

ORIGINAL ARTICLE

Open Access



# Audiologists' practice and perspectives on rehabilitation in individuals with minimal-mild degree of hearing loss: a questionnaire-based survey

Swati Goyal<sup>1</sup>, Prajwal Kumar E.<sup>1\*</sup> , Kristi Kaveri Dutta<sup>2</sup>, Gowtham Varma S.<sup>3</sup> and Prajeesh Thomas<sup>4</sup>

## Abstract

**Background** The study aimed to understand the perspectives of audiologists working in different audiological setups regarding the fitting of amplification devices for individuals with minimal-mild hearing loss which cannot be corrected or sensorineural in nature. The study employed a questionnaire-based survey research design conducted in three phases: questionnaire development, obtaining responses from audiologists, and analyzing the responses. The questionnaire consisted of three sections: demographic details, audiologist's practice, and audiologist's opinion, with a total of 22 questions. The responses from audiologists were collected through an online survey distributed via WhatsApp groups, email, and Telegram. Descriptive statistics were used to analyze the percentage of responses for each question.

**Results** The findings shed light on the current practices and opinions of audiologists. The study found that audiologists perceived the assessment of self-handicap level as aiding in better counseling, understanding motivation level, and making decisions about amplification.

**Conclusions** The findings of the study provide insights into the current practices and perspectives of audiologists in offering services to individuals with minimal-mild hearing loss.

**Keywords** Audiologists' perspectives, Rehabilitation, Minimal-mild degree of hearing loss, Amplification devices, Self-reporting questionnaire

## Background

According to WHO [1], over 2.5 billion individuals will have hearing loss by 2050, up from 1.5 billion today. If left untreated, hearing loss will deteriorate over time and have detrimental effects on various aspects of a person's life. This includes negative impacts on their medical well-being, physical health, financial situation, cognitive abilities, behavior, emotional state, and social functions [2, 3].

Hearing loss can be classified into various degrees based on the amount of reduction in sensitivity [4]. The conventionally considered factor for determining the necessity for hearing aids is the degree of hearing impairment [5, 6], which is obtained by an audiogram. If only an audiogram is taken into account, any loss under 40 dB is

\*Correspondence:

Prajwal Kumar E.  
Prajwal03121996@gmail.com

<sup>1</sup> Nitte Institute of Speech and Hearing, Nitte (Deemed to be University), Mangalore, India

<sup>2</sup> Department of Audiology, Bharati Vidyapeeth (Deemed to be University), School of Audiology and Speech-Language Pathology, Pune, India

<sup>3</sup> Aanvi Hearing Care, Pune, India

<sup>4</sup> Department of Audiology, All India Institute of Speech and Hearing, Mysuru, India

presumed to have little impact on communication, as the majority of the speech sounds, when spoken at the normal conversation level fall beyond 40 dBHL [6, 7]. However, this narrow focus on audiogram overlooks critical aspects that can significantly affect individuals with such hearing loss [8].

Studies have shown that uncorrected MMHL (minimal-mild hearing loss defined in this study as having air conduction pure tone audiogram threshold between 16 and 40 dB HL, which can not be improved by medical intervention as per the respective medical records (sensorineural in nature)) can also lead to auditory deprivation and impaired auditory processing abilities [2]. Many children with MMHL experience listening fatigue, which results from their heightened need for concentration and attention. Compared to their peers, these children often exert more effort to listen and access information [9] putting them at risk for stress. This added cognitive load and sustained attention can potentially degrade their overall well-being and academic performance [10–13]. Despite of these evidences for the impact of MMHL in literature, these factors besides audiogram seem to be given less importance in routine assessments of the auditory system which may be due to practical and technical issues in its implementation in different setups.

Assessing these factors might also be probed to understand the challenges faced by individuals with MMHL. This implies that amplification devices would be necessary even for children [14] and adults with hearing loss of less than 40 dBHL/MMHL who face the aforesaid challenges. This may be understood better by assessing the impact of hearing loss, which can be catered to using appropriate amplification. Literature also suggests using a patient-centered approach and considering the impact of hearing loss and patients' motivation while fitting hearing aids for mild hearing loss [15].

Acceptance of amplification becomes one more hurdle in rehabilitating individuals with MMHL as they might have an opinion of managing without amplification devices to avoid social stigma associated with hearing aids or be less concerned about the communication challenges [16–18]. Though an individual's personal characteristics play a significant role in this, other factors are the lack of family support and awareness about the consequences of uncorrected hearing loss. Notably, compared to other medical conditions, hearing loss has a stronger link to the development of depression among older adults [19, 20]. Also, Deal et al. [21] emphasized the importance of considering hearing health as a potential factor in cognitive well-being and the need for comprehensive hearing evaluations, even in cases of mild hearing loss. Hence, a hearing healthcare professional should also share the responsibility to create awareness regarding the problems

or consequences of minimal/ mild hearing loss among the concerned.

In one-third of the adults, the audiogram alone fails to account for the non-audiometric factors that can influence the listening ability of adults with normal or mild hearing loss [22]. In light of the above scientific reports and the author's clinical experience, the appropriate solution for individuals with hearing difficulties may not be catered to if an audiogram alone is considered.

In India, hearing aids are prescribed at various setups such as government and private hospitals, institutions, and clinics [23]. The different setups follow their own protocol for providing amplification for individuals with MMHL. Some of these management/clinicians recommend amplification devices to these groups with or without the help of additional information beyond audiogram, whereas others do not recommend it at all. Additionally, depending on the type of setup, the assessment methodology and trial approach for hearing aids differ in general or specifically for these groups of individuals. However, there is a lack of scientific information related to this scenario, which needs to be explored to list underlying factors and further clinical updates.

