

## Research Article

# Accessibility of People with Visual Impairment to Dental Services: A Prospective, Observational, Mixed Method Study

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### ARTICLE

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### ABSTRACT

**Objectives:** This prospective, observational, mixed method study aims to assess patients with visual impairment general and oral health status, oral health-related quality of life, oral health knowledge, and adherence to recommended oral hygiene advice.

**Methods:** Participants were interviewed using a semi-structured questionnaire at two sequential time points. At the day of recruitment (Time 1), participants were interviewed using questions from the adult dental health survey and the Arabic version of the oral health impact profile-14. At Time 2 (one-month post-dental education given at Time 1), participants were phoned after one month to assess their adherence to recommended oral hygiene instructions given at Time 1. The DMF Index was used to assess prevalence of dental caries.

**Results:** The mean age of the participants was 21 years (SD = 2.98). Most participants (62.5%) had acute dental pain, brushed their teeth less than twice daily, and were not registered with dentists. Each person experienced a mean of six problems (median = 6) on oral health impact profile-14 and had an average of 7.1 (SD = 4.12) active caries. At Time 2, all participants had registered with a general dentist, and all brushed their teeth at least twice daily. Thematic analyses explored crucial barriers experienced by participants to access dental services.

**Conclusions:** People with visual impairment reported poor oral health-related quality of life due to poor oral health status, oral health knowledge and education. Participants experienced long waiting lists for appointments in governmental dental hospitals, poor financial status to afford private dental care, and issues with accessibility to dental services due to transportation and caring issues.

## 1. INTRODUCTION

Visual impairment is defined as “a decreasing in the function of the visual system, which is characterized by lowering in the visual acuity, distortion and reduced capability of doing daily activity like writing and reading” [1]. Worldwide, there are 285 million people living with visual impairment [2]. Of these, 246 million people are living with low vision, and the remainder (39 million people) are blind [2]. Visual impairment is divided into distance vision impairment and near vision impairment [3].<sup>3</sup> The distance vision impairment is classified according to visual acuity into mild (6/12 - 6/18), moderate (6/18 - 6/60), severe (6/60 - 3/60), and lastly blindness (worse than 3/60)[3].

Several studies reported that people with visual impairment have poorer quality of life (QoL) when compared to the general population. For example, a cross-sectional study in Pakistan found a significant difference in QoL of 40 visually impaired adolescents when compared with 40 healthy adolescents using the World Health Organization QoL Scale (WHOQoL-BREF). A lower QoL was reported by the visually impaired adolescents in all four domains (i.e., physical health, psychological, social relationship and environment)[4]. Additionally, another institution-based, cross-sectional study in Ethiopia among 484 patients with visual impairment found that severe visual impairment/blindness and long duration of visual impairment were statistically associated with poor QoL [5]. Similarly, a hospital-based, cross-sectional study in

Nigeria among 201 participants with visual impairment noticed that the QoL scores were reduced using WHOQoL-BREF when severity of visual impairment increased [6].

People with visual impairment could be at risk of having poor oral health. For example, the oral health status of visually impaired people is poorer than the oral health status of a healthy population, and they are at greater risk of developing oral disease such as dental caries and periodontal diseases, due to insufficient plaque removal which results from their inability to visualise the plaque [7]. A cross-sectional study among 404 patients in Tamil Nadu found higher rate of dental caries with visually impaired patients due to their lack of knowledge about brushing technique [8]. Additionally, a cross-sectional study in Thailand measuring the salivary flow rate (SFR) among 146 participants using spitting and mastication methods reported that the SFR was low in visually impaired patients, considered as a risk factor for dental caries and periodontal disease [7]. Several barriers are key factors of why people with visual impairment have poorer oral health when compared to the general population, such as the availability of care providers, poor accessibility to dental services, affordability of dental services, transportation difficulties, lack of trained dental care providers, and lack of social awareness [9].

