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Original Article

Assessing Benefit of Hearing Aid Using Shortened Hearing Aid Performance Inventory

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ABSTRACT

The ultimate goal of aural rehabilitation plan is successful use of amplification device in everyday communication. Insufficient quantitative information is present about the benefits of hearing aids in Pakistan. **Objective**: To fill this gap and gather quantitative data regarding benefit derive from hearing aids, Current study assessed hearing aid benefit using shortened hearing aid performance inventory, while comparing it with different parameters of hearing aid use and demographics like gender. **Methods:** This Cross-Sectional study was conducted at Isra Institute of Rehabilitation Sciences, Isra University, Pakistan from December 2020 to May 2021. Study recruited a sample of N=377 hearing aid users, of both genders, aged 18 to 60 years, who were using hearing aids for at least 2 months, utilizing non-probability, convenient sampling. Patient's pure tone audiogram and shortened hearing aid performance inventory (SHAPI) was used for data collection. SPSS version-20.0 was used for data collection. T-test and Anova statistics used for data analysis with $p<0.05$ considered significant. **Results:** Out of 370 individuals' majority (71.6%) were males with mean age of 44.63 ± 12.99 years. Mean SHAPI score was 2.24 ± 0.68. There was significant association with duration of hearing aid use, hearing aid technology, hearing aid fitting and gender of participants. **Conclusions:** Current study revealed a low SHAPI mean score indicating benefit and satisfaction in different listening situations among hearing aid users. Benefit derived from hearing aid is significantly affected by factors like gender, hearing aid fitting, hearing aid technology and duration of hearing aid use.

INTRODUCTION

Hearing is a key factor for effective communication and individuals with hearing loss lack this aspect. According to World health organization (WHO) over 466 million individuals have disabling hearing loss (432 million adults and 34 million children) [1]. Therefore, for rehabilitation purpose, amplification devices are prescribed to individuals, so that they can hear amplified speech. Aural rehabilitation involves provision of amplification devices and development of alternative communication strategies to alleviate the communication barriers. The traditional approach of measuring speech reception can be used as the assessment of benefit derives from hearing aid and the aural rehabilitation plan as a whole. But the use of speech reception performance with and without hearing aid has poor reliability and validity [2, 3]. An individual who is unable to hear 20dB or below intensity sounds, is considered to have hearing loss, that can either be conductive, sensorineural, or mixed type of hearing loss. Depending upon the side, hearing loss can also be unilateral or bilateral. Individuals with hearing loss ranging from mild to severe are categorized as hard of hearing which result in affecting their daily life thus making it difficult for them to listen normal conversations or even loud sounds [4]. The majority of hearing aid users are elderly [5]. Age and age related health factors may lead to non-compliance with amplification devices. Furthermore, physical changes that

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accompany aging cause reduced dexterity in handling hearing aids [6]. In elderly population presence of central auditory processing or general cognitive difficulties are more frequent [7, 8]. Benefit derives from hearing aid reduces with increasing age of the patient [9]. Attitude is a significant determinant of hearing aid use and aberrant attitude can be altered by counseling to achieve better outcome [10]. Individuals who are hard of hearing commonly communicate through spoken language and can get benefit from amplification devices. Over 5% of the world total population needs rehabilitation or management to get their progressing hearing loss addressed. It is estimated that by 2050 over 700 million individuals will have hearing disability. Hearing loss greater than 35dB in the better hearing ear is considered as disabling hearing loss. Low and middle-income countries population constitute nearly 80% of individuals with disabling hearing loss. With increasing age prevalence of hearing loss increases [1]. Any sort of audiology practice has the potential to benefit greatly from outcome measures. The discipline of audiology is not exempt from the high financial costs associated with technological and medical advancements; in fact, cost is just one of major factors that impact a person's decision to select hearing aids. Therefore, choosing an optimal outcome measure requires careful consideration. Most suitable alternative for assessing benefits derives from hearing aid is self-report questionnaires as compared to speech tests that have low reliability [2, 3]. Previous studies have indicated that shortened hearing aid performance inventory (SHAPI) is the most robust subjective measure of satisfaction derived from amplification device [9, 11]. The ultimate goal of aural rehabilitation plan is successful use of amplification device in everyday communication. Inadequate numerical data concerning satisfaction derived from amplification devices has been produced in Pakistan till date. Hence this study is designed to produce quantitative data regarding benefit derive from shortened hearing aid, while comparing it with different parameters of hearing loss, amplification device use and types, and other demographics of Patients. The study is of significant practical help for giving insight into the benefit achieved by using hearing aids in patients, which could be helpful for assessing their hearing aid adjustment needs and hence help in rehabilitation.