Hence, it probes us to conduct a study to explore the practice and perspectives of audiologists working in different audiological setups of India regarding the fitting of amplification devices for individuals with MMHL. The objectives of the study were as follows:

To understand the audiologist's current practice while offering services to individuals with minimal/ mild hearing loss.

To understand the audiologist's opinion/perception towards assessing and managing individuals with minimal/mild hearing loss.

## Methods

A questionnaire-based survey study research design was employed in the present study. The study was carried out in 3 phases.

Phase 1: Development of an online questionnaire and content validation.

Phase 2: Obtaining the responses from audiologists to the developed questionnaire.

Phase 3: Analyzing the responses and inferring the results.

### Phase 1

Since the existing questionnaires did not meet our requirements, we devised a new questionnaire that suits the purpose of this study. The questionnaire was framed

under three sections: Demographic details, audiologist's practice, and audiologist's opinion. For each section, a question pool was created by referring to existing questionnaires in related areas, including the one developed by Eshwar et al. [23]: "Hearing Handicap Inventory for Elderly (HHIE) [24], Hearing Handicap Inventory for adults (HHIA) [25], "Speech, Spatial and qualities hearing scale" (SSQ12) [26], "Abbreviated profile of hearing aid benefit" (APHAB) [27], Satisfaction with amplification in daily life (SADL) [28]. Besides, questions were also included by referring to the review of literature on MMHL and hearing screening questionnaires [23, 29–31] as well as offline and online interviews with experts in the field of audiology (a total of 11 experts with minimum 10 years of experience in audiological assessment and rehabilitation working in various clinical setups including government and private hospitals, institutions and private clinics). A total of 26 questions for the demographic section, 92 questions for the audiologist's practice section, and 56 questions for the audiologist's opinion section were obtained in the pool. The authors carefully evaluated each question and removed the repeated/similar questions and left out with 19, 81, and 46 questions in the poll for demographic, audiologist's practice and audiologist's opinion sections, respectively. Later, the questionnaire was given to 5 experienced audiologists working in different setups to evaluate familiarization, cultural sensitivity, and content validity. The content was validated for its relevancy, grammatical correctness, and its ease of understanding. The reviewers evaluated each question on a 5-point rating scale and provided comments for each question as select/select with modifications/reject. Hence, only those questions with a rating of 4 or 5 and comments as select or select with modifications were selected to make the final questionnaire. Hence, the final questionnaire was comprised of a total of 22 questions, including all categories (Demographic details (3), Audiologist's Practice (13) and Audiologist's opinion(6)).The questionnaire also briefly introduced the study and the purpose of collecting the responses.The questionnaire's demographic details section focused on the work setup of the participants, their years of experience, and their highest qualifications.

The "audiologist's practice" section of the questionnaire was framed to gather information about the audiologist's present practice and their experiences in offering services to individuals with minimal or mild hearing loss. The audiologist's opinion section comprised of questions focused on the opinion and perspectives of audiologists working in India towards rehabilitation of individuals with MMHL. An online "Google Form" was created using the final questionnaire. The questionnaire comprised of a mixture of single-select choice and multiple-select

choice, and open-ended questions were included in the questionnaire.

## Phase 2

The online survey was conducted by circulating the Google Form questionnaire to audiologists working under different setups via Whats App groups, email, and telegram. The email address and the contact details of the audiologists working in India were obtained from a Indian Speech and Hearing Association(ISHA) dictionary. Each participant was asked to complete the participant consent form before responding to the questionnaire. After it was forwarded to them, the response pole remained open for a month. The participants were not restricted to any particular district or center. Only one response was permitted per registered mail ID. Any response received from the students or whoever was not currently practicing audiology and non-Indian citizens were excluded from the study. Only the participants with a minimal degree of B.ASLP with RCI registration were considered. The participants who are working in a setup with an access to hearing aid dispensing were only included in the study.

## Phase 3

After 1 month of waiting period, the response pole was closed, and the data were tabulated in SPSS for further analysis. Descriptive statistics were carried out to analyze the percentage of responses for each question.

## Results

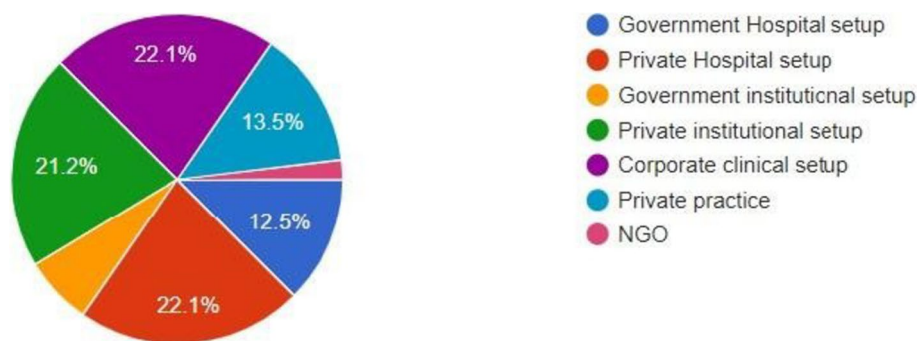
The online survey conducted using Google Forms resulted in responses from 104 audiologists across India in a 1-month period.

### Section I

This section dealt with the participants' demographic details. The descriptive statistics showed that an almost equal number of participants from every type of setup volunteered for the survey, as depicted in Fig. 1. The data also showed that most participants (77.8%) in this study were post-graduation or PhD holders.

### Section II

In this section, audiologists were asked to report their current practice and details related to MMHL. Concerning the most common complaints that a person with MMHL reports, findings show that individuals with MMHL frequently complained about problems understanding speech from a distance (81.7% of participants), background noise (69.2%), word endings/deemphasized sounds (50%), and tinnitus (46.2%), as well as seeking



**Fig. 1** Distribution of participants based on their work setup

repetition (37.5%). Comparatively, only 25% of participants reported that individuals with MMHL had problems with localization, quiet environment, telephonic conversation, following prosody, or intonation.