However, there is scarcity of information in the literature about people with visual impairments' oral health-related quality of life (OHRQoL) and their oral health knowledge, and how this vulnerable group of people adhere to recommended oral hygiene advice. Understanding these gap areas is crucial to assessing oral health needs for people with visual impairment. Consequently, this prospective, observational, mixed method study aims to assess patients with visual impairment general and oral health status, OHRQoL, oral health knowledge, and adherence to recommended oral hygiene advice.

## 2. MATERIAL AND METHODS

### 2.1 Study design and setting

This prospective, observational, mixed method study was conducted at two sequential time points at the Faculty of Dentistry of Umm Al-Qura University in Makkah (Saudi Arabia) from November 2021 to December 2021 (Time 1 (T1): At the day of recruitment, and Time 2 (T2): one-month post-dental education given at T1).

### 2.2 Inclusion and exclusion criteria

Adult participants with visual impairment (over 18 years old) who were willing to participate and were able to understand the study and provided verbal consent were eligible for inclusion in this study. Adult participants without visual impairment or with visual impairment but who were not willing to participate, and those who were less than 18 years old, were excluded from the study.

### 2.3 Procedure and measures

**Figure 1** shows the study scheme. The following explains the study scheme in detail.

#### 2.3.1 At T1

- *T1a: The questionnaire*

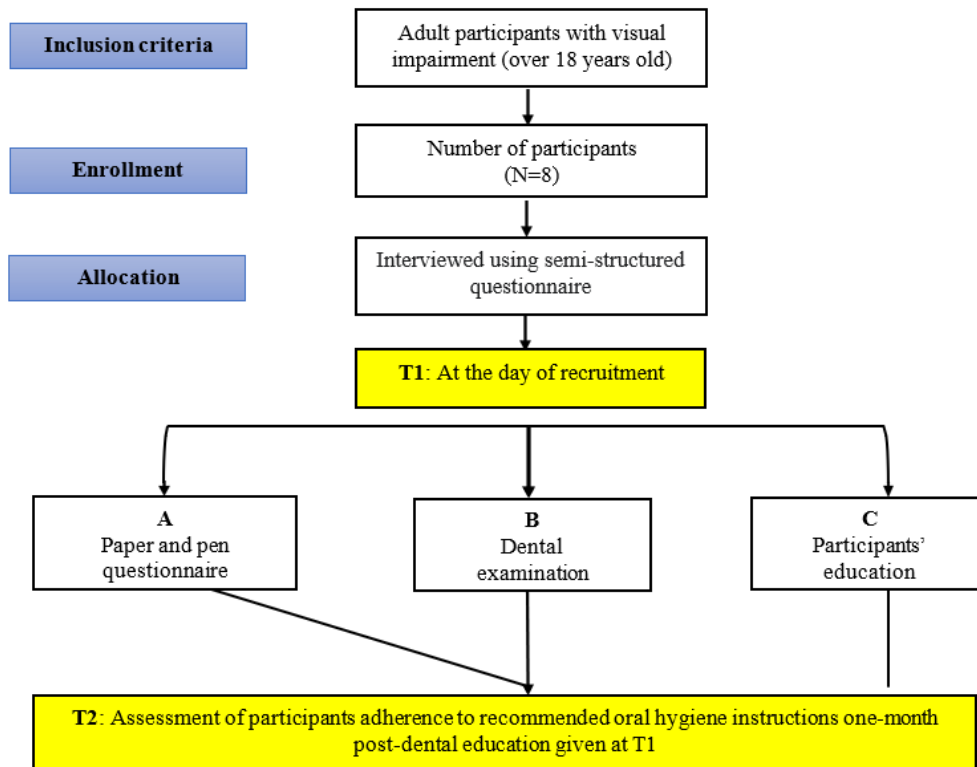
Eligible participants, who visited mobile dental clinics on the International Day of Disabled Persons were identified by the direct care team (HA and AB). At T1, participants were asked by the dental care team to complete a 20-minute paper-and-pen questionnaire. As the participants were blinded, two researchers (HA or AB) read the questionnaire's questions to each participant and accordingly they completed the questionnaire. The questionnaire aimed to assess their general and oral health knowledge (measured by questions adapted from the adult dental health survey (ADHS))[10], and OHRQoL (measured by the Arabic version of the oral health impact profile –14 (OHIP-14))[11]. Additionally, participants were asked to respond to four questions assessing dental patients' adherence to the recommended oral hygiene advice [12]. These four questions were: a) Have you registered or intended to register with a general dental practitioner?; b) are you using a fluoride-containing toothpaste?; c) what is your frequency of using fluoride-containing toothpaste? (Options: more than twice a day, twice daily, weekly, monthly, hardly ever, never), and lastly d) if the participants hardly ever or never used high fluoride-containing toothpaste, they were asked to provide a reason. These four questions have been used before and they were found to be validated and reliable [12].

