲ.					
16.	ನನಗೆ ಸಹಾಯ ಬೇಡ					
17.	ಮೆಷೀನು ತುಂಬಾ ತೊಂದರೆ ಕೊಡುತ್ತಿದೆಂದೆನಿಸುತ್ತದೆ.					
18.	ಸಮಾಜವು ಮೆಷೀನನ್ನು ತಿರಸ್ಕಾರ ಭಾವದಿಂದ ನೋಡುತ್ತದೆ.					
19.	ನನಗೆ ಮೆಷೀನನ್ನು ಹಾಕಿಕೊಳ್ಳಲು ಮರೆತುಹೋಗುತ್ತದೆ.					

20.	ನನ್ನ ಸ್ನೇಹಿತರು ಮತ್ತು ಕುಟುಂಬದವರು ನನಗೆ ಸಹಾಯ ಮಾಡುವುದಿಲ್ಲ.					
21.	ಮರೆತು ಮೆಷೀನನ್ನು ಎಲ್ಲೊ ಇಟ್ಟುಬಿಡುತ್ತೇನೆ ಮತ್ತು ಅವುಗಳನ್ನು ಹುಡುಕಲು ಕಷ್ಟ.					
22.	ಮೆಷೀನುಗಳನ್ನು ಹಾಕಿಕೊಂಡರೆ ನನಗೆ ವಯಸ್ಸಾಗಿದೆಂದೆನಿಸುತ್ತದೆ.					
23.	ಬೇರೆಯವರಿಂದ ನಾನು ಕೀಳು ಎಂಬ ಭಾವನೆ ಬರುತ್ತದೆ.					
24.	ಮೆಷೀನು ಹಾಕಿಕೊಳ್ಳುವುದರಿಂದ ನಾನು ಅಂಗವಿಕಲನೆಂದೆನಿಸುತ್ತದೆ.					
25.	ಮೆಷೀನು ಬಳಸುವುದರಿಂದ ಜನರು ನನ್ನನ್ನು ಬೇರೆ ರೀತಿಯಲ್ಲಿ ನೋಡುತ್ತಾರೆ.					
26.	ಮಾರಾಟಗಾರರು ನನಗೆ ಹೇಳಿದಂತೆ ಮೆಷೀನು ಇಲ್ಲ. ಅದು ಭಿನ್ನವಾಗಿದೆ.					
27.	ಮೆಷೀನುಗಳನ್ನು ಸಂಭಾಳಿಸಲು ತುಂಬಾ ಕಷ್ಟ. ಏಕೆಂದರೆ ಅವು ತುಂಬಾ ಚಿಕ್ಕ ಉಪಕರಣಗಳು.					
28.	ನನ್ನ ಕಣ್ಣಿನ ಸಾಮರ್ಥ್ಯ ತುಂಬಾ ಕಡಿಮೆ ಆದ್ದರಿಂದ ಮೆಷೀನನ್ನು ಸಂಬಾಳಿಸಲು ಕಷ್ಟ.					
29.	ಅದನ್ನು ಬಳಸಲು ಸಹಾಯ ಮಾಡುವವರು ಯಾರೂ ಇಲ್ಲ.					
30.	ಮೆಷೀನು ಕೆಟ್ಟುಹೋದರೆ ಅದನ್ನು ನಿಭಾಯಿಸಲು ತುಂಬಾ ದುಬಾರಿ					
31.	ಬ್ಯಾಟರಿ ತುಂಬಾ ಬೇಗ ಖಾಲಿಯಾಗುವುದರಿಂದ ಮತ್ತು ಅದರ ಬೆಲೆ ಜಾಸ್ತಿ ಇರುವುದರಿಂದ ಬಳಸಲು ಕಷ್ಟ.					
32.	ಮೆಷೀನುಗಳನ್ನು ಹಾಕಿಕೊಳ್ಳವುದು ಹೇಗೆ ಎಂದು ಗೊತ್ತಿಲ್ಲ.					
33.	ಮೆಷೀನುಗಳನ್ನು ಬಳಸಲು ಬರುವುದಿಲ್ಲ.					
34.	ಹತ್ತಿರದಲ್ಲಿ ಸಿಗುವ ಸೌಲಭ್ಯಗಳು ಕಡಿಮೆ.					
35.	ಸಾರಿಗೆ ಸೌಲಭ್ಯಗಳು ಸಿಗುವುದು ಕಡಿಮೆ.					
36.	ಮೆಷೀನು ಹಾಕಿಕೊಂಡರೆ ಕಿವಿನೋವು ಅಥವಾ ಕಡಿತ ಉಂಟಾಗುತ್ತದೆ.					
37.	ಕಿವಿಯಲ್ಲಿ ಗುಗ್ಗೆ ತುಂಬಾ ಸಂಗ್ರಹಣವಾಗುತ್ತದೆ.					
38.	ತುಂಬಾ ಶೆಕೆಯಿದ್ದರೆ ಬೆವರುವ ಕಾರಣ ಮೆಷಿನ್ ಹಾಕಿಕೊಳ್ಳಲಾಗುವುದಿಲ್ಲ.					
39.	ಮೆಷೀನು ಹಾಕಿಕೊಳ್ಳವುದರಿಂದ ತಲೆ ನೋವು ಬರುತ್ತದೆ.					