

Knowledge and attitude of the general population regarding infant hearing loss in Saudi Arabia

Abdulhakeem N. Almutairi¹, Abdullah M. Altuaysi², Mohammed S. Alwhaid³, Muath A. Alhasson³, Meshari A. Alharbi³, Hawra'a A. Alsalam⁴, Hashim A. Almazyadi⁵, Abdulrahman Ahmed Almuqbil⁶

¹Assistant Professor, Otolaryngology Head and Neck Surgery Department, Qassim University, ²ENT Resident, Otolaryngology & Head and Neck Surgery Department, King Saud Hospital, Riyadh, ³Medical Intern, Unaizah College of Medicine, Qassim University, ⁴Medical Interns, Dar Aluloom University, Riyadh, ⁵Medical Interns, Batterji Medical Collage, Jeddah, ⁶Medical Intern, College of Medicine, Qassim University, Saudi Arabia

ABSTRACT

Background: Ear health and hearing loss (HL) among infants has devastating outcomes. With most HL being deemed preventable, the assessment of one's knowledge and attitude regarding this impairment is important. In Saudi Arabia, the state of the general population's knowledge on infant HL remains unknown. **Objectives:** To determine and further elucidate the general population's knowledge and attitude with regard to HL in Saudi Arabia. **Methods:** This is a cross-sectional survey-based study conducted on the general population of Saudi Arabia. A predetermined questionnaire was translated into Arabic. This was distributed among the targeted participants in several provinces of Saudi Arabia (central, northern, eastern, western, and southern) by using an online survey via social media. The data were collected and analyzed via the SPSS program. **Results:** The knowledge with moderate, poor, and good was determined among 60.9%, 29.6%, and 9.4% of the participants, respectively. The participants with positive and negative attitudes were detected among 92.6% and 7.4% of respondents, respectively. Increasing age was associated with better attitude, while increased knowledge was directly related to higher educational attainment. Those who have a child with HL had nearly twice as poor knowledge as those who do not have a child with HL ($P < 0.001$). **Conclusions:** Although most of the respondents possessed a positive attitude toward infant HL, their knowledge about it seems to be lacking. Thus, there is a need to address these knowledge gaps regarding infant HL.

Keywords: Cross-sectional studies, hearing loss, infant, knowledge, Saudi Arabia

Introduction

Hearing loss (HL) has been considered as one of the most common health concerns worldwide. In fact, in 2017, the World Health Organization reported ~466 million cases of HL across the globe. Of these, 34 million people are children. By 2050, it

is predicted that more than 900 million individuals will suffer from HL.^[1,2] It is worth mentioning that an international statistic reports that 2–3 live newborns per 1000 have HL.^[3] In the United States, 3 per 1000 live births are born with permanent HL.^[4]

It was estimated that 60% of HL cases are present in children due to preventable causes. The etiology of children's HL can be classified into congenital or acquired. Congenital HL is when the infant is born deaf. It can result from hereditary HL or non-hereditary HL factors prenatally or at the time of birth.

Address for correspondence: Dr. Abdulrahman Ahmed Al-Muqbil Medical Intern, College of Medicine, Qassim University, Saudi Arabia. E-mail: 361110729@qu.edu.sa

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Meanwhile, hereditary HL has been noted to be a significant contributor to congenital HL. In more than 50% of all cases, autosomal recessive, autosomal dominant, and x-linked can be a mode of inheritance. In prenatal mothers, factors such as infections with cytomegalovirus, herpes simplex virus, or German measles have been identified. Moreover, being born to diabetic mothers, toxemia, rhesus incompatibility complications, and premature birth injuries were all considered as causes of congenital HL. Meanwhile, it was determined that acquired HL can present at a later stage of children's life as a result of many causes such as certain chronic ear infections, infectious diseases, use of particular drugs, and exposure to excessive noise.^[5-7]

Furthermore, HL can result in a significant disability among children in four ways. First, it delays language and speech development. Second, it directly contributes to learning ability, leading to general reduced academic achievements. Third, the children's ability to communicate effectively is compromised, resulting in isolation, frustration, and poor self-concept. Lastly, it can affect vocational choices. Previous studies have suggested that early identification and intervention can minimize or even prevent such devastating consequences.^[8,9]