- *T1b: Dental examination*

Subsequently, participants' oral health status was examined by a qualified dentist (RI) and repeated by another qualified dentist (RA or OA) to ensure consistent recording of measures. Participant's oral health status was investigated through assessing the presence of dental caries (D), filled (F), and missing teeth (M) (measured by DMFT index)[13]. Additionally, clinical oral dryness for each participant was measured via clinical oral dryness score (CODS)[14]. The CODS is a validated and reliable tool to assess salivary gland function in the clinical setting. It consisted of a 10-point scale; each point representing a characteristic of dryness in the oral cavity [14]. Lastly, the presence of the occlusion at the premolar and molar areas (right and left) were considered to assess participants' ability to chew food normally.

- *T1c: Participants' education*

Once the questionnaires, interviews and dental examination were completed, participants were educated about proper oral hygiene advice recommended by the National Health Service (England, UK)[15]. For example, each participant was educated about the proper toothbrushing technique which was illustrated on a large model of teeth with a large, plastic toothbrush using audio explanations and tactile sensation for 10 minutes. Following this step, participants were discharged from the mobile dental clinic with free toothpaste and toothbrush. Participants with urgent dental pain were referred to the hospital dental clinics at Umm Al-Qura University



**Figure 1: Study's scheme**

(Makkah, Saudi Arabia) for further investigation and treatment.

### 2.3.2 At T2: Interview

At T2, participants were contacted via phone by the researcher (HA) at four weeks post-T1c and invited to participate in semi-structured interviews (each for 15 minutes) using a topic guide that sought to explore their barriers and challenges to accessing dental services – see **Table 1**. The interviews were conducted through the phone. A verbal consenting was obtained from participants to record the interview. Moreover, participants were asked to respond to the four questions that have been asked at T1 to reassess their adherence to the recommended oral hygiene advice given at T1c.

## 2.4 Data analyses

### 2.4.1 Quantitative data

Simple descriptive statistics (i.e., frequencies and percentages) were used to present the sample characteristics. In this study, OHIP-14 was also measured as a threshold score. For example, the impacts are reported to be present if they reach the threshold which was counted when the participants reported occasional, often, or very often for each OHIP-14 domain (i.e., functional limitation, physical pain, psychological discomfort, social impact, psychological disability, social disability, and handicap). The statistical significance was assumed at 5% level and all the analyses were carried out using IBM SPSS® version 25.0.

**Table 1: The topic guide used during interviews (N=8)**

1. What are the obstacles that you faced or will face during your need for a dentist?
2. What is the biggest problem/challenge you face or will direct you when visiting the dentist?
3. Do you expect that your financial state has a reason for not attending the dentist?
4. Do you expect that the frequency of your medical appointments does not correspond to the date of the visit to the dentist?
5. Is the lack of someone to help you go to the dentist one of the reasons for the lack of visits to the dentist?
6. Have you ever been refused treatment by a dentist?
7. Would you expect a general dentist to have less experience treating people with low vision and need specialized care?

