ABSTRACT

Objective: This study sought to evaluate medical students’ current understanding of childhood hearing loss in the Gulf Cooperation Council (GCC) nations of Saudi Arabia, Bahrain, Kuwait, and the Sultanate of Oman.

Methods: A cross-sectional study was conducted in multiple GCC countries. Non-probability convenient sampling was used to recruit participants through e-mails and social media platforms including WhatsApp. An online questionnaire was distributed to medical and health science students in four medical schools in GCC countries regarding knowledge toward childhood hearing loss.

Results: A total of 791 participants were enrolled in this study. The participants were of 18-30 years age bracket. Most of the participants (69%) were females. The majority of them (81%) were single; the rest (19%) were married. The study revealed that many participants (62%) were not well-informed about hearing loss.

Conclusion: The majority of the participants have limited knowledge toward childhood hearing loss.

Keywords: Deafness, gulf countries, children, infants, hearing loss.

Introduction

Hearing loss is one of the most prevalent conditions in childhood. It is a significant health problem that requires early detection and intervention. According to the World Health Organization, approximately 466 million people worldwide have disabling hearing loss, of which 34 million are children [1]. Hearing impairment in children, if not detected early, can lead to delays in speech and language development and have long-lasting harmful effects on social and emotional development and quality of life [2].

Hearing impairment in children has a variety of causes. Some kids have hearing issues from birth (congenital hearing loss), and some children have acquired hearing loss from birth as a result of congenital toxoplasmosis, rubella, cytomegalovirus, and herpes simplex virus infections. Acute respiratory infections, otitis media, and measles are recognized causes of hearing loss. Other factors that are associated with hearing impairment include environmental exposure to noise, poor socio-economic conditions, trauma to the ear, and certain medications or toxins.

In addition, several studies have revealed that risk factors around the time of birth, such as hypoxia neonatorum, birth injuries, hyperbilirubinemia, prematurity, and a stay at a neonatal intensive care unit longer than 5 days, play a major role in the pathogenesis of deafness [3].

There are more than 100 genes that have been identified as being associated with non-syndromic hearing loss. Hereditary hearing impairment is difficult to diagnose...
due to the extreme heterogeneity of the disorder. GJB2 is the predominant deafness-causing gene, with the other common genes being CDH23, SLC26A4, MYO15A, COL11A2, and MYO7A. The total number of nonsyndromic hearing loss genes identified to date is around 121. Of these, 49 genes are autosomal dominant, 76 genes are autosomal recessive, and 5 genes are X-linked [4].

Newborn hearing screening programs are helpful in the early identification of newborns with hearing impairment and allow prompt, specific treatment according to the cause and severity of hearing loss. A published study by Vos et al. [5], Belgium, has shown how hearing screening programs have contributed to earlier audiological intervention for children with hearing impairment.

Hearing aid devices can be used to help improve hearing and speech, especially in children with sensorineural hearing loss, and the type of hearing aid recommended depends on several factors, including the child’s physical limitations, medical condition, and personal preference. However, children might not get a good outcome from hearing aids if they are not comfortable wearing them. This requires assistance and encouragement from the parents and continuous supervision so that the children get accustomed gradually to wearing the hearing aid.

Hearing aids do not restore normal hearing; therefore, it could take some time to become acclimated to the various noises that they broadcast [6]. Cochlear implants in children are another modality of treatment for children with severe sensorineural hearing loss. Cochlear implants aim to replace the function lost by the natural cochlea.

In a normal ear, the hair cells within the cochlea act as a transducer of mechanical energy from sound vibration into energy capable of stimulating the eighth cranial nerve and subsequently the hearing area of the cerebral cortex. The ramification of a decrease in these hair cells’ number is the loss of the ability of the cochlea to perform its function. The implant replaces the task of the lost hair cells by converting mechanical energy into the electrical energy necessary the implant takes over the role of the lost hair cells by converting the mechanical energy into electrical one to excite the remaining cochlear neurons and the eighth cranial nerve [7,8].