Previous studies have emphasized that support from family, friends, and family physicians has been shown to impact hearing help-seeking.^[10] In an Australian population-based cohort research, less than 50% of people seeking assistance from their physicians received a referral for treatment or support services for HL.^[11] Pediatricians and other general practitioners understand the importance of early detection and intervention for deafness in infants. Physician responsibilities will be supported by the provision of action-oriented tools that educate parents about the significance of follow-up and equip clinicians to implement proper surveillance methods into everyday practice.^[12] Despite the availability of effective therapies, several hurdles limit the chance of screening in the primary care environment. The majority of patients are hesitant to disclose their hearing impairment. However, studies have reported that patients are usually not reluctant to discuss such issues with their family physician. Moreover, they follow the advice or referral recommendation that are proven to be beneficial.^[13]

Understanding the causes of this dysfunction has been determined crucial to inhibit it.^[14] Evaluating parents' understanding of HL and audiology services is critical for establishing appropriate and comprehensive hearing programs for children.^[15] Previous research has shown that parents highly favor early identification and treatments for hearing impairments.^[16]

The current study aimed to determine and further elucidate the knowledge and attitude of Saudi Arabia's general population with hearing loss.

Methods

This is a cross-sectional study targeting the general adult population in different provinces around Saudi Arabia (central,

northern, eastern, western, and southern) in the period from July 21, 2020 to August 8, 2021 to assess the knowledge and attitude toward infant HL. With the COVID-19 pandemic, an online survey via SurveyMonkey was used as a safe alternative to paper surveys, and these were distributed via social media. We assured a 100% response rate with only one response per device by allowing non-repeated internet protocol (IP); we included the adult population, excluding physicians, medical staff, and participants under 18 years of age. The sample size was calculated using the OpenEpi program, version 3. The estimated sample size was 9462, which was based on a confidence level of 99%. We then increased the sample size by 30% to cover the non-response rate. The questionnaire was adapted from the questionnaire designed by Olusanya as well as Parving;^[3,14] this was translated into Arabic by a professional translator.

With 18 and 11 questions directed to assess the knowledge of the risk factors, four questions were intended to evaluate the knowledge of identification and intervention, and three questions were regarding the participant's attitude. The questionnaire comprised three categories, answerable as "yes," "no," or "not sure," in addition to the items pertaining to the participants' demographic data. A pilot study was performed to ensure the questions' efficiency and clarity, and the time required to complete the questionnaire was calculated. Ethical approval was obtained from Qassim Regional Research Ethics Committee Registered at National Committee of Bio & Med, Ethics (ECBE) Registration No. H-04-Q-001. The participants provided consent at the beginning of every survey. Data were elaborated with numbers (percentages) for all qualitative variables, while mean, standard deviation, and median (min-max) were used to elaborate all quantitative variables. Using the Chi-square test, we compared the participants' knowledge and attitude toward infant HL based on their respective sociodemographic characteristics. Multivariate regression was also conducted to determine the independent factor associated with poor knowledge and a negative attitude. Simultaneously, correlation procedures were used to determine the linear relationship between knowledge and attitude scores. All statistical data were analyzed using Statistical Packages for Software Sciences (SPSS) version 21 (Armonk, New York, IBM Corporation).

Results

In total, we recruited 13837 respondents coming from different provinces in Saudi Arabia. As described in Table 1, most of the participants were aged around 21–30 years (37.5%); the majority of them were females (68.4%), and more than half (53%) were married, while 40.3% had a bachelor degree.

As presented in Figure 1, the most frequently cited province was the Eastern Province (38.8%), followed by Riyadh Province (20.8%) and Makkah Province (19.5%). In comparison, the Northern Border and Jawf Province were the least mentioned (0.3% each, respectively).

Figure 2 presents some of the most perceived reasons for having an infant with HL, with having a family history of HL (27.7%) as the most cited reason, followed by the baby being born underweight (12.1%) and baby under mechanical ventilation (11%).

In the assessment of attitude regarding infant HL, as presented in Figure 3, we learned that nearly all of them would let their baby use a hearing aid if necessary (94.6%), while the proportion of respondents who would like their baby tested or those concerned about their child’s hearing and need more information were 91.7% and 48%, respectively.

In Table 2, the top three statements where respondents exhibited better knowledge were as follows: “children with HL can attend school” (84.5%), “babies can be born with HL” (78.4%), and

“children with HL can have similar educational opportunities as hearing peers” (75.1%). On the other hand, respondents had less knowledge on the following statements: “jaundice can cause HL” (9.6%), “Putting a baby under mechanical ventilation is a risk factor of HL” (12.7%), and “having an underweight born baby is a risk factor of HL” (13%).