### 2.4.2 Qualitative data

The qualitative data were analysed using a thematic analysis approach [16]. The recorded interviews were transcribed verbatim. Two researchers (HA and RS) read the transcripts and independently coded the raw data to gather initial codes. Following this, selective coding was accomplished to recognise common themes that emerged from the interviews. The identified themes were peer

debriefing with the research team to ensure that data analysis was validated [17].

### 3. RESULTS

#### 3.1 Quantitative data

- *Demographic details of the participants*

Eight male participants were interviewed and filled in the self-reported questionnaire. Of these, two participants (25%) had asthma and iron deficiency anaemia, and both are receiving treatment with inhaler and iron supplement, respectively. The mean age of the participants was 21 years (SD = 2.98).

- *Self-rating of general and oral health*

Five of the respondents (62.5%) described their general health status as very good, two (25%) as good and one patient as fair. When asked about their oral health, two (25%) described their oral health as very good, three (37.5%) as fair, one (12.5%) as bad, and two (25%) as very bad. In terms of aesthetics, two (25%) of the participants rated their contentment with how their teeth and mouth looked as very good, two (25%) as fair and 4 (50%) as very bad.

- *Participants' oral health knowledge*

None of the participants had dentures. One respondent brushed his teeth more than twice per day, while one participant brushed twice per day (97%). Three (37.5%) and one (12.5%) reported that they brushed their teeth once a day and less than once per day, respectively. Two participants reported that they never brushed their teeth. Six participants (75%) reported that they have a toothbrush and two (25%) reported that they do not have a toothbrush. All except three (37.5%) respondents used toothpaste when brushing teeth. Participants were asked about additional oral hygiene aids; seven participants (87.5%) reported that they do not use any additional oral hygiene aids such as mouthwash, dental floss, and interspace brush.

In term of registration with a general dentist, the majority (n=5, 62.5%) were not registered with a general dentist. Two participants (25%) reported that they attended the dentist regularly/occasionally, three (37.5%) visited their dentists when they had trouble with their teeth, and three (37.5%) never visited a dentist.

The majority of participants (n=5, 62.5%) had consumed a fizzy drink, fruit juices, or soft drinks (i.e., squash) at least six or more times a week. Moreover, most participants (n=6, 75%) did have sugar in their hot beverages.

When participants were asked about their experience of dry mouth, four (50%) reported that they never/hardly ever felt that their mouth is dry, while the remainder (n=4, 50%) reported that they fairly often/very often feel

their mouth is dry. All participants who experienced dry mouth reported that they do not use anything to moisten their mouth and reduce the feeling of dryness.

- *OHRQoL*

The mean OHIP-14 scores for all participants was 5.7 (SD = 4.86), meaning that each person experienced a mean of six problems (median = 6).

- *Dental health examination*

Five participants (62.5%) had dental pain. All participants had an average of 7.1 (SD = 4.12), 1 (SD = 1.39) and 1.5 (SD = 2.77) active caries, filled and missing teeth, respectively. Upon using CODS, two (25%) of the participants were rated as having a mild condition, while four (50%) were rated as having a moderate condition. All participants except one had occlusal contact at the molar and/or premolar areas.

- *Adherence to the recommended oral hygiene advice*

T2, participants were approached after one month from T1c. Participants' adherence to dental advice showed that all participants had registered with a general dentist, and all have toothbrushes and use fluoride-containing toothpaste at least twice daily.

