

Oral Health Status, Treatment Needs and Oral Health Related Quality of Life among Hearing Impaired Adults in Riyadh City, Saudi Arabia

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ABSTRACT

Aim: The primary objective was to determine the oral health status and treatment needs among hearing-impaired (HI) adults. Second, to assess the relationship between the oral health variables and oral health-related quality of life (OHRQoL) by using General Oral Health Assessment Index (GOHAI)-Ar questionnaire among HI adults in Riyadh city, Saudi Arabia.

Materials and methods: A total of 146 HI adults between the age groups of 18–21, 22–25, and >25 years were included in the study. A convenient sampling technique was used to obtain the study sample. Oral health condition was recorded by using oral hygiene index-simplified (OHI-S), plaque index (PI), and gingival index (GI). The WHO methodology was used to record dental caries and treatment needs. The Saudi Arabian version of GOHAI-Ar questionnaire was used to gather information with regard to OHRQoL. A sign language expert communicated information between HI and investigator while answering the questionnaire.

Results: More than half of the HI had fair OHI-S (55.2%) and PI score (54.2%), while 60.1% of HI had moderate gingival inflammation. The prevalence of dental caries (82.2%) and treatment needs (85.6%) were found to be high. Mean oral hygiene scores between Saudi and non-Saudi nationals [(1.64) vs (1.12), $p = 0.041$] showed significant differences. Missing and filled teeth showed significant differences across different age groups ($p = 0.000$). The mean GOHAI-Ar was found to be low (14.44 ± 9.59). Spearman's test showed a significant positive correlation between the GOHAI-Ar score and the toothbrushing method ($r = 0.164$, $p = 0.047$). Toothbrushing time, oral hygiene material, last visit to dentist, OHI-S score, PI score, decayed, missing, and decayed missing filled teeth (DMFT) scores were negatively correlated with GOHAI-Ar. Speech was the main concern for the HI.

Conclusion: There was a fair oral hygiene, moderate gingival inflammation, high caries experience, and treatment needs with low GOHAI-Ar scores indicating poor OHRQoL among HI.

Keywords: GOHAI-Ar, Hearing impaired, OHRQoL, Oral health status, Treatment needs.

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INTRODUCTION

Of all our tactile systems, hearing is the most fundamental to communication. The terms "hearing impairment" and "hearing loss" refer to the audiometric evaluation that is below the threshold for normal hearing (around 15 dB). The term "deaf" is applied to complete hearing loss. These can be inherited, or acquired over a period of time or disease process. Hence, any hearing impairment effects pretty much the complete human experience. Loss of hearing has harmful consequences on individual's psychological, emotional, educational, and occupational performances. Moreover, hearing loss among older adults is associated with social isolation, despair, abstinence from routine activities, frustration, and conflicts with family and friends.^{1,2} The prevalence of disabling hearing impairment is a silent, invisible, and life-long condition that is showing an upward trend. It has been reported that the adult onset hearing impairment is considered to be the third leading cause of disability.^{3,4}

In advanced countries, hearing impairment is one of the commonest birth defects and sensorineural disorders.⁴ More than 360 million people are affected by this disability, and 32 million (9%) of them are children. It has been reported that the South Asia has the highest prevalence of hearing loss (27%), while Middle East the lowest (3%). Gender comparison showed that more than half (56%) of the males and less than half (44%) females were affected with hearing loss.⁵

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The prevalence of sensorineural hearing loss in Saudi Arabia was found to be 1.5% that is considered high, and 36–66% being attributed to the genetic factors. This high prevalence

could be due to increased rates of consanguinity (57–67%) in Saudi population.^{6,7}

Previously conducted studies have reported poor oral hygiene, gingival inflammation, increased level of dental caries, and higher treatment needs among the hearing-impaired (HI) subjects compared with that of normal subjects.^{8–10} Similarly, studies conducted among HI children from Saudi Arabia have highlighted increased caries experience and poor oral hygiene status compared with that of the normal children.^{2,11} The problems associated with the mastering of the oral hygiene skills and lack of adequate oral health knowledge and access to qualified dentist were reasons for poor oral status among HI children in Saudi Arabia.¹²