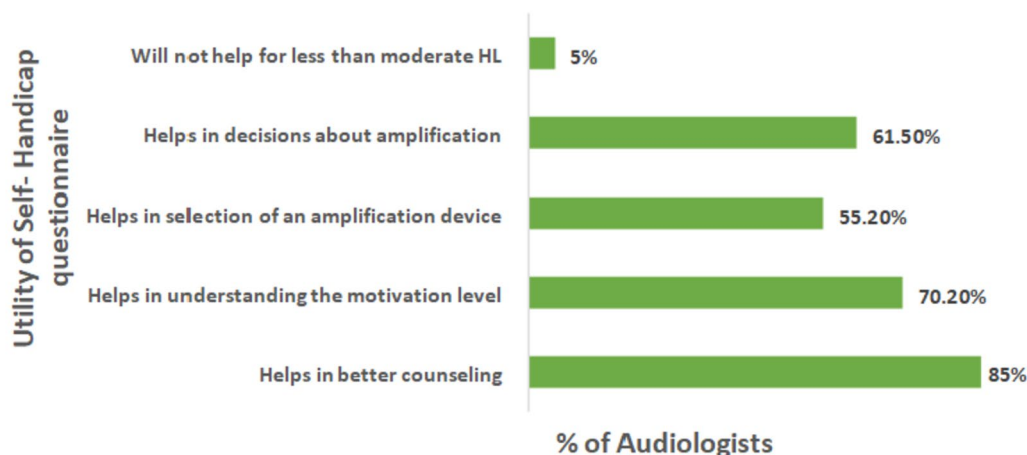
Concerning the secondary associated problems reported by individuals with MMHL in their respective setups, 61.5% of participants stated that it leads to difficulty in speech and language acquisition or may develop misarticulation, 51.9% stated the risk of psychosocial factors, 51% stated auditory processing issues in children, 45.2% stated the risk of developing auditory deprivation, and 32.7% stated cognitive decline. Less than 2% of participants stated poor academic performance, withdrawal behavior, and anger issues. However, 8% of participants stated that their clients did not report any associated secondary problems.

In response to a question related to assessment of self-handicap level, 85% feel it aided them in better counseling, understanding the motivation level (70.2%), selection of an amplification device (55.8%), and making decisions about amplification (55.8%). Interestingly,

61.5% of audiologists feel that it needs to be administered irrespective of the degree of HL. Less than 5% of the participants feel it should not be administered for patients below moderate degree and will not help in any decision-making regarding amplification. The utility of self-Handicap questionnaire in an audiologist's current practice is depicted in Fig. 2.

In response to a question related to self-awareness, 60.6% of participants stated that patients who visited were self-aware about their problem, whereas 31.7% of audiologists stated that individuals with MMHL refused to accept the hearing loss and hence failed to notice the problem being faced. Only 5.8% of participants stated that they noticed the problem. Only about 1% of participants say family members notice even before the patients. Findings show that not all those who visited audiologists were self-aware/self-motivated about their issues, but the majority of them had self-awareness.

A large majority of audiologists reported that they do consider factors beyond audiogram for fitting hearing aids for MMHL (always—30.8%/ often—27.9%/



**Fig. 2** Utility of self-handicap level in the current practice of audiologists

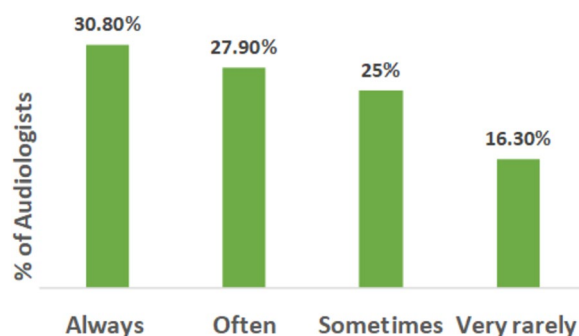
sometimes—25%), whereas very few audiologists (16.3%) reported that they do not/very rarely consider them. The frequency of consideration of factors beyond audiogram in their current practice is depicted in Fig. 3.

In response to a question regarding the crucial factors considered for hearing aid fitting in individuals with MMHL, more than 70% of the participants considered type-degree of hearing loss, audiogram pattern, speech audiometry, quality of life, and communication needs. In addition, 56.2% considered the SPIN score, 55.8% considered affordability, and 52.9% considered the handicap level of the patient. Only about 1% of participants stated that they consider lifestyle and listening needs.

In response to a question regarding the impact on quality of life, 76% of participants stated that the patients underwent awkward situations because of the unavailability of certain subtle auditory cues, 56.7% stated that the patients get fatigued due to effortful listening, 51.9% stated they appear distractive/ frustrated, and 43.3% stated that it degrades their psychosocial communication abilities. However, a small percentage (18.3%) of audiologists' stated that they had not encountered any patient whose quality of life was affected due to MMHL.

The number of assessments of individuals with MMHL in each setup was also addressed, and the data showed that among 104 audiologists, 11.1% encounter MMHL patients always, 61.5% encounter often, 25% encounter sometimes, and 1.9% encounter very rare.

Concerning questions related to the management of individuals with minimal hearing loss, data showed that only 1.9% of audiologists stated that they always provide amplification for bilateral minimal HL. In contrast, 2.9% stated often provide, 12.5% stated sometimes, and 38.5% stated very rarely provide amplification in this group. A major percentage (44.2%) of audiologists stated that they never provide amplification in minimal HL cases.