To raise the awareness of the community regarding hearing loss among children in Gulf Cooperation Council (GCC) countries (Saudi Arabia, Bahrain, the United Arab Emirates, Qatar, Kuwait, and the Sultanate of Oman), this research was conducted to evaluate health students’ knowledge regarding hearing loss among children. The results of the assessment might improve the development of health promotion and disease prevention activities for ear and hearing health in GCC countries, which would further reduce preventable causes of child hearing loss.

Subjects and Methods

A cross-sectional study was conducted during the period from November to December 2021 in GCC countries. An online questionnaire survey was made through the Survey Monkey platform and was distributed to 791 participants from four medical schools in GCC countries.

Random sampling was done to select participants. A web link to the questionnaire was shared with participants who agreed to complete the survey through email and WhatsApp. Restriction through an IP address was used to avoid multiple responses.

The study population consisted of medical and health science students who were currently enrolled at the four GCC universities; all were of Arabic origin, both sexes and aged 18-30 years. All students attending classes on the days of data collection were eligible to participate in the study.

The questionnaire was an adapted and modified version of the questionnaire used by Olusanya et al. [9]. It has two parts, A and B. Part A consisted of questions on socio-demographic information. Part B consisted of questions that assessed knowledge of hearing loss in the areas of types, epidemiology, risk factors, genetic factors, clinical features, complications, and treatment of hearing impairment. The questionnaire evaluating knowledge about childhood hearing loss had 21 questions. The choices were “yes,” “no,” and “do not know.” One point was awarded for “yes,” while “no” and “do not know” received 0 points. A final score ranging from 0 to 21 points was calculated for each participant in the knowledge evaluation. Based on the final awarded score, the level of knowledge was classified into “poor knowledge” for scores of 0-10 points and “good knowledge” for scores of 11-21 points. This classification was adopted from Alsudais et al. [10].

Statistical Package for Social Sciences v26 was used for data analysis. A p-value cut-off point of 0.05 at the 95% confidence interval was used to determine statistical significance. Using the chi-square test, the data were analyzed to examine if there was a significant difference between socio-demographic characteristics and knowledge about hearing loss.

Results

A total of 791 participants (medical students) answered the questionnaire, and their ages ranged from 18 to 30 years. Most of the participants were females (n = 546, 69%); single (n = 641, 81%); and undergraduates in the medical field (n = 737, 93%). In addition, the largest portion of the participants (n = 322, 41%) were from Kuwait, followed by participants from Saudi Arabia (n = 207, 26%), while the rest (around one-third) was roughly divided between participants from Bahrain and participants from Oman (Figure 1).

Three statements that had the highest percentage of correct answers were: “The child might be born with hearing loss,” “the treatment for hearing loss is available,” and “there is a relationship between hearing impairment, distraction, and poor academic achievement.” On the other hand, three statements with the lowest percentage of correct answers were: “jaundice (yellowing of the
Knowledge of childhood hearing loss classifies participants according to their knowledge level toward childhood hearing loss, where 34.43% \((n = 304)\) had good knowledge, while 61.57% \((n = 487)\) had poor knowledge (Figure 2).

The results showed no significant association between gender and knowledge about hearing loss in children \((p > 0.05)\); the percentage of good knowledge was 35.9\% \((n = 88)\) in males and 39.6\% \((n = 216)\) in females. On the other hand, the association between country of origin and knowledge about hearing loss in children was statistically significant \((p < 0.05)\). However, good knowledge was lower in Bahrainis \((n = 68, 49.6\%)\), as compared to those from the other three Gulf countries \((63.3\%-65.6\%)\) (Table 2).

**Discussion**

Childhood hearing loss is a major obstacle to children’s development and interaction with society. Adequate knowledge of the causes of children’s hearing loss is essential to design specific preventative measures to avoid that tragedy and to ensure early detection of it, which dramatically improves the lives and the future of these children.
Increasing awareness of university students about infants with hearing impairment and children would reflect on their community, so people would have more commitment toward seeking medical advice early and would increase community demands for health intervention programs. Several studies have shown that hearing impairment is more likely to be ignored and recently detected in developing countries, where both community awareness and health facilities are poor [11,12].

The current study findings showed that the majority of the participants (90%) had a relatively high level of knowledge in relation to the statement “The child might be born with hearing loss,” followed by the statement “The treatment for hearing loss is available.” The results showed that more than 70% of participants answered correctly. In addition, 73% were aware of the relationship between hearing impairment, distraction, and poor academic achievement.