METHODS

This cross sectional study was conducted at Isra Institute of Rehabilitation Sciences (IIRS), Isra University, Islamabad over a period of 6 months from December 2020 to May 2021. Study recruited a sample of N=377 hearing aid users from different audiology clinics of Islamabad using non-probability convenience sampling. Sample was calculated using Raosoft online calculator with 95% confidence internal and 5% margin of error. Sample included both genders, aged 18 to 60 years, using hearing aid for the last 2 months. Those with any physical or mental health related issues or those suffering with inflammatory or obstructive ear disorders and with vertigo complaints were excluded. A demographic sheet, Shortened Hearing Aid Performance Inventory (SHAPI) [9,11] and Patient's Pure Tone Audiogram were used for data collection. Study was initiated after obtaining ethical approval of research from Institutional Research Board of Isra University Dated 06th Nov 2020 and informed consent of the participants. Ethical guidelines were observed and confidentiality of the participant's data were maintained. Hearing aid users were approached and data collected through telephone calls, WhatsApp and email. Shortened Hearing Aid Performance Inventory (SHAPI) is a valid and reliable questionnaire that consists of 38-items regarding specific listening situations with which respondents are assumed to be familiar. The Respondents graded the performance of amplification device in different communication circumstances on a scale of 1 to 6, with 1 for "very helpful", 2 is "helpful", 3 is "very little help", 4 "No help" , 5 is "hinders the performance" and 6 refers to the "Does not apply". Higher SHAPI score indicated less benefit derive from hearing aid, while lower SHAPI score indicates more benefit derive from hearing aid [9, 11]. Data were analyzed using SPSS 20.0 version and descriptive statistics were used. Frequency and percentage were calculated for patient and hearing aid use characteristics and means for the SHAPI score. T-test and Anova statistics were utilized to see any association of SHAPI score with the patient and hearing aid use characteristics. $P<0.05$ was considered significant.

RESULTS

Current study sample comprised 265(71.6%) males and 105(28.4%) female hearing aid users with a mean age of 44.63 ± 12.99 years. Descriptive statistics (table 1) of the study show that 28.9% of participants were using hearing aid for 1-2 years, whereas 60.5% of the participants were using hearing aid for more than ten hours per day. Also, most of the participants i.e., 97.8% were using digital hearing aid, out of these 48.4% participants were using completely in the canal style of hearing aid. Upon assessment, it was also revealed that 79.5% participants reported no tinnitus; followed by 12.4% participants had tinnitus in both ears. 4.6% participants had profound level of hearing loss in right ear and 3.8% in left ear. This table shows that most of the participants reported sensorineural hearing loss of both ears.

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Table 1: Descriptive statistics for demographic and clinical variables (n=377)

Variables	Group	Frequency (%)
Hearing aid fitting	Monaural Right ear	74(20)
	Monaural Left ear	33(8.9)
	Binaural	263(71.1)
Duration of hearing aid use	2-6 months	15(4.1)
	7-12 Months	16(4.3)
	1-2 years	107(28.9)
	3-4 years	66(17.8)
	5-6 years	56(15.1)
	7-8 years	56(15.1)
	9-10 years	15(4.1)
	Plus 10 years	39(10.5)
Hourly use per day	3-4 hours	4(1.1)
	5-6 hours	32(8.6)
	7-8 hours	51(13.8)
	9-10 hours	59(15.9)
	More than 10 hours	224(60.5)
Hearing aid technology	Analogue hearing aid	8(2.2)
	Digital hearing aid	362(97.8)
Hearing aid style	BTE	108(29.2)
	RITE	39(10.5)
	ITE	16(4.3)
	ITC	28(7.6)
	CIC	179(48.4)
Tinnitus	Right ear	22(5.9)
	Left ear	8(2.2)
	Both ears	46(12.4)
	No	294(79.5)
Degree of hearing loss in right ear	Normal	16(4.3)
	Mild	12(3.2)
	Moderate	132(35.7)
	Moderately severe	136(36.8)
	Severe	57(15.4)
	Profound	17(4.6)
Degree of hearing loss in left ear	Normal	36(9.7)
	Mild	21(5.7)
	Moderate	87(23.5)
	Moderately severe	146(39.5)
	Severe	66(17.8)
	Profound	14(3.8)
Type of hearing loss in right ear	Normal	16(4.3)
	Conductive	8(2.2)
	Sensorineural	294(79.5)
	Mixed	52(14.1)
Type of hearing loss in left ear	Normal	40(10.8)
	Conductive	11(3)
	Sensorineural	261(70.5)
	Mixed	58(15.7)

In current study the mean score of participants on SHAPI was 2.24 ± 0.68 (range 1 to 4.6). Table 2 shows the cross tabulation of SHAPI score with gender, hearing aid technology and hearing aid fitting. The scores p-values of all three variables show a significant (p=0.000) result.