**Fig. 3** Consideration of factors beyond audiogram in the current practice of audiologists

Concerning questions related to the management of individuals with mild hearing loss, data showed that only 1% of participants stated that they never provided amplification of mild HL. A major percentage of audiologists stated that they provide amplification. The Mann-Whitney U findings showed that there is a significant difference ( $U = 1429$ ,  $Z = -9.457$ ,  $p < 0.05$ ) in the frequency of hearing aid fitting between individuals with minimal and mild hearing loss among audiologists. The descriptive statistical data of the rating scores towards the frequency of hearing aid fitting in minimal and mild hearing loss is shown in Table 1. The recommendation status/frequency of amplification devices in the current practice of audiologists for mild hearing loss in comparison with mild hearing loss is depicted in Fig. 4. The findings of chi-square test showed a significant association ( $\chi^2 = 94.804^a$ ,  $df = 4$ ,  $p < 0.05$ ) between rating score and the degree of hearing loss in such a way that the audiologists were fitting hearing aids more often when the degree of hearing loss shifted from minimal to mild hearing loss.

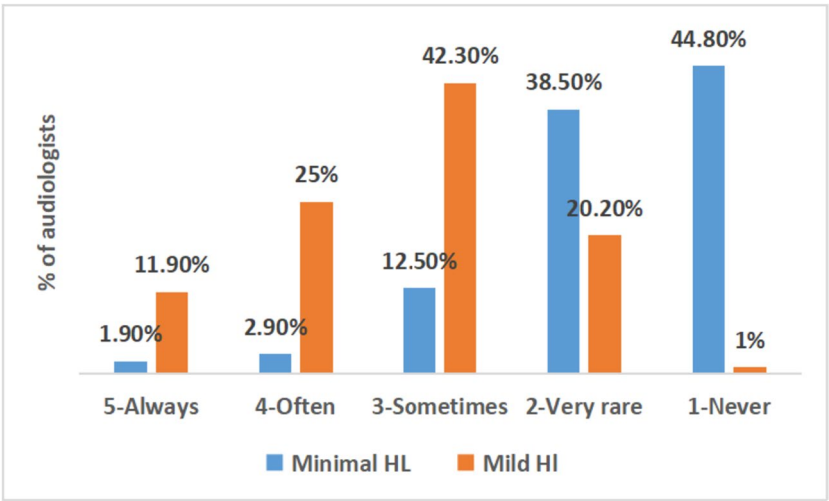
In conditions where the individuals have minimal HL in one ear and mild HL in the other ear, 45.2% of participants stated that they provided amplification only to the ear which had mild HL, 31.7% of participants stated that they chose to provide amplification to both the ears when the patients find it comfortable, whereas 21.2% will choose not to provide amplification for neither of the ears. The recommendation of amplification in such a condition in the current practice is depicted in Fig. 5.

On the patient perspective front, regarding their willingness to accept amplification, 61.8% of audiologists stated that very rarely patients with MMHL agree for amplification, 21.2% stated that sometimes they agree for amplification, 5.8% stated that they often agree for amplification, and 4.8% stated that they never agree to wear a hearing aid. Most audiologists report that they rarely agree to wear a hearing aid. The patient's willingness to accept amplification in the current practice of audiologists who participated in this study is depicted in Fig. 6.

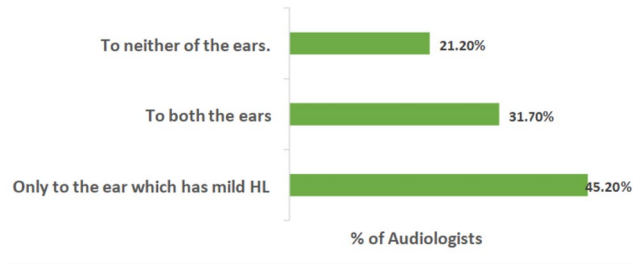
**Table 1** Descriptive statistical data of the rating scores towards the frequency of hearing aid fitting in minimal and mild hearing loss

Statistics	Minimal HL	Mild HL
N	104	104
Mean	1.7885	3.2692
Median	2	3
Mode	1	3
Standard deviation	0.89955	0.93716
Inter quartile percentiles	25th	1
	50th	2
	75th	2

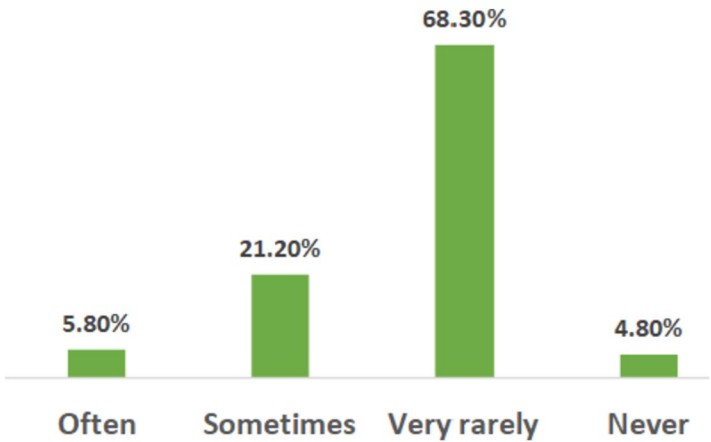




**Fig. 4** The recommendation status/frequency of amplification devices in the current practice of audiologists for mild hearing loss in comparison with mild hearing loss



**Fig. 5** Recommendation of amplification for minimal HL in one ear and mild HL in other ear in the current practice of audiologists



**Fig. 6** Patient's willingness to accept amplification in the current practice of audiologists

While enquiring on the initiatives taken by the audiologist to encourage this group to use amplification, 19.2% of audiologists stated that they always counsel, 25% often counsel, 29.8% sometimes counsel, and 20.2% very rarely counsel patients with minimal/mild HL about the requirement of hearing aid accessories. Table 2 depicts these major findings of section II.