Oral conditions interrupt normal social role functioning and lead to foremost variations in behavior, such measures are called oral health-related quality of life measures (OHRQoL).¹³ Globally, there is an emphasis on the measurement of quality of life through the assessment of physical, mental, and social well-being to effectively influence the health-care decisions.¹⁴ Several original and translated versions of OHRQoL instruments have been designed in the past two decades. General Oral Health Assessment Index (GOHAI) is a 12-item questionnaire designed to assess the impact of oral conditions on the quality of life, especially of the elderly people. GOHAI questionnaire assessed the three domains: physical function, pain or discomfort, and psychosocial function of quality of life.¹⁵ An original English version of the GOHAI questionnaire has been translated into an Arabic version which showed excellent validity and reliability to be used in Saudi Arabia.¹⁶

In spite of the seriously increasing level of hearing loss and poor oral conditions, there is a noticeable lack of data for oral health outcomes among adults with hearing problems in Saudi Arabia. However, a few studies that have addressed particularly on this topic demonstrated that although hearing loss differs from person to person, it consistently has a negative impact on individual's lives across OHRQoL measures, including physical function, pain, or discomfort and psychosocial function. Moreover, a few studies reported among hearing disabled mainly focused on children and assessed the prevalence of dental caries without much emphasis on the concept of OHRQoL.

Identifying oral health status and the OHRQoL among adults with hearing disabled is essential to improve their oral health outcomes. Further, this study seeks to strengthen the existing literature on oral health status, treatment needs, and OHRQoL by investigating the epidemiological profile of hearing-disabled adults, thereby providing evidence base for the oral health policies concerned with HI in Saudi Arabia.

Hence, the primary objective of the study was to determine the oral health status and treatment needs among HI adults. Second, to assess the relationship between the oral health variables and OHRQoL among HI adults aged ≥ 18 years in Riyadh city, Saudi Arabia.

MATERIALS AND METHODS

Ethical Approval

The study proposal was submitted and registered (FPGRP/43838001/215) in the Research Center of Riyadh Elm University. Institutional review board of Riyadh Elm University formally approved the study (RC/IRB/2018/977). The society for hearing disabled was approached and permission was obtained to conduct the study in Riyadh city. Due to the communication

problems with the hearing disabled, a sign language expert working with them conveyed information and consent to participate in the study was obtained from the participants.

Study Design

A cross-sectional descriptive survey was conducted among HI adults in Riyadh city, Saudi Arabia. The study was conducted over a period of 4 months from July 2018 to August 2018.

Study Participants and Setting

Adults aged 18 years and above, diagnosed as HI and willing to participate in the study, were included by applying the convenient sampling methodology. Data were collected by inviting the HI adults to the Namuthajiya clinics of the Riyadh Elm University, Riyadh.

Sample Size

The sample size was calculated based on the following formula:

$$n = \frac{z_{\alpha}^2 p \cdot q}{E^2}$$

where $Z_{\alpha} = 1.96$; $p = 93\%$ (the prevalence of dental caries among HI derived from the past study);¹¹ $q = 7 (100 - p)$; confidence interval = 95%; power = 95%; level of significance = 5%; E (allowable error) = 5% of $p = 4.65$. The sample size estimation yielded 114 subjects to be part of the study. However, to increase the power of the study, 32 more subjects were included thereby making a final sample of 146. The convenient sampling methodology was employed to select the study sample.

Standardization and Calibration

All the oral examination was carried out by a single-trained and calibrated postgraduate student from the Department of Dental Public Health. Intraexaminer calibration exercise was carried out by examining 10 dental patients seeking dental care in the Namuthajiya Campus to familiarize the criteria. All the data obtained from the patients were analyzed using the κ statistics, and the coefficient was found to be 82% reflecting substantial agreement in the examination.