The descriptive statistics of the respondents’ knowledge and attitude regarding infant HL are well elaborated in Table 3. Based on these results, the total mean knowledge score was 12.4 (SD 4.98) out of 28.5 points, where the majority were determined to have moderate knowledge (60.9%) on infant HL, while the rest had either poor (29.6%) or good knowledge (9.4%). Concerning their attitude, the total mean score was 2.34 (SD 0.69), with nearly all having a positive attitude (92.6%) toward infant HL, with only 7.4% negative.

In Figure 4, the correlation between knowledge and attitude scores was positively statistically significant ($r = 0.208$; $P < 0.001$), suggesting that a positive attitude toward infant HL is also likely to increase as one’s knowledge increases.

Measuring the relationship between the level of knowledge and attitude based on the participants’ sociodemographic characteristics, we determined that increasing age can significantly influence both knowledge ($\chi^2 = 112.283$; $P < 0.001$) and attitude ($\chi^2 = 40.701$; $P < 0.001$). We also observed that educational attainment was significantly associated with both knowledge ($\chi^2 = 270.351$; $P < 0.001$) and attitude ($\chi^2 = 29.605$; $P < 0.001$), while participants’ province also showed a significant connection to either knowledge ($\chi^2 = 23.972$; $P = 0.021$) or attitude ($\chi^2 = 32.563$; $P = 0.001$). Furthermore, gender ($\chi^2 = 102.120$; $P < 0.001$) and marital status ($\chi^2 = 19.043$; $P < 0.001$) showed significant difference with attitude but not with knowledge (both $P > 0.05$); further, having a child with HL has also been determined to significantly influence one’s knowledge level $\chi^2 = 12.758$; $P < 0.001$ on infant HL, but not on the level of attitude ($\chi^2 = 2.213$; $P = 0.0137$). [Table 4]

Table 1: Sociodemographic characteristics of participants (n=13837)

Study data	n (%)
Gender	
Male	4372 (31.6%)
Female	9465 (68.4%)
Age group	
≤20 years	2293 (16.6%)
21-30 years	5185 (37.5%)
31-40 years	3214 (23.2%)
41-50 years	2077 (15.0%)
>50 years	1068 (07.7%)
Marital status	
Single	6037 (43.6%)
Married	7330 (53.0%)
Divorced or widowed	470 (03.4%)
Educational level	
High school or below	3292 (23.8%)
College student	2814 (20.3%)
Diploma degree	1263 (09.1%)
Bachelor degree	5574 (40.3%)
Master or Ph.D. degree	894 (06.5%)

