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Original Research Article

Experience of helmet usage among hearing aid users: a cross sectional study

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ABSTRACT

Background: In India, persons with hearing impairment who benefit from hearing aids can acquire a driving license. The law mandates helmet use while driving two-wheelers. Using a hearing aid with a helmet on may be a challenge, but it is paramount to understand the difficulties the hearing aid users face.
Methods: A cross-sectional research design was used to study the experience of hearing aid users who ride two-wheelers. A checklist was developed and administered to 15 individuals with hearing impairment who ride two-wheelers. The checklist had 11 questions under three domains; 'helmet related,' 'comfort related', and 'driving/ listening related. The study was carried out in and around Bangalore. The data was collected through the interview method.
Results: The subjects reported difficulties in the comfort-related and driving/listening-related domains. Many participants felt the need to modify the helmet design to suit hearing aid users. They also felt a need for a special program for driving mode in the hearing aids.
Conclusions: Hearing-impaired two-wheeler riders face problems in localization, fear of hearing aid falling, and sweating using hearing aids while driving. It affects them on two fronts. One, it may pose a risk to others or the hearing impaired themselves on the road. Second, avoiding riding two-wheelers may limit their rights and mobility.

Keywords: Hearing aids, Helmets, Driving, Public health, Road safety

INTRODUCTION

A road traffic injury is a fatal or non-fatal injury incurred due to a collision. Two-wheelers are the primary commutation mode for people from lower socioeconomic backgrounds.[1,2] In India in 2015, an alarming average of 17 lives lost per hour- the scope of the problem is particularly severe.[3] Road traffic injuries are the leading cause of death for children and young adults aged 5-29 years, with young males under 25 accounting for nearly 73% of the fatalities.[4] RTAs for motorcyclists, cyclists, and pedestrians account for more than 50% of head-related deaths.[4] A possible reason for the elevated fatality rate is the lack of protective equipment and shielding, such as low helmet use, as evidenced in low and middle-income countries.[5] The economic burden of road traffic accidents is 3.7% of the Indian GDP.[6]

Studies show the importance of wearing helmets in preventing motorcycle crash (MC) injuries and deaths.[4,7] A Cochrane review found that helmet use reduced the risk of head injuries and deaths by 69 and 42%, respectively.[5] Though vision and hearing complement and coordinate each other in making driving safe, the hearing alerts are seen as cueing to the visual system more so to localize the sound source and direct the visual system to search for the object in that direction. Contradictory reports are available in the literature on the effect of hearing loss on

driving skills. An early study indicated that hearing-impaired people, as a group, had poorer driving records than normals.[8] A later study reported that no such higher risks are posed by hearing impairment.[9] However, hearing aid users were at increased risk of an injury collision and speculated the feedback from the hearing aid as the cause. The more auditory distractions someone had, the more difficult it was to focus on safe driving.[10]

Driving may exacerbate the challenge, and those using hearing aids were at increased risk of an injury collision.[10] It was speculated that the feedback from the hearing aid while driving may create a distraction, placing the driver at an increased risk of crash involvement.[9] Hence, in reality, hearing aid users may or may not use the hearing aid or the helmet during driving. It should be noted that hearing-impaired individuals, who would benefit from hearing aids, are eligible for driving license in India. Further, the law mandates the use of helmets while driving two-wheelers. Thus, it is essential to understand the effective use of helmets amongst the hearing impaired and the discomfort they undergo while using helmets and a hearing aid.

Therefore, the study attempts to fill in the knowledge gaps indicated above by analyzing the difficulties faced by hearing aid users while riding two-wheelers. The study aimed to examine the challenges faced by hearing aid users when wearing helmets and investigate potential changes or challenges in the utilization of hearing aids while riding a two-wheeler. Study will help understand whether the existing helmet designs meet the needs of individuals using hearing aids and establish whether specialized helmet designs are necessary.

Rationale: It is crucial to comprehend how hearing-impaired people utilize helmets and how uncomfortable it can be for them to wear a helmet while wearing hearing aids. The novelty of the study is that it probes the experience of hearing aid users on driving two-wheelers, which is a typical mode of mobility in developing countries.

Aim of the study was to explore the lived experiences of helmet usage in hearing aid using individuals.

METHODS

A cross-sectional research design was used to study the experience of hearing aid users who ride two-wheelers. Fifteen hearing aid users aged between 18 to 60 years volunteered to take part in the study. A convenient sampling method was used to select the participants from the community. Only subjects who reportedly commuted regularly in two-wheelers were recruited. Considering that most individuals with hearing impairment preferred the other mode of transport to avoid driving, the current study was carried out with a smaller sample size. All subjects were residents of Bangalore. People who had vision problems along with hearing loss were not included in the study. A checklist for this purpose was developed and validated. Data were collected over six months (2019, December). Duration of hearing loss, hearing aid usage, and unilateral/bilateral hearing aid usage could be confounding factors. The study was approved by the institute ethics committee (No. SISH/AS180010/2018-20).