Data Collection

A special proforma was prepared to collect the information from each study subject. The study proforma consisted of two parts: the first part included questionnaire to record demographic and oral health information and oral health-related quality of life. The second part recorded clinical oral health information.

Questionnaire Information

A sign language expert communicated the information between HI and the investigator to complete the questionnaire items. Demographic and oral health information section (frequency of toothbrushing, oral hygiene material, oral hygiene method, and last visit to dentist) consisted of seven close-ended questions (age, gender, nationality, frequency of toothbrushing, oral hygiene material, oral hygiene method, and last visit to dentist). OHRQoL of the study participants was measured using the Arabic version of GOHAI-Ar consisting of 12 items on a six-point Likert scale [0 = never, 1 = seldom, 2 = sometimes, 3 = often, 4 = very often, 5 = always]. The GOHAI-Ar was calculated by adding the score of the 12 items experienced, and it ranged from 0 to 60.

Clinical Oral Examination

Oral examination of the study participants was carried out in the Namuthajiya dental clinics by using a mouth mirror, WHO probe, and dental chair light while participant sitting on the dental chair. Oral hygiene index-simplified (OHI-S) proposed by Greene and Vermillion¹⁷ was recorded on six surfaces of the index teeth (buccal surfaces of teeth no. 16, 11, 26, 31 and lingual surfaces of 36 and 46), in case of missing index teeth, adjacent teeth were considered for recording. Similarly, plaque index (PI) of Silness and Løe¹⁸ and gingival index (GI) of Løe¹⁹ were recorded on teeth no. 16, 12, 24, 36, 32, and 44. The status of the decayed, missing, and filled teeth and dentition status and treatment needs were assessed. The WHO oral health assessment form 1997 was used to record dental findings among HI.

Statistical Analysis

Shapiro–Wilk’s test showed nonnormal distribution of the data. Descriptive statistics of frequency distribution, percentages, mean, and standard deviation were calculated. Nonparametric tests of Kruskal–Wallis and Mann–Whitney *U* were applied to compare the mean scores among different groups (age, gender, and nationality). The Chi-square test was applied to evaluate the association between demographic variables and treatments needs. Spearman’s test was applied to find the correlation between different variables. All the data were entered, coded, and subjected to analysis using Statistical software Package SPSS version 25.0 (Armonk, NY: IBM Corp., USA) by considering the significance level under 5% ($p < 0.05$).

RESULTS

A total of 146 HI subjects participated in the study, in which most of the subjects were females 105 (71.9%), aged between 18 years and 21 years 69 (47.3%). A high percentage of Saudi nationals 131 (89.7%) participated in the study compared with the non-Saudi nationals 15 (10.3%). When asked about the oral hygiene practices, the majority of the subjects mentioned that they brushed their teeth twice daily 55 (37.7%) by using toothbrush and toothpaste 133 (91.1%) with a horizontal technique 55 (37.7%). Nearly, 68 (46.6%) of the study subjects visited dentist 0 to 6 months back (Table 1).

Most of the subjects showed fair oral hygiene 79 (55.2%) and plaque 78 (54.2%) scores, while 86 (60.1%) of the study subjects had moderate gingival inflammation. Additionally, the prevalence of dental caries and treatment needs were found to be 120 (82.2%) and 125 (85.6%), respectively, as shown in Table 2.