**Table 2** Major findings of section II

Question	Responses	% of audiologists
Self-awareness	Self-aware about their problem	60.6%
	Refused to accept the hearing loss and hence failed to notice the problem being faced	31.7%
Self-assessment measures	Helps in better counseling	85%
	Helps in understanding the motivation level	70.20%
	Helps in selection of an amplification device	55.20%
	Helps in decisions about amplification	61.50%
	Will not help for less than moderate HL	5%
Recommendation of amplification devices for minimal HL	Always	1.90%
	Often	2.90%
	Sometimes	12.50%
	Very rarely	38.50%
	Never	44.80%
Recommendation of amplification devices for mild HL	Always	11.5%
	Often	25%
	Sometimes	42.3%
	Very rarely	20.2%
	Never	1%
Acceptance of amplification by patients	Often	5.80%
	Sometimes	21.20%
	Very rarely	68.30%
	Never	4.80%
Impact on quality of life	Faces awkward situation because of the unavailability of certain subtle auditory cues	76%
	Get fatigued due to effortful listening	56.7%
	Appear distractive/ frustrated	51.9 %
	It degrades their psycho social communication abilities	43.3%
	No impact experienced	18.3%

### Section III

In this section, the audiologists were asked to provide their opinion/perspectives in questions related to assessing and managing individuals with MMHL.

According to 76% of audiologists, only an audiogram is not enough to weigh the extent of hearing problems in patients with minimal/mild HL, whereas 8.7% of audiologists stated that an audiogram is enough. Of audiologists, 15.4% are probably in dilemma, and they stated that an audiogram might be enough to measure hearing problems.

As per the experience in dealing with this group of patients, 64.4% of audiologists stated that patients with minimal/mild HL become aware of the issues related to their hearing, regarding which they were unaware or ignorant when they administered a self-report questionnaire on themselves. However, 34.6% of audiologists are in dilemma regarding whether realization occurs after the self-reporting questionnaire.

In response to an opinion regarding the hearing aid fitting for minimal/mild HL, 75.7% of audiologists opined that all pediatric patients with mild HL need to be aided, 38.8% opined that all adult patients with mild HL need to be aided, and 41.7% opined that only those patients who have hearing loss with progressive nature need to be aided. In addition, 3.9% opined that they need not be aided as they can hear speech at normal conversation level. Of participants, 45.6% opined that patient with more communication need/ self-handicap level needs to be aided, whereas 52.4% opined that those patients who score poorly on the SPIN test need to be aided. Similarly, 40.8% opined that those with auditory processing issues need to be aided, and 25.2% opined that minimal HL need not be aided.

In response to a question concerning the factors to be included in counseling, 48.1% of audiologists opined that patients should be counseled for follow-up every 6 months to monitor the progressiveness of HL. The 31.7%

emphasized counseling them about amplification, listening-rich environments, less noise exposure, auditory and cognition deprivation, along with follow-up.

In response to the opinion regarding the necessity of amplification in minimal/mild HL, 29.8% of audiologists feel the need for amplification as it will impact the quality of life, whereas 8.7% feel it is not necessary to provide amplification. They are of the opinion that the patient can wait and monitor the progression of loss. Interestingly, 46.2% of audiologists opined on providing the amplification only when the patient feels the need for it based on their listening needs. The opinion of audiologists regarding this is depicted in Fig. 7.

In response to a question concerning the attitude and acceptance towards amplification among patients, 17% of audiologists stated they accept it readily and would require very few follow-up visits. Sixty-two percent stated that they require frequent follow-up or fine-tuning sessions to accept the amplification, and 9%

stated patients were not satisfied with hearing aids and returned them. The degree of acceptance also depends on whether they have realized their problems and the choice of amplification arises from self-motivation.

The summary of major findings is tabulated in Table 3.

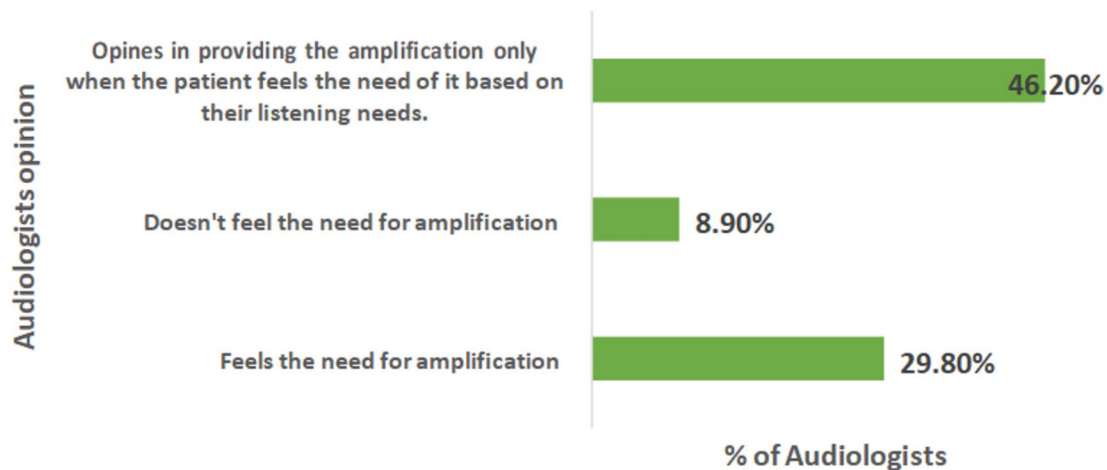
## Discussion

### Section I

The findings from section I demonstrate that the audiologists who participated in the study evenly represented the work setup in terms of number. Hence, the responses can represent the practice and opinion of the audiologists working at most work setups.