Phase I: Development and validation

A collection of questions was developed based on suggestions from the general public and academicians. The checklist was designed with 30 questions divided into three categories: 1. Helmet related; 2. Comfort related 3. Concerns about wearing a helmet while driving or while listening. The content validity was carried out by four audiologists and one epidemiologist, each with at least ten years of expertise in their specialized fields. A five-point scale was used for validation, with one being the lowest score and five the highest. Based on the relevance and appropriateness of the generated item, validators were asked to rate each item. Those items which were rated irrelevant and inappropriate were excluded from the study. The final checklist comprised a total of 11 questions categorized into the following domains: questions connected to helmets (Q. no. 1-3), related to comfort (Q. no. 4-7), and linked to driving and listening (Q. no. 8-11). There were no negative items and reverse scoring in the checklist. The checklist was self-explanatory and, where appropriate, included instructions for the respondents. A five-point rating scale was used, with 'one' denoting "never" and 'five' denoting "always." Further, the participants were asked to respond to two probe questions; 1. Do you need a special driving program mode in hearing aids? 2. Is there a need for a special helmet for hearing aid users? This was done to see if the participants perceived a need for a hearing aid/helmet modification.

Phase II: Participants

Fifteen hearing-impaired participants with valid driving licenses between 18 and 60 took part in the study. The subjects reported benefits from their hearing aids. The researcher reviewed their audiological reports, had discussions with the participants to check the hearing aid benefit informally, and physically inspected the hearing aids for their working condition. Participants reported using hearing aids regularly for at least a year and had never driven without a helmet or a hearing aid. Individual who had vision issues along with hearing loss were not included in the study. All the participants have been driving for more than five years and using hearing aids for more than eight hours daily.

Procedure for data collection

Participants were instructed to complete a checklist after carefully reading the given instructions. Informed consent was obtained from all the participants. Participants could

rate their answers on a 5-point rating scale using the self-explanatory format of the checklist. The scale ranged from one, which stood for "never," to 5, which stood for "always.". Further, the probing questions to explore the perception of need for modification in hearing aid/helmet were scaled on 5-point scale between 'strongly disagree, disagree, neutral, agree, and strongly agree.'

Statistical analysis

Frequency and percentages were used to express the data.

RESULTS

The demographic profile of the subjects revealed that the mean age of the participants was 42.13 (14.52) years. Of that, 14 were males, and one was female. All 15 subjects had bilateral hearing loss ranging from mild to moderately severe degrees. All subjects reported no prior exposure to noise. Mean duration of hearing aid usage was 8.03 (6.44) years. About 86.6% of people had been using hearing aids for more than 2 years. Bilateral hearing aid use is at 73.3%, 40.6% of subjects used BTE, 13.3% used RIC and 46.6% used CIC hearing aids (Table 1).

Table 2 shows that a majority (60%) felt uncomfortable listening with hearing aid and helmet used together, more than half of them (53%) reported difficulty to localize the sounds through their hearing aids with their helmet on. Nearly half (46%) reported sweating around the ears upon using hearing aids with a helmet on and one-fourth of the participants (26%) reported that they were afraid that their hearing aids might fall off.

Interestingly, about 73% agreed/strongly agreed that there is a need for a special driving program, as well as another 60% felt same for a specially designed helmet (Table 3).

Table 1: Demographic profile of the subjects (n=15).

Profile	Category	N	Percentage (%)
Gender	Male	14	93.33
	Female	01	6.67
Type of hearing loss	SNHL	14	93.33
	Mixed HL	01	6.67
Hearing aid usage	Unilateral	04	26.67
	Bilateral	11	73.33
Type of hearing aid	BTE	08	53.33
	CIC	04	26.67
	RIC	03	20.00

Legend: SNHL: Sensorineural hearing loss, HL: Hearing loss, BTE: Behind the ear hearing aid, CIC: Completely in the ear hearing aid, RIC: Receiver in the canal hearing aid.

Table 2: Experience of helmet usage on hearing aid users.