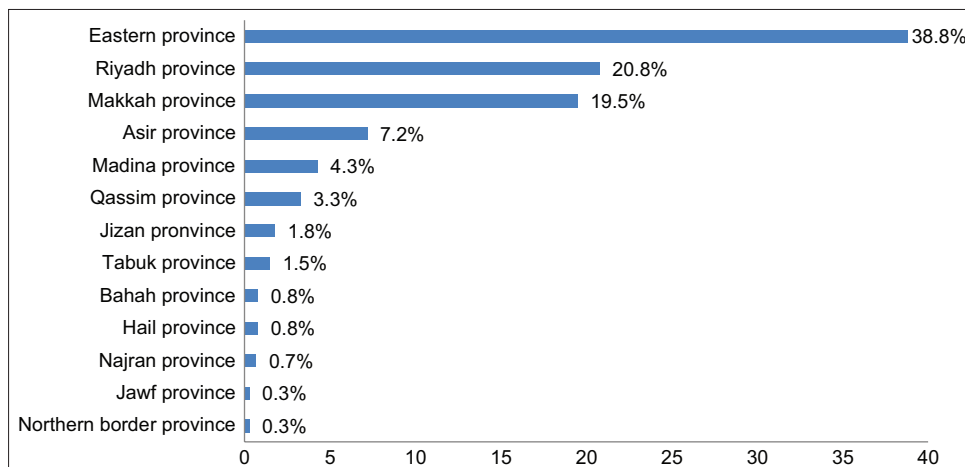


Figure 1: Participants province in Saudi Arabia

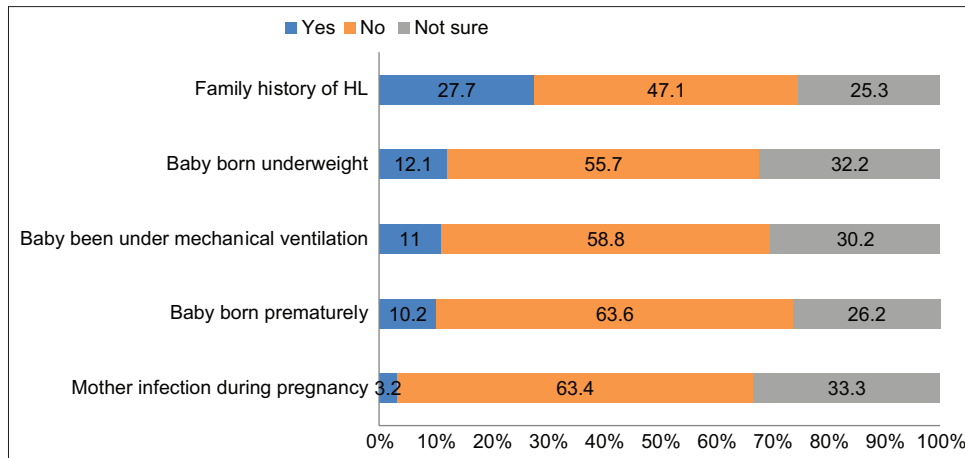


Figure 2: Perceived reason for having an infant with HL

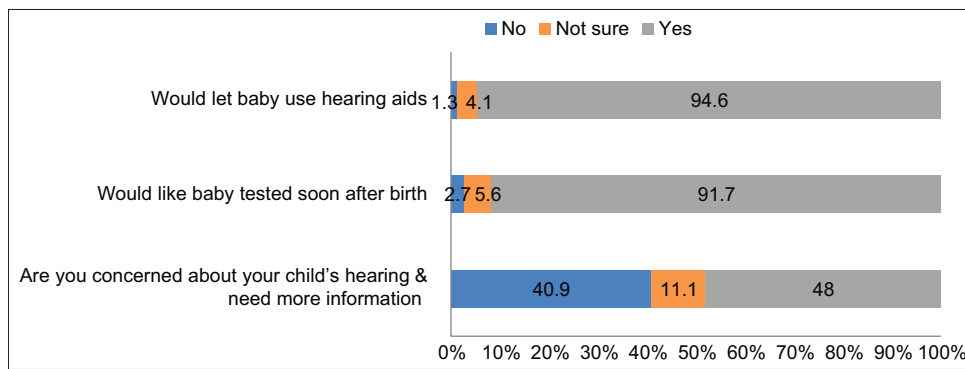


Figure 3: Assessment of Attitude regarding infant HL

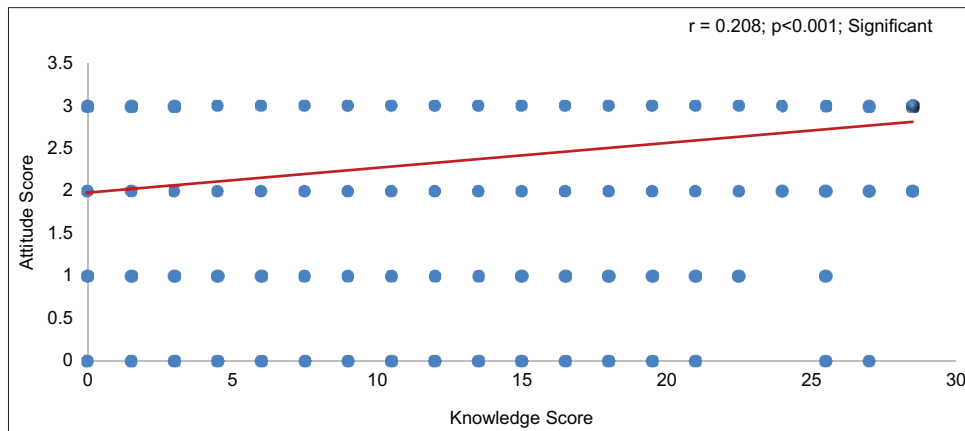


Figure 4: Correlation (Pearson-r) between knowledge and attitude score

In a multivariate regression model, we learned that there is a chance that females' attitude toward infant HL would significantly improve in as much as 70% compared to males (AOR = 0.345; CI = 0.345-0.487; $P < 0.001$). Those in the age group of 21–30 years were also found to have significantly better knowledge than those who were 20 years or below (AOR = 0.404; CI = 0.278–0.588; $P < 0.001$). In terms of attitude toward infant HL, it was predicted that the increase in positive attitude is associated with increasing age, which was confirmed by our findings: age group of 21–30 years (AOR = 0.302; CI = 0.180–0.506; $P < 0.001$),