### Section II

The findings related to the most common complaints reported by patients are in sync with a study by Beck et al. [32] where they stated that the most common self-reported problem from a patient of the mild category of



**Fig. 7** Audiologists' opinion on the need for amplification in minimal/mild HL

**Table 3** Summary of major findings for the questions in section III

Questions	Opinion of audiologists	% of audiologists
Is audiogram enough to weigh the extent of hearing problems in minimal/mild HL	Yes	8.7%
	No	76%
	Maybe	15.4%
Belief on self-reporting questionnaire	Yes	64.4%
	No	1%
	Maybe	34.6%
Need for amplification	Feels the need	29.80%
	Doesn't feel the need	8.90%
	Opined in providing the amplification only when the patient feels the need of it based on their listening needs	46.20%



hearing loss is speech understanding in noise difficulties. In view of this section's responses, it is understood that the majority of audiologists deal with minimal/mild HL patients with gross/overt complaints, while a small percentage reported dealing with patients having covert/finer complaints. This can be attributed to the lack of self-awareness or self-realization of the issues, which led the majority of the patients to report only gross complaints [33]. Evidence in the literature supports our findings that an individual with hearing loss always refrains from understanding the impact of the hearing loss on his/her quality of life, and acceptance of the hearing loss is rare due to the social stigma associated with hearing loss [34].

The findings for the question related to secondary associated problems revealed a variety of issues, as the secondary problems might have developed as a consequence of the persistence of hearing loss for a longer time. Hence appearance/presence of secondary problems might have varied based on the duration of hearing loss prior to consultation.

The results of the question related to the utility of self-handicap questionnaire are in agreement with the study by Humes [35], in which he stated that utilizing a self-assessment tool like the Hearing Handicap Inventory for the Elderly (HHIE) can be an effective means of evaluating the necessity for hearing assistance. Similarly, Edwards [36] put forth the notion that a significant portion of the population experiences self-perceived hearing difficulties despite lacking measurable hearing loss.

Findings for the question related to self-awareness are in agreement with Newman et al. [37] which showed that majority of the individuals with mild hearing loss had significant perceived handicap.

The findings related to the recommendation of amplification devices in current practice are in sync with the finding reported in the literature, which revealed that 43% of the patients who had self-reported mild degree of loss received a suggestion of a 'wait and retest' approach for hearing aids from their audiologists [38]. This trend of not opting to provide amplification devices as an immediate solution to these groups might be in sync with various reasons quoted in the literature, which include telephone amplification, personal sound amplification products, use of communication strategies, auditory training, or educational programs [38].

As indicated in this study, a majority of audiologists take into account factors beyond the audiogram when assessing a patient's hearing condition. The findings also suggest that most audiologists do not recommend amplification unless it affects patients' quality of life or reports their issues by themselves. A small percentage of audiologists stated that they administer self-handicap questionnaires to make patients realize or understand the extent

of difficulty faced by patients because of MMHL and recommend amplification only if it dictates the necessity. When both minimal and mild hearing loss co-exist, the majority stated that they choose the ear with mild hearing loss for amplification, and few stated they choose bilateral amplification. These variations in the findings can be explained by the differences in the protocol followed in each setup. Also considering the population of India and the prevalence of hearing impaired in India [39], administration of optimal test battery comes with technical and practical difficulties under all different setups of audiological practice. Since, in India, the hearing dispensing takes place in a variety of setups [23] and lack of clarity in the available national guidelines specific to MMHL, adherence to the guidelines is not uniform and audiologists practice with the protocols which are given by their parent organizations.

The section III findings enlighten our knowledge regarding the opinions of audiologists towards the assessment and management of individuals with MMHL. The findings show that majority of the audiologists believe in using the test battery approach to measure hearing loss. The audiologists' opinion in this regard is in agreement with the findings of Newman et al. [37] in which authors obtained a wide range of self-handicap scores from a group of adults with a mild degree of hearing loss, which underscores the ability of audiogram alone to predict the hearing related problems. The results also support the evidence in research that shows a trending inclination to use a battery of tests instead of relying only on audiograms [40]. The findings also suggest that many audiologists believe in administering a self-assessment questionnaire, which will give the patients more insight into their issues and motivate them to resolve them. These findings are also supported by Wiley et al. [41] and Sindhusake et al. [42] where they have demonstrated the utility of self-perceived handicap questionnaires by patients in the realization of their hearing issues. In addition, this would also serve as the first step in making them accept hearing loss.

The findings related to an opinion regarding the hearing aid fitting are in agreement with a Delphi survey by Serda et al. [15] which also suggests a patient-centered approach for fitting hearing aids. The opinion is also in support with the fact that amplification is mandatory in cases of pediatric patients as it is vital for their speech, language, cognitive, and academic development [11].

Findings related to the opinion regarding counseling support the fact that regular follow-ups (6-month intervals) help audiologists know about the progressiveness of hearing loss. When patients are diagnosed with minimal/mild HL but have not reported significant communication difficulties, then it may be advised to go for a

biannual audiological follow-up, including an audiogram and questionnaire.

Overall findings to the questions from section III show that most audiologists believe that the audiogram is not enough to weigh the extent of a hearing problem in individuals with minimal-mild hearing loss. Therefore, hearing aid as a treatment option becomes unnecessary if only the audiogram is considered. Additional tests/factors beyond audiogram throw light on the necessity of amplification and mitigate the potential negative consequences of not giving amplification. Also, audiologists opined that many patients would realize the importance of amplification once they undergo the factors beyond audiogram and accept their hearing loss, which will result in them agreeing to wear hearing aids. The majority of audiologists also believe in providing amplification only when the patient feels the need for it based on their listening requirements. The findings in this section infer that, despite of the the technical related issues which were discussed in the practice section, the audiologists in India are of the opinion/perspectives which are optimal to the individuals with MMHL and act accordingly.

## Conclusion

Responses from 104 audiologists to the questionnaire reveal that most audiologists come across patients with gross/ overt complaints. The majority of audiologists assert that patients who came to them were already aware of the problems, while only a few said they had to convince them of their problems.