#### 3.2 Qualitative data

- *Main barriers to dental services reported by the participants*

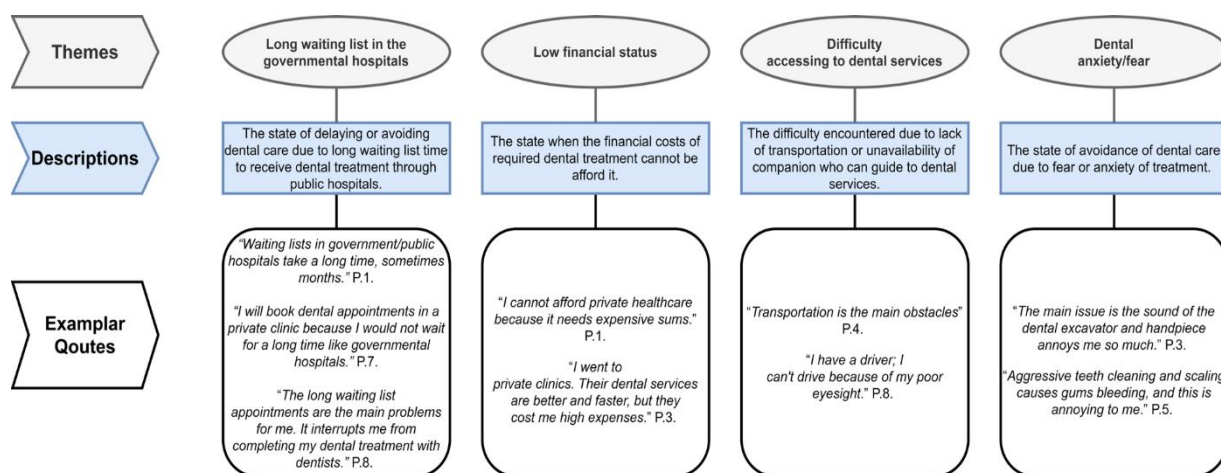
**Table 2** shows the interview transcripts. Thematic analyses of qualitative data explored crucial barriers experienced by participants. These barriers were that they have to deal with long waiting lists for appointments in governmental hospitals (n = 5, 62.5%), lack of affordability of private clinics due to low financial status (n = 4, 50%), and lack of accessibility due to transportation and caring issues (n = 3, 37.5%). A summary of the main barriers to accessing dental services with corresponding quotes is provided in **Figure 2**.

### 4. DISCUSSION

This study set out to assess patients with visual impairment and their general and oral health status, OHRQoL, oral health knowledge, and adherence to recommended oral hygiene advice. Briefly, the study found that people with moderate to severe visual impairment reported lower general/oral health status and OHRQoL scores due to poor oral health knowledge and education. For example, the findings of this study showed that most participants brush their teeth less than the recommended advice (less than twice per day), and two reported that they do not have a toothbrush. Sharififard, Sargeran [18] supported our findings in their cross-sectional study of 130 visually impaired adolescents in Iran, and they found that 48% of participants brushed their teeth once a day, while a few (8%) never brushed their teeth. In fact, it is