Questions	Never (1) (%)	Rarely (2) (%)	Sometimes (3) (%)	Often (4) (%)	Always (5) (%)
Helmet related					
Avoid driving	14 (93.33)	1 (6.67)	0	0	0
Helmet block your hearing aid	12 (80)	3 (20)	0	0	0
Difficult to adapt	5 (33.33)	8 (53.33)	2 (13.33)	0	0
Comfort related					
Fear for hearing aid fall	4 (26.67)	7 (46.67)	3 (20)	1 (6.67)	0
Feel ear pain	9 (60)	5 (33.33)	1 (6.67)	0	0
Sweating around the ears	2 (13.33)	6 (40)	3 (20)	3 (20)	1 (6.67)
Get annoyed	8 (53.33)	6 (40)	1 (6.67)	0	0
Driving and listening					
Feel uncomfortable	2 (13.33)	4 (26.67)	4 (26.67)	5 (33.33)	
Hearing aid occluding	10 (66.67)	5 (33.33)	0	0	0
Difficulty in localising	3 (20)	4 (26.67)	6 (40)	1 (6.67)	1 (6.67)
Traffic noise irritation	4 (53.33)	10 (40)	1 (6.67)	0	0

Table 3: Perception of need for modification in hearing aid/helmet.

Modifications	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
Need for special driving program	2 (13.33)	0	2 (13.33)	2 (13.33)	9 (60)
Need for special helmet	3 (20)	2 (13.33)	1 (6.67)	2 (13.33)	7 (46.67)

DISCUSSION

The results showed that none of the participants avoided driving though they had some difficulties with the helmet usage. It could be due to the fact that in this study, only the participants who were already using their hearing aids while driving were included. These participants might have already developed some coping mechanisms to deal with the difficulties presented by driving. However, this may not be the case for most other hearing aid users who may decide not to wear a hearing aid or helmet, posing a serious problem that has to be addressed.

Participants reported some difficulties in the comfort-related and driving/listening domains. The most common concerns were fear of hearing aids falling off & sweating around the ear when wearing a helmet over a hearing aid. It is important to note that even among the general public, users of helmets regularly express discomfort-related difficulties.[11] These comfort difficulties may be significantly worse for those who wear hearing aids. The current helmet design may not be sufficiently compatible with hearing aids. Despite these obstacles, participants showed awareness of the value of wearing a helmet and reported a preference for using it when driving, demonstrating their commitment to placing safety first. Participants in the study also mentioned having difficulties in the listening domain with uncomfortable listening with a hearing aid as well as the difficulty in the sound localization. Traffic noise is a big problem for hearing-impaired drivers in developing nations like India, where honking is frequent. Further, localization problems may force persons using the hearing aid heavily rely on the visual cues, which adds to their cognitive load. Failure of the one sensory system causes an increase in the cognitive drain, which could impact on the driving ability.

Contrary to reporting lesser difficulties, most participants felt the need for better-designed helmets and special hearing aid programs. This indicates that there could be some or many other factors that this checklist should have looked into. Modifications to helmet design should be made to address comfort-related issues so that people wearing hearing aids can wear them comfortably. Driving experience for persons with hearing impairments could also be substantially improved by introducing specialised driving program modes in hearing aids to solve the difficulties of sound localization and filtering out distracting traffic noise. Further, the coping mechanism applied by successful hearing aid users while driving could be documented for the benefit of other hearing aid users who otherwise desist themselves from driving. Training programs focusing on improving situational awareness, appropriate use of visual signals, and ways to handle the mental fatigue while driving shall be beneficial.

Hearing loss is one of these issues that impact practical capacities and add to mental weariness and direct deficits. Even though it is legal for people with hearing loss to drive, little research has been done on the effectiveness of hearing aids in different driving scenarios. Laws requiring the use of helmets have been shown to reduce brain injuries, especially in low- and middle-income countries.[1,2,12] However, the influence of an individual's medical condition, such as sensory impairments or cognitive limitations, on accident rates cannot be overlooked.[13,14] The results of this study highlight the need to further probe into the difficulties and the solution for simultaneous usage of hearing aid and helmet by persons with hearing impairment.

Limitations

The checklist used in this study may not be sensitive to bring out all the aspects of the stated problem and its solution. Further, the present study was carried out on a smaller sample size. Future studies can expand the research by including many other factors, including reasons for hearing aid users not driving/ not wearing a helmet, different types of hearing aids, different degrees of hearing loss, and others. The present study findings cannot be generalised owing to small sample size. There is a need to study these aspects further to improve the drive safety aspects for persons with hearing impairment. With the higher burden of road traffic accidents biased towards developing countries and young people, a detailed study becomes even more important.

CONCLUSION

Persons with hearing impairment face problems while using a hearing aid with their helmet on. Common problems reported by hearing aid users while wearing helmet were the sweating around the ears upon using hearing aids with a helmet on, uncomfortable listening with hearing aid while using helmet, difficulty to localize the sounds through their hearing aids with their helmet. The problems pertaining to comfort and listening are majorly reported. The participants felt a need to modify both the helmet and the hearing aids.

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