31–40 years (AOR = 0.324; CI = 0.203–0.515; $P < 0.001$), 41–50 years (AOR = 0.456; CI = 0.289–0.720; $P = 0.001$), and more than 50 years old (AOR = 0.593; CI = 0.363–0.969; $P = 0.034$). On the other hand, the odds of having a negative attitude toward infant HL for those married (AOR = 1.889; CI = 1.178–3.029; $P = 0.008$) and those who were divorced or widowed (AOR = 1.729; CI = 1.108–2.699; $P = 0.016$) would likely to increase by nearly two times than those who were single. Furthermore, the increase in infant HL knowledge was determined to be likely associated with the increased level of one's

Table 2: Assessment of knowledge about risk factors, identification, and intervention of HL

Knowledge statement	Yes n (%)	No n (%)	Not sure n (%)
1. Babies can be born with HL	10853 (78.4%)	530 (03.8%)	2454 (17.7%)
2. High fever can cause HL	7870 (56.9%)	1185 (08.6%)	4782 (34.6%)
3. Convulsion can cause HL	5807 (42.0%)	1306 (09.4%)	6724 (48.6%)
4. Ear discharge can cause HL	7485 (54.1%)	1740 (12.6%)	4612 (33.3%)
5. Drugs can cause HL	5229 (37.8%)	2092 (15.1%)	6516 (47.1%)
6. Traditional Chinese medicine can cause HL	1837 (13.3%)	1625 (11.7%)	10375 (75.0%)
7. Jaundice can cause HL	1334 (09.6%)	5105 (36.9%)	7398 (53.5%)
8. Delayed crying at birth can cause HL	2482 (17.9%)	3666 (26.5%)	7689 (55.6%)
9. Prolonged noise can cause HL	8280 (59.8%)	2154 (15.6%)	3403 (24.6%)
10. Infection and medication in pregnant can cause HL of the baby	6226 (45.0%)	1449 (10.5%)	6162 (44.5%)
11. Measles can cause HL	3501 (25.3%)	2538 (18.3%)	7798 (56.4%)
12. Treatment for HL is available	8309 (60.0%)	1399 (10.1%)	4129 (29.8%)
13. HL can be identified soon after birth	8707 (62.9%)	1810 (13.1%)	3320 (24.0%)
14. Children with HL can attend school	11688 (84.5%)	717 (05.2%)	1432 (10.3%)
15. Children with HL can have similar educational opportunities as hearing peers	10396 (75.1%)	1523 (11.0%)	1918 (13.9%)
16. Do you think having a family history with HL can be a risk factor to have HL?	6623 (47.9%)	3219 (23.3%)	3995 (28.9%)
17. Do you think having an underweight born baby can be a risk factor to have HL?	1798 (13.0%)	5482 (39.6%)	6557 (47.4%)
18. Do you think premature born baby can be a risk factor to have HL?	3885 (28.1%)	3674 (26.6%)	6278 (45.4%)
19. Do you think putting the baby under mechanical ventilation can be a risk factor to have HL?	1761 (12.7%)	4854 (35.1%)	7222 (52.2%)

HL - Hearing Loss

Table 3: Prevalence of knowledge and attitude regarding infant HL (n=13837)

Knowledge and attitude parameters	n (%)
Total knowledge score	
Mean±SD	12.4±4.98
Median (min-max)	12 (0-28.5)
Level of knowledge	
Poor	4098 (29.6%)
Moderate	8432 (60.9%)
Good	1307 (09.4%)
Total attitude score	
Mean±SD	2.34±0.69
Median (min-max)	2.0 (0-3.0)
Level of attitude	
Negative	1019 (07.4%)
Positive	12818 (92.6%)

HL - Hearing Loss

education, which we validated on the following findings: among college student (AOR = 0.201; CI = 0.152–0.265; $P < 0.001$), diploma degree (AOR = 0.356; CI = 0.270–0.470; $P < 0.001$), bachelor degree (AOR = 0.231; CI = 0.168–0.317; $P < 0.001$), and masters or PhD degree (AOR = 0.525; CI = 0.416–0.662; $P < 0.001$). Meanwhile, in terms of attitude, it was predicted that college students might significantly improve their attitude toward infant HL as compared to those who are still in high school or below (AOR = 0.602; CI = 0.405–0.893; $P = 0.012$). Additionally, respondents' likelihood to have poor knowledge is likely to increase by nearly two times among those who do not have a child with HL (AOR = 1.802; CI = 1.400–2.318; $P < 0.001$) [Table 5].