One of the signs of hearing loss is speaking or language problems, and one of the symptoms is ear discharge, which can cause hearing loss [2]. The current findings showed a high level of awareness regardless of these signs and symptoms. On the other hand, those who possessed the least knowledge in relation to the statement “Jaundice (yellowing of the skin) can cause hearing loss;” only less than 12% were aware of this important information, followed by the statement “Putting the baby under mechanical ventilation (if needed) might increase the possibility of hearing loss.” In addition, only 20.4% knew that measles infection, which is one of the most common infections during childhood before vaccine discovery, can cause hearing loss. The current study results showed poor knowledge.

Moreover, around one-third of the participants knew the relationship between hearing impairment and autism. Regardless of taking medications and associations to cause hearing loss, less than 50% were aware of this information. A previous study by Alsdays et al. [10] revealed that knowledge of risk factors among participants was higher in relation to the statement “babies can be born with hearing loss,” while participants possessed poor knowledge regarding the statement “jaundice can cause hearing loss;” followed by “low birth weight that is 1,500 g can cause hearing loss.” However, a study by Kaspar et al. [13] and colleagues investigating the knowledge of sensory neural hearing loss found that participants had better knowledge about “noise exposure can cause hearing loss” and “family history,” but poor knowledge regarding the statement “jaundice can cause hearing loss,” followed by “delayed crying at birth can cause hearing loss.”

This study’s results were similar to those of a previous study that took place in Qassim, Saudi Arabia [10]. The convergence of cultures between citizens of Saudi Arabia and other Gulf countries might be one of the reasons for this observation. Questions about the knowledge of participants regarding the risk factors in the current study revealed that participants possessed a high degree of knowledge in relation to the statement “The child might be born with hearing loss.” Moreover, they possessed a low level of knowledge in relation to the statement “Jaundice (yellowing of the skin) can cause hearing loss;” The results of this study were in line with those of a previous study conducted in Qassim, Saudi Arabia [10].

The limitation of the study included not involving two GCC countries (Qatar, UAE) which would add more to the study. Moreover, increasing the sample size in future studies with students of different majors could add a valuable variety to the study.

**Figure 2.** Level of knowledge toward childhood hearing loss.

<table>
<thead>
<tr>
<th>Demographic variable</th>
<th>Categories</th>
<th>Knowledge level</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Poor N (%)</td>
<td>Good N (%)</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>157 (64.1)</td>
<td>88 (35.9)</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>330 (60.4)</td>
<td>216 (39.6)</td>
</tr>
<tr>
<td>Country</td>
<td>Bahrain</td>
<td>69 (50.4)</td>
<td>68 (49.6)</td>
</tr>
<tr>
<td></td>
<td>Oman</td>
<td>43 (34.4)</td>
<td>82 (65.6)</td>
</tr>
<tr>
<td></td>
<td>Saudi Arabia</td>
<td>76 (36.7)</td>
<td>131 (63.3)</td>
</tr>
<tr>
<td></td>
<td>Kuwait</td>
<td>116 (38)</td>
<td>206 (64)</td>
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</tbody>
</table>
Conclusion

The participants in this study demonstrated poor knowledge of hearing loss in children, which requires intensifying efforts and awareness-raising programs for medical students regarding the hearing health of children and its importance for their development. There are several reasons why children have hearing impairments and early detection of hearing impairment in babies is made possible by newborn hearing screening programs.

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List of Abbreviations

- GCC: Gulf Cooperation Council
- SNHL: Sensory neural hearing loss
- UAE: United Arab Emirates

Conflict of interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Funding

None.

Consent to participate

Informed consent was obtained from all the participants.

Ethical approval

Ethical approval for the study was obtained from the Research and Ethics Committee of the College of Medicine and Medical Science, Arabian Gulf University, Bahrain (E003-PI-6/20), dated: 13 September 2022.

Author details

2. College of Medicine and Medical Sciences, Arabian Gulf University, Manama, Bahrain
3. Al Imam Mohammad Ibn Saudi Islamic University, Riyadh, Saudi Arabia
4. Professor, Department of Pediatrics, Arabian Gulf University, Manama, Bahrain

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