The responses and opinions of audiologists for the questions in sections II and III lead to the conclusion that the audiogram alone is not deemed sufficient by most audiologists to fully evaluate the severity of a patient's hearing problem. Moreover, they believe that additional tests and factors are necessary to determine the need for amplification or the potential consequences of not using hearing aids.

The study also concludes that the audiologists in India are of the opinion which are optimal for MMHL; however, practical and technical issues in implementation might come in a way in practicing on their beliefs.

## Acknowledgements

We would like to extend our appreciation to all the subject experts for their input on the questionnaire. Thank you, to all the participants of the study.

## Authors' contributions

KD, GV, and SG: Study design, concept; KD, GV, SG, PK, and PT: preparation of questionnaire, acquisition of data; PK and SG: drafting the manuscript, interpretation of the results; PT: supervision, critical revision of the manuscript.

## Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

## Declarations

### Ethics approval and consent to participate

Compliance with ethical guidelines of all the testing procedures was accomplished using a non-invasive technique in the current study and adhered to the conditions of the institutional ethical approval committee of All India Institute of Speech and Hearing, Mysuru. Prior informed consent was taken from the participants for their willingness to participate in the study in the Google Form circulated.

### Consent for publication

The participants gave written informed consent for the publication of the data and materials contained within this study.

### Competing interests

The authors report no conflicts of interest.

Received: 31 December 2023 Accepted: 16 February 2024

Published online: 01 March 2024

## References

- Chadha S, Kamenov K, Cieza A (2021) The world report on hearing, 2021. *Bull World Health Organ* 99(4):242. <https://doi.org/10.2471/BLT.21.285643>
- Arlinger S (2003) Negative consequences of uncorrected hearing loss—a review. *Int J Audiol* 42(Suppl 2):S17–S20
- Kochkin S, Rogin CM (2000) Quantifying the obvious: The impact of hearing instruments on quality of life. *Hear Rev* 7(1):6–34
- Goodman A (1965) Reference zero levels for pure-tone audiometer. *ASHA* 7(262):1
- Fitzpatrick EM, Cologrosso E, Sikora L (2019) Candidacy for amplification in children with hearing loss: a review of guidelines and recommendations. *Am J Audiol* 28(4):1025–1045. [https://doi.org/10.1044/2019\\_AJA-19-0061](https://doi.org/10.1044/2019_AJA-19-0061)
- Trematerra A, & Iannace, G. (2013). Proceedings of meetings on acoustics. In *Proceedings of meetings on acoustics* (Vol. 20, No. 015001, p. 1) <https://doi.org/10.1121/1.4861195>
- Northern JL, Downs MP (2002) *Hearing in children*. Lippincott Williams & Wilkins
- Windmill IM, Tamas L, Olah L (2022) Rethinking the audiogram for hearing aid selection. *The Hearing Journal* 75(12):24–25. <https://doi.org/10.1097/01.HJ.0000904472.97801.41>
- Hornsby BW, Gustafson SJ, Lancaster H, Cho SJ, Camarata S, Bess FH (2017) Subjective fatigue in children with hearing loss assessed using self-and parent-proxy report. *American Journal of Audiology* 26(3S):393–407. [https://doi.org/10.1044/2017\\_AJA-17-0007](https://doi.org/10.1044/2017_AJA-17-0007)
- Bess FH, Dodd-Murphy J, Parker RA (1998) Children with minimal sensorineural hearing loss: prevalence, educational performance, and functional status. *Ear Hear* 19(5):339–354
- Blair JC (1985) The effects of mild sensorineural hearing loss on academic performance of young school-age children. *Volta Review* 87(2):87–93
- Davis JM, Effenbein J, Schum R, Bentler RA (1986) Effects of mild and moderate hearing impairments on language, educational, and psychosocial behavior of children. *Journal of speech and hearing disorders* 51(1):53–62. <https://doi.org/10.1044/jshd.5101.53>
- Kenworthy OT, Klee T, Tharpe AM (1990) Speech recognition ability of children with unilateral sensorineural hearing loss as a function of amplification, speech stimuli and listening condition. *Ear Hear* 11(4):264–270. <https://doi.org/10.1097/00003446-199008000-00003>
- Joint Committee on Infant Hearing (2000) American Academy of Audiology, American Academy of Pediatrics. *American Speech-Language-Hearing Association* 798–817. <https://doi.org/10.1542/peds.106.4.798>
- Sereda M, Hoare DJ, Nicholson R, Smith S, Hall DA (2015) Consensus on hearing aid candidature and fitting for mild hearing loss, with and without tinnitus: Delphi review. *Ear Hear* 36(4):417. <https://doi.org/10.1097/AUD.0000000000000140>