Discussion

This study examined the knowledge and attitude of the public regarding infant HL. Our findings would be essential to the best

of our knowledge as it involves a large community in Saudi Arabia. Studies have reported that parental knowledge regarding hearing loss is essential to enable auditory access and support language development to ensure the maximum outcomes for children. Studies have suggested that early detection of hearing impairment is beneficial for future outcomes in speech. Moreover, parents with proper knowledge can detect such deformities sooner than anyone else.^[17] Similarly, knowledge regarding hearing loss and its mode of treatment is also important for general practitioners. Most individuals feel comfortable discussing their and their family issues with their family physician and follow their advice.^[13,18] Previous findings also revealed that perceived knowledge and confidence levels are related to self-reported action levels and hearing device use.^[19]

As per our findings, the overall mean knowledge score was 12.4 (SD: 4.98) out of 28.5 points, with moderate knowledge observed among 60.9% of the respondents, and the rest were either poor (29.6%) or good knowledge (9.4%). In the Qassim region, Saudi Arabia, Alsudays *et al.*^[20] measured the knowledge and attitude to childhood HL and hearing services among parents who attended well-baby and ear nose throat (ENT) clinics between August 2018 and September 2018. Based on their accounts, poor knowledge was found in more than half of the respondents (57.6%), while the remaining 42.4% were considered good knowledge, although the findings in our study showed otherwise. However, the criteria of classification need to be considered as in our study, we classified the level of knowledge into three categories: poor, moderate, and good. Similarly, in Egypt [13], nearly half of the parents (48.4%) exhibited poor knowledge, while good knowledge was found among 51.6%, which did not seem to agree with our results.

On the other hand, in India,^[21] nurses had better viewpoints regarding infant hearing impairment. According to their findings,

Table 4: Relationship between the level of knowledge (poor vs. good) regarding infant HL and the socio-demographic characteristics participants (n=5405)

Factor	Level of Knowledge [†]		Level of Attitude [‡]	
	Poor n (%) (n=4098)	Good n (%) (n=1307)	Negative n (%) (n=663)	Positive n (%) (n=4742)
Gender				
Male	1480 (36.1%)	483 (37.0%)	358 (54.0%)	1605 (33.8%)
Female	2618 (63.9%)	824 (63.0%)	305 (46.0%)	3137 (66.2%)
χ^2 ; P	0.302; 0.583		102.120; <0.001**	
Age group				
≤20 years	786 (19.2%)	95 (07.3%)	137 (20.7%)	744 (15.7%)
21-30 years	1527 (37.3%)	590 (45.1%)	299 (45.1%)	1818 (38.3%)
31-40 years	951 (23.2%)	303 (23.2%)	137 (20.7%)	1117 (23.6%)
41-50 years	537 (13.1%)	221 (16.9%)	66 (10.0%)	692 (14.6%)
>50 years	297 (07.2%)	98 (07.5%)	24 (03.6%)	371 (07.8%)
χ^2 ; P	112.283; <0.001 **		40.701; <0.001 **	
Marital status				
Single	1834 (44.8%)	550 (42.1%)	343 (51.7%)	2041 (43.0%)
Married	2114 (51.6%)	708 (54.2%)	294 (44.3%)	2528 (53.3%)
Divorced or widowed	114 (02.8%)	34 (02.6%)	26 (03.9%)	173 (03.6%)
χ^2 ; P	3.750; 0.290		19.043; <0.001	
Educational level				
High school or below	1134 (27.7%)	158 (12.1%)	187 (28.2%)	1105 (23.3%)
College student	856 (20.9%)	230 (17.6%)	163 (24.6%)	923 (19.5%)
Diploma degree	436 (10.6%)	84 (06.4%)	70 (10.6%)	450 (09.5%)
Bachelor degree	1469 (35.8%)	669 (51.2%)	206 (31.1%)	1932 (40.7%)
Master or PhD degree	203 (05.0%)	166 (12.7%)	37 (05.6%)	332 (07.0%)
χ^2 ; P	270.351; <0.001 **		29.605; <0.001 **	
Participants province				
Riyadh province	813 (19.8%)	291 (22.3%)	130 (19.6%)	974 (20.5%)
Makkah province	865 (21.1%)	297 (22.7%)	166 (25.0%)	996 (21.0%)
Madina province	193 (04.7%)	43 (03.3%)	21 (03.2%)	215 (04.5%)
Qassim province	118 (02.9%)	43 (03.3%)	14 (02.1%)	147 (03.1%)
Eastern province	1531 (37.4%)	441 (33.7%)	210 (31.7%)	1762 (37.2%)
Asir province	306 (07.5%)	108 (08.3%)	76 (11.5%)	338 (07.1%)
Tabuk province	65 (01.6%)	14 (01.1%)	14 (02.1%)	65 (01.4%)
Hail province	41 (01.0%)	07 (0.50%)	03 (0.50%)	45 (0.90%)
Northern border province	10 (0.20%)	04 (0.30%)	02 (0.30%)	12 (0.30%)
Najran province	25 (0.60%)	14 (01.1%)	05 (0.80%)	34 (0.70%)
Jizan province	83 (02.0%)	23 (01.8%)	12 (01.8%)	94 (02.0%)
Bahah province	35 (0.90%)	18 (01.4%)	07 (01.1%)	46 (01.0%)
Jawf province	13 (0.30%)	04 (0.30%)	03 (0.50%)	14 (0.30%)
χ^2 ; P	23.972; 0.021 **		32.563; 0.001 **	
Having a child with HL				
Yes	224 (05.5%)	107 (08.2%)	32 (04.8%)	299 (06.3%)
No	3874 (94.5%)	1200 (91.8%)	631 (95.2%)	4443 (93.7%)
χ^2 ; P	12.758; <0.001**		2.213; 0.137	