Table 2: Interviews transcripts

Participants	Q1: What are the obstacles that you faced or will face during your need for a dentist?	Q2: What is the biggest problem/challenge you face or will direct you when visiting the dentist?	Q3: Do you expect that your financial state has a reason for not attending the dentist?	Q4: Do you expect that the frequency of your medical appointments does not correspond to the date of the visit to the dentist?	Q5: Is the lack of someone to help you go to the dentist one of the reasons for the lack of visits to the dentist?	Q6: Have you ever been refused treatment by a dentist?	Q7: Would you expect a general dentist to have less experience treating people with low vision and need specialized care?
P1	"There are no major obstacles"	"I faced a problem a month ago"	"Yes, waiting lists in government/public hospitals take a long time, sometimes months. I cannot afford private healthcare because it needs expensive sums"	"Yes, on most occasions, my medical appointments, such as physiotherapy and eye doctor appointments, do not coincide with the dentist's appointments"	"No. Never"	"It did not happen at all"	"I do not think so"
P2	"I never visited the dentist because I did not complain of any dental issues"	"I think there is no problem"	"Yes, the financial status is an issue. However, I do not need to go because I do not have dental pain"	"No, thank God, I do not have dental appointments at the moment. So, I do not think that many appointments with other specialities affect dental appointments"	"No, it's absolutely not true"	"I couldn't answer because I didn't visit the dentist"	"I do not know"
P3	"My dentist is constantly travelling, which is postponing my appointments regularly"	"Yes, the main issue is the sound of the dental excavator and handpiece annoys me so much"	"Sometimes when I had acute dental pain, I went to private clinics. Their dental services are better and faster, but they cost me high expenses"	"I do not know. I do not have many medical appointments"	"Yes, sometimes when everyone around me is busy"	"No"	"He may have less experience, but I am not sure"
P4	"Transportation"	"I have never had any problem"	"Of course, my financial situation affects the visit to the dentist, as the appointments waiting list in government hospitals are long. Therefore, the visit to the private clinics will save me time"	"For sure, never get along"	"Sure, since all of my brothers are working and busy, transportation is a major problem for me"	"No, my dental treatment was never refused, and everyone did not fail to serve me properly"	"No, on the contrary, everyone served me properly. Everyone is entrusted with that"
P5	"There are almost no significant obstacles, but when there is a dental problem that needs a visit to the dentist. The delay occurs due to procrastination, work pressure, and studies tasks, which are the biggest obstacle for me"	"Aggressive teeth cleaning and scaling causes gums bleeding, and this is annoying to me"	"No, never"	"I can arrange between them properly"	"No"	"No"	"I think the dentist knows exactly what he is doing. For example, he reminds me to rinse during the dental procedure. Also, he helps and guides me to get out of the clinic to the waiting room at the end of the appointment"
P6	"Honestly, I believe that there are no obstacles. But I do not know. I never visit the dentist"	"I have not visited the dentist, so I do not know. I may face a problem, or I may not face any problem"	"Yes. For sure"	-	-	-	-
P7	"Usually, the dental appointments waiting list is very long, which mainly hinders my treatment with the dentist"	"There is nothing. Everything is fine"	"Of course, if the financial condition is good, I will book dental appointments in a private clinic because I would not wait for a long time like governmental hospitals"	"I don't have many medical appointments"	"Yes"	"No one refused my treatment"	"Yes, it is possible. For instance, they do not explain how to properly brush my teeth because probably they do not have time"
P8	"The long waiting list appointments are the main problems for me. It interrupts me from completing my dental treatment with dentists"	"I did not have problems"	"No. I do not think so"	"Yes, I have regular eye appointments, but we try to match the eye appointment with the dental appointment because the appointments in government hospitals are long"	"I have a driver: I can't drive because of my poor eyesight"	"No, it didn't happen"	"It is not a big problem, but it is possible to let them know that the light of the dental chair is annoying to us"



**Figure 2: Main barriers reported by participants to accessing dental service**

recommended to brush twice daily to overcome oral diseases [19]. Additionally, according to methods used for oral hygiene by participants involved in our study, most participants did not include mouthwash, dental floss, or interspace brush as a part of their daily oral hygiene practice. Therefore, it is inferred from our study findings that people with visual impairment required comprehensive education about mandating good oral hygiene through brushing their teeth within the recommended frequency, using additional oral hygiene aids such as dental floss, and visiting the dentist regularly.

It is better to have a proactive step by the dentist to educate visually impaired patients about oral health behaviours and status and also teach them to determine their oral problems [20]. It is somewhat surprising that in the present study, 62.5% of participants did not register with a general dentist while 37.5% never visited a dentist. This indeed explained why most participants in this study reported a high prevalence of dental caries and fillings. This finding is consistent with several studies that investigated people with visual impairment who have higher dental caries when compared to the general population. For example, Vinoven, Rahman [21] in their cross-sectional study found that the prevalence of dental caries among visually impaired participants in Malaysia was relatively higher by 40% when compared to healthy peers. Similarly, a comparative study of 79 visually impaired participants in Riyadh (Saudi Arabia) found that the visually impaired participants had poor oral health status when compared to the general population [22]. Furthermore, most of the participants in our study were not satisfied with their oral health status and more than half of them were experiencing dental pain and they reported unfavourable OHIP-14 scores. This was supported by the clinical findings of our study which revealed that all participants had at least one active caries and/or filled and/or missing teeth. Similar, a population-based cross-sectional study of 248 visually

impaired participants in India stated that the prevalence of dental caries was high (49.3%), with 87.4% suffering from periodontal diseases [23]. This is not a surprising finding as it is inferred from our study that participants, as discussed earlier, have poor oral health knowledge and education.