The study participants aged >25 years showed lower mean PI (1.27), GI (1.17), OHI-S (1.46), and decayed teeth compared with the 18–21 years and 22–25 years old age groups. Age categories of 18–21, 22–25, and >25 years showed a mean number of missing teeth of 0.36, 0.54, and 2.95, respectively. When the number of missing teeth was compared among the three groups by using the Kruskal–Wallis test, a statistically significant difference was observed ($p = 0.000$). Further analysis by using the Mann–Whitney tests disclosed that the study participants aged >25 years had significantly higher missing teeth compared to the other two age groups ($p = 0.000$). Age categories of 18–21, 22–25, and >25 year showed a mean number of filled teeth of 0.94, 2.22, and 2.78, respectively. The mean number of filled teeth showed a statistically

Table 1: Personal and oral health characteristics of the study participants ($n = 146$)

Characteristics		n	%	95% confidence level (%)	
				LB	UB
Gender	Male	41	28.1	21.3	35.7
	Female	105	71.9	64.3	78.7
Age (years)	18–21	69	47.3	39.3	55.3
	22–25	37	25.3	18.8	32.8
	Above 25	40	27.4	20.7	35.0
Nationality	Saudi	131	89.7	84.0	93.9
	Non-Saudi	15	10.3	6.1	16.0
Frequency of tooth brushing	Once daily	54	37.0	29.5	45.0
	Twice daily	55	37.7	30.1	45.7
	Three times daily	21	14.4	9.4	20.8
	Once weekly	10	6.8	3.6	11.8
	I don’t brush	6	4.1	1.7	8.3
Oral hygiene materials	Tooth brush and toothpaste	133	91.1	85.7	94.9
	Miswak	10	6.8	3.6	11.8
	Finger with paste	3	2.1	0.6	5.4
Oral hygiene method	Horizontal	55	37.7	30.1	45.7
	Vertical	33	22.6	16.4	29.9
	Scrub	54	37.0	29.5	45.0
	Non-specific	4	2.7	0.9	6.4
Last visit to dentist	Never visited	14	9.6	5.6	15.2
	0–6 months	68	46.6	38.6	54.7
	7–12 months	31	21.2	15.2	28.4
	More than 12 months	33	22.6	16.4	29.9

Table 2: Clinical indices used among the study participants

Characteristics		n	%	95% confidence level (%)	
				LB	UB
OHI-S	Good	50	35.0	27.5	43.0
	Fair	79	55.2	47.1	63.2
	Poor	14	9.8	5.7	15.5
PI score	Good	40	27.8	21.0	35.5
	Fair	78	54.2	46.0	62.2
	Poor	26	18.1	12.4	24.9
GI score	Mild	46	32.2	24.9	40.1
	Moderate	86	60.1	52.0	67.9
	Severe	11	7.7	4.2	12.9
Prevalence of dental caries		120	82.2	75.4	87.7
Prevalence of treatment needs		125	85.6	79.2	90.6

LB, lower bound; UB, upper bound

Table 3: Comparison of mean scores of clinical indices with respect to age, gender and nationality

Variables	Age (years)			p	Gender		p	Nationality		
	18–21	22–25	>25		Male	Female		Saudi	Non-Saudi	p
PIS	1.38	1.34	1.27	0.568	1.35	1.34	0.877	1.35	1.23	0.477
GIS	1.27	1.37	1.17	0.404	1.43	1.20	0.079	1.26	1.29	0.997
OHI-S	1.63	1.64	1.46	0.660	1.88	1.47	0.059	1.64	1.12	0.041
Decayed teeth	8.00	7.84	5.25	0.084	8.29	6.78	0.104	7.34	6.00	0.419
Missing teeth	0.36^a	0.54^a	2.95^b	0.000	0.95	1.18	0.992	1.15	0.87	0.740
Filled teeth	0.94^a	2.22^b	2.78^b	0.000	1.22	1.98	0.054	1.81	1.40	0.722
DMFT score	9.29	10.59	10.98	0.276	10.46	9.93	0.392	10.29	8.27	0.271
GOHAI-Ar	15.25	13.43	13.98	0.432	15.73	13.93	0.499	14.27	15.87	0.555