HL - Hearing Loss. [†]Excluded respondents with moderate knowledge. [‡]P has been calculated using Chi-square test. **Significant at P<0.05 level

64% of nurses were aware of infant hearing impairment, with only 36% not aware, which is higher than our results. However, it is understandable that nurses' perceived awareness was likely to be higher than the general population as they are members of public health institutions. Furthermore, we learned that having a child with HL was an independent risk factor of poor knowledge. In some studies, age showed a significant association with awareness or knowledge. For instance, Al Shehri *et al.*^[21] found a significant association between age and level of awareness, explaining that the level increased as the age increased, while Alsudays *et al.*^[20]

found a significant association between knowledge and age group. This was also consistent with our findings as age group was determined to significantly influence one's level of knowledge. In addition, we determined that educational level was also an influential factor of knowledge. In the multivariate regression model, we hypothesized that respondents' knowledge increased as the educational attainment increased.

In the specific assessment of knowledge toward infant HL, respondents showed high scores on the following statements:

Table 5: Multivariate regression analysis to determine the independent significant factor associated with poor knowledge and negative attitude regarding infant HL (n=5405)

Factor	Knowledge			Attitude		
	AOR	95% CI	P	AOR	95% CI	P
Gender						
Male	Ref			Ref		
Female	0.960	0.836-1.103	0.565	0.410	0.345-0.487	<0.001**
Age group						
≤20 years	Ref			Ref		
21-30 years	0.404	0.278-0.588	<0.001**	0.302	0.180-0.506	<0.001**
31-40 years	0.937	0.704-1.245	0.652	0.324	0.203-0.515	<0.001**
41-50 years	0.823	0.625-1.083	0.164	0.456	0.289-0.720	0.001**
>50 years	1.148	0.860-1.531	0.349	0.593	0.363-0.969	0.037**
Marital status						
Single	Ref			Ref		
Married	1.293	0.891-1.876	0.177	1.889	1.178-3.029	0.008**
Divorced or widowed	1.024	0.724-1.449	0.894	1.729	1.108-2.699	0.016**
Educational level						
High school or below	Ref			Ref		
College student	0.201	0.152-0.265	<0.001**	0.602	0.405-0.893	0.012**
Diploma degree	0.356	0.270-0.470	<0.001**	0.701	0.465-1.055	0.089
Bachelor degree	0.231	0.168-0.317	<0.001**	0.722	0.467-1.118	0.144
Master or PhD degree	0.525	0.416-0.662	<0.001**	0.964	0.659-1.411	0.851
Participants province						
Riyadh province	Ref			Ref		
Makkah province	1.264	0.376-4.250	0.705	1.566	0.432-5.683	0.495
Madina province	1.271	0.378-4.274	0.698	1.441	0.398-5.218	0.578
Qassim province	0.903	0.258-3.156	0.873	2.328	0.602-9.005	0.221
Eastern province	1.353	0.385-4.759	0.637	2.194	0.546-8.818	0.268
Asir province	1.184	0.353-3.971	0.784	1.912	0.529-6.904	0.323
Tabuk province	1.412	0.414-4.812	0.581	1.160	0.316-4.262	0.823
Hail province	0.912	0.239-3.490	0.893	1.239	0.304-5.049	0.765
Northern province	0.842	0.196-3.623	0.818	3.460	0.610-19.64	0.161
Najran province	1.536	0.276-8.550	0.624	1.396	0.192-10.15	0.741
Jizan province	2.410	0.604-9.614	0.213	1.818	0.370-8.934	0.462
Bahah province	1.260	0.344-4.611	0.727	2.390	0.580-9.854	0.228
Jawf province	1.852	0.485-7.070	0.367	1.592	0.351-7.215	0.546
Having a child with HL						
Yes	1.802	1.400-2.318	<0.001**	1.447	0.986-2.125	0.059
No	Ref			Ref		