Since dentists play a major role in maintaining good oral health, our study also explored dental attendance intentions of respondents. We found that the majority (62.5%) were not registered with a general dentist and did not have regular visits. However, after a simple reminder during the phone interview, this percentage rose to 100% and all participants have a toothbrush and have registered with general dentists to get dental treatment and regular dental visits. However, it is important to notice that there is a possibility of response bias. For example, participants may have been disinclined to say that they had not registered with general dentists when asked over the phone.

When participants asked about barriers to dental services, most of them reported having long waiting lists for appointments in governmental hospitals, lack of affordability for private clinics due to low financial status, and lack of accessibility due to transportation and caring issues. Similarly, a qualitative study in Canada that explored perceived utilisation of dental services among seven deaf and blind adults in Canada found that blind people reported several barriers to dental services, such as high costs of necessary complex dental treatment, and their eligibility for the dental service that ceased at the age of 65 [20]. Accordingly, it is obvious that people with visual impairment required expediting of their dental appointments to help them exercise their right to receive dental care, through educating dental staff and people in authority at private and governmental dental hospitals.

This study presents some limitations that need to be



discussed. First, the data were collected from a single centre with a small sample size, so caution must be applied as the findings might not be transferable to other populations across different geographical regions. However, a similar qualitative study with seven participants with visual impairment has been reported [20]. Larger samples categories will be needed for a more precise analysis. The lack of gender variabilities in the sample adds further caution regarding the generalisability of these findings, as all participants included in the study were males. The key strength of the present study was approaching and giving a unique insight into patients with visual impairments. Also, only a few studies assessed people with visual impairments, and their oral health and knowledge and its impact on their QoL. Additionally, using a mixed method approach has offered a framework for the exploration of the crucial barriers that they encounter by interviewing the patients for more accurate data collection. Lastly, participants in this study were recruited using the mobile dental clinic; hence a representative sample of people with visual impairment who have poor accessibility to dental service were involved.

## 5. CONCLUSION AND FUTURE RESEARCH

In conclusion, prior to this study, it was questionable to make predictions about the oral health status of visually impaired individuals. This study has identified that people with visual impairment reported lower general/oral health status and OHRQoL scores due to poor oral health knowledge and education. This was one of the possible explanations for the high rate of dental caries. Moreover, the most apparent barriers were long waiting lists for appointments in governmental hospitals, poor financial status to afford private care, and issues with accessibility to dental services due to transportation. The evidence from this study suggests that people with visual impairment require proper education and service delivery programmes to meet the optimum conditions of their oral health. Also, this study opens up the groundwork for future research, such as the preparation of dental services and dental staff to treat people with visual impairment through using psychometric analyses tools, which will help to determine the main domains (i.e., dental staff skills and/or knowledge) that require improvement.

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## CONFLICT OF INTEREST

The authors declare that they have no known competing financial interests or personal relationships that could

have appeared to influence the work reported in this paper.

## ETHICAL APPROVAL

The Biomedical Ethics Committee, Department of Medicine at Umm Al-Qura University (Makkah, Saudi Arabia) approved the study (approval number: HAPO-02-K-012-2021-12-895) in accordance with the Helsinki Declaration. A verbal consenting was obtained from participants before inclusion in the project.

## DISCLOSURE STATEMENT

None.

## CREDIT AUTHOR STATEMENT:

HA: Conceptualisation, Methodology, Validation, Formal analysis, Investigation, Writing - Original Draft. RI: Writing - Original Draft, Data collection. RA: Writing - Original Draft, Data collection. OA: Writing - Original Draft, Data collection. AB: Writing - Original Draft, Data collection. RS: Writing - Original Draft, Data collection, Validation, Formal analysis. All authors critically reviewed and approved the final draft article and are responsible for the content and similarity index of the manuscript.

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