PIS, PI score; GIS, GI score; OHI-S, oral hygiene index score; DMFT, decayed m, missing filled teeth; similar alphabetic across rows shows no significant difference between groups; GOHAI-Ar, General Oral Health Assessment Index Arabic Version [mean GOHAI-Ar ± SD (14.44 ± 9.59)]

significant difference among the three groups ($p = 0.000$). Further analysis revealed that subjects aged >25 years showed significantly higher mean number of filled teeth compared to 18–21 year age category ($p = 0.000$). Similarly, subjects in 23–25 years age category had significantly higher mean filled teeth compared to the 18–21 year age category ($p = 0.006$). Mean DMFT scores varied across different age groups. Study subjects in age categories of 18–21, 22–25, and >25 years showed a mean DMFT scores of 9.29, 10.59, and 10.98, respectively, without any significant differences ($p = 0.276$). Similarly, the highest mean GOHAI-Ar score of 15.25 was found in 18 to 21 year followed by 13.98 in >25 year and 13.43 in 22–25 year age categories with no statistical significance ($p = 0.432$) (Table 3).

Male subjects showed higher plaque (1.35 vs 1.34, $p = 0.877$), gingival (1.43 vs 1.20), OHI-S (1.88 vs 1.47), decayed teeth (8.29 vs 6.78, $p = 0.104$), DMFT score (10.46 vs 9.9, $p = 0.392$), and GOHAI-Ar scores (15.73 vs 13.93, $p = 0.499$) compared to their counter parts. While female subjects showed higher missing (1.18 vs 0.95, $p = 0.992$) and filled teeth (1.98 vs 1.22, $p = 0.054$) compared to the male participants without any statistical significance (Table 3).

Saudi nationals showed increased mean plaque score (1.35 vs 1.23), decayed (7.34 vs 6), missing (1.15 vs 0.87), filled teeth (1.81 vs 1.40), and DMFT scores (10.29 vs 8.27) compared to non-Saudi nationals. Similarly, Saudi's (1.64 vs 1.12, $p = 0.041$) showed significantly higher OHI-S score compared to the non-Saudi's. A lower GOHAI-Ar score was found among Saudi nationals (14.27 vs 15.87, $p = 0.555$) compared to the non-Saudi nationals without any significant differences (Table 3).

More than half 40 (55.6%) of 18–21 years, 19 (26.4%) 22–25 years, and 13 (18.1%) in >25 years were in need of preventive caries arresting care. This showed statistically significant differences ($p = 0.036$). Similarly, the age of the study participants was found to be significantly associated with one surface fillings ($p = 0.017$). Around 74 (66.7%) females and 37 (33.3%) males were in need of one surface filling. This difference in one surface filling between male and females was statistically significant ($p = 0.012$) (Table 4).

Spearman's correlation test was applied to assess the relationship between DMFT score, demographic, and oral health variables among the study participants. DMFT score showed significant positive correlation ($r = 0.165$, $p = 0.046$) with the frequency of toothbrushing. Moreover, age, timing of brushing teeth, materials used for teeth cleaning, method of toothbrushing, and last visit to dentist positively correlated with DMFT score without any statistical significance. While gender and nationality of the study participant were found to be negatively correlated with the DMFT scores (Table 5).

The responses to the individual GOHAI-Ar items varied with a high percentage of study subjects always limited the kinds of food they eat 74 (50.7%), troubled biting or chewing 83 (56.8%), unable to speak clearly 113 (77.4%), limited the contact with the people 94 (64.4%), used medication to relieve pain 93 (63.7%), worried about teeth, gums, or dentures 74 (50.7%), self-conscious of teeth, gums, or dentures 81 (55.5%), and uncomfortable eating in front of others 94 (64.4%). While a high percentage of subjects, very often able to swallow comfortably 46 (31.5%) and sensitive to hot, cold, or sweet

Table 4: Association between demographic variables and treatment needs among study subjects