16. Roup CM (2016) The impact of minimal to mild sensorineural hearing loss in adults. *Perspectives of the ASHA Special Interest Groups* 1(6):55–64. <https://doi.org/10.1044/persp1.SIG6.55>
17. Brooks DN (1989) The effect of attitude on benefit obtained from hearing aids. *British Journal of Audiology* 23(1):3–11. <https://doi.org/10.3109/03005368909077813>
18. Blood GW, Blood IM, Danhauer JL (1977) The hearing aid effect. *Hearing Instruments* 28(6):12
19. Kochkin S (1993) MarkeTrak III: Why 20 million in US don't use hearing aids for their hearing loss. *Hearing Journal* 46:26–26
20. Mener DJ, Betz J, Genther DJ, Chen D, Lin FR (2013) Hearing loss and depression in older adults. *J Am Geriatr Soc* 61(9):1627. <https://doi.org/10.1111/jgs.12429>
21. Leverton, T. (2019). Depression in older adults: hHearing loss is an important factor. *bmj* 364 <https://doi.org/10.1136/bmj.l160>
22. Deal JA, Sharrett AR, Albert MS, Coresh J, Mosley TH, Knopman D, Lin FR (2015) Hearing impairment and cognitive decline: a pilot study conducted within the atherosclerosis risk in communities neurocognitive study. *American journal of epidemiology* 181(9):680–690. <https://doi.org/10.1093/aje/kwu333>
23. Easwar V, Boothalingam S, Chundu S, Manchaiah VK, Ismail SM (2013) Audiological practice in India: an internet-based survey of audiologists. *Indian J Otolaryngol Head and Neck Surg* 65:636–644. <https://doi.org/10.1007/s12070-013-0674-2>
24. Ventry IM, Weinstein BE (1982) The hearing handicap inventory for the elderly: a new tool. *Ear Hear* 3(3):128–134. <https://doi.org/10.1097/00003446-198205000-00006>
25. Newman CW, Weinstein BE, Jacobson GP, Hug GA (1990) The Hearing Handicap Inventory for Adults: psychometric adequacy and audiometric correlates. *Ear Hear* 11(6):430–433. <https://doi.org/10.1097/00003446-199012000-00004>
26. Noble W, Jensen NS, Naylor G, Bhullar N, Akeroyd MA (2013) A short form of the Speech, Spatial and Qualities of Hearing scale suitable for clinical use: tThe SSQ12. *Int J Audiol* 52(6):409–412. <https://doi.org/10.3109/14992027.2013.781278>
27. Cox RM, Alexander GC (1995) The abbreviated profile of hearing aid benefit. *Ear Hear* 16(2):176–186. <https://doi.org/10.1097/00003446-199504000-00005>
28. Cox RM, Alexander GC (1999) Measuring satisfaction with amplification in daily life: tThe SADL scale. *Ear Hear* 20(4):306–320. <https://doi.org/10.1097/00003446-199908000-00004>
29. Andersson KE, Andersen LS, Christensen JH, Neher T (2021) Assessing real-life benefit from hearing-aid noise management: SSQ12 questionnaire versus ecological momentary assessment with acoustic data-logging. *Am J Audiol* 30(1):93–104. [https://doi.org/10.1044/2020\\_AJA-20-00042](https://doi.org/10.1044/2020_AJA-20-00042)
30. Hoover A, Krishnamurti S (2010) Survey of college students' MP3 listening: hHabsits, safety issues, attitudes, and education. *Am J Audiol* 19(1):73–83. [https://doi.org/10.1044/1059-0889\(2010\)08-0036](https://doi.org/10.1044/1059-0889(2010)08-0036)
31. Convery E, Hickson L, Meyer C, Keidser G (2019) Predictors of hearing loss self-management in older adults. *Disabil Rehabil* 41(17):2026–2035. <https://doi.org/10.1080/09638288.2018.1457091>
32. Beck DL, Danhauer JL, Abrams HB, Atcherson SR, Brown DK, Chasin M, et al (2018) Audiologic considerations for people with normal hearing sensitivity yet hearing difficulty and/or speech-in-noise problems. *The Hearing Review* 25(10):28–38
33. Utoomprurkorn, N., Stott, J., Costafreda, S. G., & Bamio, D. E. (2021, June). Lack of association between audiogram and hearing disability measures in mild cognitive impairment and dementia: what audiogram does not tell you. In *Healthcare* (Vol. 9, No. 6, p. 769). MDPI. [<https://doi.org/10.3390/healthcare9060769>]
34. Ruusuvaari JE, Aaltonen T, Koskela I, Ranta J, Lonka E, Salmenlinna I, Laakso M (2021) Studies on stigma regarding hearing impairment and hearing aid use among adults of working age: a scoping review. *Disability and rehabilitation* 43(3):436–446. <https://doi.org/10.1080/09638288.2019.1622798>
35. Humes LE (2021) An approach to self-assessed auditory wellness in older adults. *Ear Hear* 42(4):745. <https://doi.org/10.1097/AUD.0000000000001001>
36. Edwards, B. (2020, February). Emerging technologies, market segments, and MarkeTrak 10 insights in hearing health technology. In *Seminars in hearing* (Vol. 41, No. 01, pp. 037–054). Thieme Medical Publishers. <https://doi.org/10.1055/s-0040-1701244>
37. Newman CW, Hug GA, Jacobson GP, Sandridge SA (1997) Perceived hearing handicap of patients with unilateral or mild hearing loss. *Annals of Otolaryngology, Rhinology & Laryngology* 106(3):210–214. <https://doi.org/10.1177/00034894971060030>
38. Kochkin S (2012) MarkeTrak VIII: The key influencing factors in hearing aid purchase intent. *Hearing Review* 19(3):12–25
39. Verma RR, Konkimalla A, Thakar A, Sikka K, Singh AC, Khanna T (2021) Prevalence of hearing loss in India. *National Medical Journal of India* 34:4. [https://doi.org/10.25259/NMJL\\_66\\_21](https://doi.org/10.25259/NMJL_66_21)
40. Roup CM, Post E, Lewis J (2018) Mild-gain hearing aids as a treatment for adults with self-reported hearing difficulties. *J Am Acad Audiol* 29(6):477–494. <https://doi.org/10.3766/jaaa.16111>
41. Wiley TL, Cruickshanks KJ, Nondahl DM, Tweed TS (2000) Self-reported hearing handicap and audiometric measures in older adults. *J Am Acad Audiol* 11(02):67–75. <https://doi.org/10.1055/s-0042-1748012>
42. Sindhusake D, Mitchell P, Smith W, Golding M, Newall P, Hartley D, Rubin G (2001) Validation of self-reported hearing loss The Blue Mountains hearing study. *International journal of epidemiology* 30(6):1371–1378. <https://doi.org/10.1093/ije/30.6.1371>

## Publisher's Note

Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.