Table 2: Cross tabulation of mean SHAPI score and duration of hearing aid use, technology, laterality/fitting and gender

Variables	Group	N	Mean ± SD	p-value
Duration of hearing aid use	2-6 months	15	2.80 ± 0.57	0.00
	7-12 Months	16	2.29 ± 0.78	
	1-2 years	107	2.29 ± 0.56	
	3-4 years	66	1.88 ± 0.60	
	5-6 years	56	2.35 ± 0.78	
	7-8 years	56	2.36 ± 0.44	
	9-10 years	15	3.00 ± 1.02	
	Plus 10 years	39	1.87 ± 0.62	
Gender of participants	Male	265	2.13 ± 0.67	0.00
	Female	105	2.53 ± 0.63	
Hearing aid Technology	Analogue hearing aid	8	2.60 ± 0.08	0.00
	Digital hearing aid	362	2.23 ± 0.69	
Hearing aid fitting	Monaural Right ear	74	2.24 ± 0.65	0.00
	Monaural Left ear	33	1.99 ± 0.46	
	Binaural	263	2.27 ± 0.71	

DISCUSSION

Current study was conducted to assess the benefit derived from amplification device using a Shortened Hearing Aid Performance Inventory. Due to literature gap in Pakistan, this study was aimed at filling this gap by providing evidence based data in this regard. Mean SHAPI score is 2.24 which indicates hearing aid users are benefited from hearing aid in different listening situations. Mean SHAPI score was compared to gender, hearing aid fitting, hearing aid technology and duration of hearing aid use, which significantly affect the mean SHAPI score. Lower SHAPI mean score (2.24) in the current study indicates that the benefit derived from hearing aid in different listening situations is more in the study population as compared to the Schum (2.30) [11] and Jerrum and Purdy (2.50). SHAPI mean score in Jerrum and Purdy study was higher than the current study indicating a less benefit from hearing aid in different listening situations [9]. This difference in the mean score might be contributed to the difference in the hearing aid fitting and sample size. Another study conducted by Schum hearing aid satisfaction mean score (2.30) was more than the current study (2.24) [11]. That might be because of mean age and hearing aid fitting. In contrary, Walden *et al.*, revealed mean hearing aid satisfaction score of 2.13, which is less than the current study. This difference in the mean score might be contributed to the low sample size, experienced hearing aid users who have more than 10 years of experience and more hourly use per day of amplification device in Walden *et al.*, study. Moreover, the questionnaire used by the Walden *et al.*, was 64 items questionnaire [12]. Hourly use per day is significantly associated with satisfaction from hearing aid (Schum *et al.*,)(Brooks *et al.*,)(Satherley *et al.*,)(Cameron *et al.*,), this is consistent with the present study's findings [11-15]. Brooks in 1985 conducted study on the factors related

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to under use of hearing aid, it was revealed that hearing aid users who use hearing aid for fairly extensive time were satisfied from amplification device while those hearing aid users with less hourly use per day were not satisfied from amplification device [13]. Schum in 1992 conducted study on responses of elderly hearing aid users on the hearing aid performance inventory, study revealed that more benefit was derived from hearing aid for those hearing aid users who wear amplification device more often [11]. In contrast, Jerrum and Purdy in 1997, Bender *et al.*, & Parving and Philip found no correlation between hourly use per day and benefit derived from hearing aid [9, 16, 17]. The rationale for the inconsistency across literature is not clear. However, it seems that benefit derived from hearing aid is not simply identified by the number of hours per day hearing aid users wear their amplification devices. In current study SHAPI mean score is significantly correlated to hearing aid fitting, which is contrary to the findings of Schum and Jerrum and Purdy. Possible reason for this difference can be that current study have majority (71.1%) of the participants using binaural hearing aid fitting as compared to 49% and 55% by Jerrum and Purdy and Schum [9, 11] respectively. In current study gender is significantly associated with satisfaction from hearing aid, indicating a more benefit derived from hearing aids among male participants (2.13 Mean SHAPI score) as compared to female participants (2.53 Mean SHAPI score) which is also in compliance to study by Narne *et al.*, [18]. In contrast Williams *et al.*, and Aurelio *et al.*, reported no gender difference in terms of satisfaction from hearing aid [19, 20]. This difference could be accounted by the equal number of male and female participants in previous study and it might be because of different questionnaire was used to assess satisfaction from hearing aid.

CONCLUSIONS

Current study revealed a low SHAPI mean score indicating benefit and satisfaction in different listening situations among hearing aid users. Benefit derived from hearing aid is significantly affected by factors like gender, hearing aid fitting, hearing aid technology and duration of hearing aid use.

Authors Contribution

Conceptualization: GS
Methodology: GS, MAS
Formal Analysis: AJ
Writing-review and editing: AM, MAS, GS

All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflict of interest.

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