Variables	Preventive caries arresting care		One surface filling		Two or more surface filling		Crown for any reason		Pulp care and restorations		Extraction	
	n	%	n	%	n	%	n	%	n	%	n	%
Age (years)												
	18-21	55.6	58	52.3	40	50.6	8	61.5	8	44.4	5	27.8
	22-25	26.4	29	26.1	18	22.8	2	15.4	2	11.2	5	27.8
	>25	18.0	24	21.6	21	26.6	3	23.1	8	44.4	8	44.4
	<i>p</i>	0.036*	0.017*		0.637		0.530		0.146		0.144	
Gender												
	Male	31.9	37	33.3	22	27.8	5	38.5	2	11.1	5	27.8
	Female	68.1	74	66.7	57	72.2	8	61.5	16	88.9	13	72.2
	<i>p</i>	0.306	0.012*	0.946		0.383		0.087		0.976		
Nationality												
	Saudi	93.1	99	89.2	73	92.4	12	92.3	17	94.4	15	83.3
	Non-Saudi	6.9	12	10.8	6	7.6	1	7.7	1	5.6	3	16.7
	<i>p</i>	0.191	0.704	0.247		0.748		0.340				

Table 5: Spearman's correlation between caries experience (DMFT)—demographic and oral health variables

Variables	Correlation coefficient	<i>p</i>
Age	0.133	0.109
Gender	-0.071	0.393
Nationality	-0.091	0.273
Frequency of brushing teeth	0.165*	0.046
Timing of brushing teeth	0.094	0.259
Materials for teeth cleaning	0.110	0.186
Method of teeth brushing	0.037	0.654
Last visit to dentist	0.140	0.092

foods 55 (37.7%). Nearly, 47 (32.2%) never pleased with the look of teeth. In general, a mean GOHAI-Ar ± SD (14.44 ± 9.59) score was reported among the study participants (Table 6).

Spearman's test showed a significant positive correlation between GOHAI-Ar score and toothbrushing method ($r = 0.164, p = 0.047$). However, toothbrushing time, oral hygiene material, last visit to dentist, OHI-S score, PI score, decayed, missing, and DMFT scores were negatively correlated with GOHAI-Ar without any statistically significant difference (Table 7).

DISCUSSION

This study presented an overview of the relationship among oral health status, treatment needs, and oral health-related quality of life among the HI adults in Riyadh city in Saudi Arabia. To the best of our understanding, this is the first study to explore the impact of oral health conditions on OHRQoL among HI. A high percentage of Saudi females aged between 18 years and 21 years with HI participated in this study.

More than half of the HI had fair oral hygiene and plaque scores with moderate gingival inflammation. A similar finding is reported in Yemen.²⁰ The Saudi HI exhibited significantly higher mean oral hygiene index scores while compared to non-Saudi HI. The oral hygiene index score among males was higher when compared to females, and the difference was not statistically significant ($p = 0.059$). These findings are contrary to the other reported studies from India.^{10,21,22} The reason for such finding could be the low level of oral health awareness observed among the HI in Saudi Arabia.¹²

One of the main findings of our study was 82% of prevalence of caries among HI. This finding is similar (82.5%) to that of reported by Vichayanrat and Kositpumivate in Thailand.²³ The prevalence of caries in our study was lower than the other reported studies (93% and 88%).^{2,20} On the contrary, studies conducted in Nepal (72.2%) and India (65%) reported lower prevalence of dental caries among HI compared to the present study.

The caries severity was affected by the age groups considered in the present study. HI demonstrated high mean decayed teeth in the age group of 18-21 years compared to the other age groups. This indicated high severity of the caries among the HI. This finding is higher than that reported by the Al-Qahtani and Wyne¹¹ and Al-Qahtani et al.² in Saudi Arabia.^{2,11} This is suggestive of active disease and could be attributed to various reasons including communication problems and low level of awareness and high dental treatment needs among HI. After making careful observations of present and previously reported literature, it can be found that as the age increased from childhood until adolescence caries severity increased drastically while the prevalence reduced to certain extent among HI in Saudi Arabia. Moreover, a comparison

Table 6: Frequency distribution of subjects' responses on individual GOHAI-Ar items