HL - Hearing Loss; AOR - Adjusted Odds Ratio; CI - Confidence Interval. **Significant at $P < 0.05$ level

“children with HL could attend school” (84.5%), “babies can be born with HL” (78.4%), and “children with HL can have similar educational opportunities as hearing peers” (75.1%). Several papers have reported that children with HL should not be denied the chance to go to school.^[16,20,21] For example, Alsudays *et al.*^[20] documented that parents agreed that “children with HL can attend school,” which was also consistent with the papers published in India and South Africa.^[16,22] In contrast, respondents showed less knowledge on the following statements: “Jaundice can cause HL” (9.6%), “Putting a baby under mechanical ventilation is a risk factor of HL” (12.7%), and “having an underweight born baby is a risk factor of HL” (13%). A study published in South Africa and the Solomon Islands^[22,23] also does not agree that jaundice was a risk factor for HL, which is consistent with our study findings.

Moreover, we measured the attitude of respondents toward infant HL via three statements discussed in Figure 3. Based on the given criteria, the total mean attitude score was 2.4 (SD: 0.69) out of 3 points, wherein nearly all (92.6%) respondents exhibited positive attitudes toward infant HL, with only 7.4% negative. These results seem to coincide with other papers,^[22,24] which mainly reported that nearly all participants exemplified a positive attitude toward infant HL. We also examined which factors are associated with attitude, and based on our assessment, female gender and higher educational attainment (college students/ graduates) were more associated with a better attitude. On the other hand, being married and being divorced or widowed had a significant impact on poor attitude, which is contrary to the findings of Alsudays *et al.*^[20] as the latter did not find any significant association between the level of attitude among the age group, gender, and educational attainment. Similarly, we

hypothesized that increasing age was associated with increasing positive attitude toward such impairment; this was consistent with the findings of Elbeltagy *et al.*,^[24] who documented that parents' age has a significant association with a child's attitude in terms of wearing a hearing aid.

Moreover, in the thorough assessment of attitude toward infant HL, respondents mostly expressed positive attitude in the following statements: "Would let their baby use hearing aid if necessary" (94.6%) and "Would like their baby tested soon after birth" (91.7%). However, the percentage of respondents who would like to know more about infant HL was only 48%. In South Africa and the Solomon Islands,^[22,23] the proportion of respondents who would like to know more about infant HL was relatively higher than our results, which indicated 96.7% and 98.7% each, respectively. In India, a significant number of mothers (84.9%) expressed willingness to have their child tested after birth, which was also in line with our results.^[16]

Limited knowledge and less interest in gaining awareness regarding HL among the Saudi population may lead to a grave outcome.

Conclusion

Although most of the respondents exhibited a positive attitude regarding infant HL, their knowledge seems lacking. Having a child who is suffering from HL greatly improved their awareness on such impairment. Moreover, increasing age positively impacted attitude while being married or had been married had a negative impact on attitude. As per our findings, increasing the knowledge level on infant HL among the general population should be a priority; thus, more educational campaigns should be conducted to address these knowledge gaps, with the government institutions playing a vital role in this process.

Ethical considerations

Ethical approval was obtained from Qassim Regional Research Ethics Committee Registered at National Committee of Bio & Med, Ethics (ECBE) Registration No. H-04-Q-001.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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