GOHAI-Ar items	Always (%)	Very often (%)	Often (%)	Sometimes (%)	Seldom (%)	Never (%)
1. Limit the kinds of food	(50.7) 74	(27.4) 40	(6.2) 9	(5.5) 8	(2.7) 4	(7.5) 11
2. Trouble biting or chewing	(56.8) 83	(20.5) 30	(7.5) 11	(7.5) 11	(2.1) 3	(5.5) 8
3. Able to swallow comfortably	(3.4) 5	(31.5) 46	(7.5) 11	(5.5) 8	(26.7) 39	(25.3) 37
4. Unable to speak clearly	(77.4) 113	(9.6) 14	(0.7) 1	(2.7) 4	(2.1) 3	(7.5) 11
5. Able to eat without discomfort	(4.1) 6	(25.3) 37	(7.5) 11	(4.1) 6	(24.7) 36	(34.2) 50
6. Limit contact with people	(64.4) 94	(19.2) 28	(5.5) 8	(1.4) 2	(2.7) 4	(6.8) 10
7. Pleased with look of teeth	(2.7) 4	(24.0) 35	(8.2) 12	(9.6) 14	(23.3) 34	(32.2) 47
8. Used medication to relieve pain	(63.7) 93	(12.3) 18	(4.1) 6	(2.1) 3	(0.7) 1	(17.1) 25
9. Worried about teeth, gums or dentures	(50.7) 74	(29.5) 43	(8.2) 12	(4.1) 6	(2.7) 4	(4.8) 7
10. Self-conscious of teeth, gums or dentures	(55.5) 81	(20.5) 30	(6.2) 9	(6.2) 9	(6.8) 10	(4.8) 7
11. Uncomfortable eating in front of others	(64.4) 94	(16.4) 24	(4.1) 6	(5.5) 8	(4.1) 6	(5.5) 8
12. Sensitive to hot, cold or sweet foods	(28.8) 42	(37.7) 55	(12.3) 18	(8.2) 12	(4.8) 7	(8.2) 12

Table 7: Spearman's correlation between GOHAI-Ar and oral health variables

Variables	Correlation coefficient	Sig. (2-tailed)
Toothbrush frequency	0.029	0.731
Toothbrush timing	-0.081	0.334
Oral hygiene material	-0.113	0.176
Toothbrushing method	0.164*	0.047
Last visit to dentist	-0.064	0.442
OHI-S	-0.148	0.078
PI	-0.063	0.454
GI	0.005	0.955
Decayed teeth	-0.059	0.476
Filled teeth	0.042	0.612
Missing teeth	-0.071	0.393
DMFT score	-0.075	0.369

Significance of bold values, $p < 0.05$

of mean decayed teeth across different genders, age groups, and nationality did not show any significant differences ($p > 0.05$).

Missing teeth due to the dental caries increased as the age progressed among HI. Study subjects aged >25 years showed significantly higher missing teeth compared to the 18–21 years and 22–25 years ($p = 0.000$). This is suggestive of consequences of untreated tooth decay and lack of awareness of dental treatment needs observed during the young age that resulted in loss of teeth later in life. Gender and nationality did not affect the mean number of missing teeth among HI. Significantly higher filled teeth were observed at the ages 22–25 years and above 25 years compared to 18–21 years. It highlights access problems among HI at an earlier age ($p = 0.000$). Moreover, the filled component is higher in females and Saudi nationals with no significant differences.

Previously conducted studies by Nowak among 17 year-old and above reported a DMFT score of 13.25,²⁴ Jain et al. reported a DMFT score of 4.48 among 18–22 years,²¹ Pradhan et al. reported mean DMFT (2.22 ± 3.61),²⁵ and Al-Qahtani et al. found a mean DMFS of 14.3 in >16 –18 years old,² while our study reported a high mean DMFT score of 10.98 in age category >25 years. From this finding, it is obvious that the severity of the caries increased with higher age with decayed component being a major component. This increased DMFT score did not show any significant differences across various age groups, gender, and nationality of HI in this study.

In oral healthcare, objective measures of clinical indices do not precisely reflect the patients' perception of their oral health

conditions. OHRQoL questionnaires are important tools that assess oral health from the patient's perspective. They consider the multidimensional aspects of health and also consider the functional and psychosocial impacts of dental diseases.²⁶ The OHRQoL has many dimensions including the self-evaluation of the individual's oral health, functional and emotional well-being, anticipation and satisfaction with care, and understanding of self.²⁷

In our study, Saudi Arabian version of the GOHAI-Ar has been utilized due to its excellent validity, reliability, and availability in local language. Moreover, it can be self-administered, quick, and easy to use.^{16,28} HI answered the questionnaire with the help of a sign language interpreter, who coordinated between the investigator and the study participants while answering the GOHAI-Ar items. Before the start of the study, a sign language interpreter was oriented to the instrument.

Only few studies have reported oral health status and treatment needs among HI from Saudi Arabia. These studies mainly focused on exploring oral health status and treatment needs, and oral health awareness. As far as we know, none of the study reported the impacts of oral conditions on OHRQoL among HI. Individuals with HI can have a range of oral conditions that could impact their OHRQoL. Overall, the mean GOHAI-Ar was found to be 14.44 ± 9.59 on a scale of 0–60 suggesting low OHRQoL among HI. Higher scores GOHAI-Ar scales indicated better oral OHRQoL among HI. One of the interesting findings of the study was that as the age increased, the GOHAI-Ar decreased indicating poor OHRQoL. Additionally, male and non-Saudi HI demonstrated higher GOHAI-Ar score.

Due to the lack of published information on OHRQoL among deaf or HI, our findings have been compared with the other sensory impaired individuals. In our study, item 4 (unable to speak clearly) was the most common performance affected by the poor oral health as demonstrated by GOHAI-Ar inventory. On the contrary, Singh et al. reported that difficulty in eating was the most affected activity due to poor oral health among visibly impaired students by using Child-Oral Impact on Daily Performance.²⁹ Our study has clearly demonstrated a visible impact on the quality of life of HI adults due to poor oral conditions. The GOHAI-Ar showed a significant positive correlation with the toothbrushing method used by the HI. While clinical oral indices such as high OHI-S, PI, decayed teeth, missing teeth, and DMFT scores all have shown negative correlation with GOHAI-Ar indicating less favorable OHRQoL among HI. Toothbrush frequency and filled teeth have shown a weak positive correlation with the GOHAI-Ar suggesting somewhat favorable OHRQoL among HI.



The way questionnaire was administered to the HI was completely different, as the sign language interpreter interviewed the HI in the presence of an investigator. Saudi Arabian version of GOHAI-Ar was utilized by making this study unique in nature. It is the first study to investigate oral health status and treatment needs along with the OHRQoL among HI. Several limitations can be identified while conducting a study among HI subjects. We did not use any specific questionnaire that is intended to be used among HI for collecting information about OHRQoL. Another limitation of the study was that it did not consider the individual's extent of hearing loss, age of onset of loss, favored language, and psychological concerns of the HI. We did not collect any information related to the socioeconomic status of the study participants to relate it to the OHRQoL. This study was conducted with a small sample obtained from a single HI center in Riyadh city. Utmost caution should be exercised while generalizing the findings of this study to a larger population of HI in Saudi Arabia. Hence, further studies with a large representative sample of HI from different regions of the Saudi Arabia should be considered. The current study's finding may act as baseline information for the future studies.

CONCLUSION

HI considered in the study showed fair oral hygiene, high caries experience, and unmet treatment needs leading to poor OHRQoL as measured using GOHAI-Ar. Hence, specialized oral health awareness and comprehensive dental care programs should be initiated to improve OHRQoL of HI.

CLINICAL SIGNIFICANCE

Accumulated oral health care needs should be addressed through the specific programs to improve the OHRQoL of HI adults in Riyadh city, Saudi Arabia.

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