

Article

Knowledge, Attitudes, and Practices of Self-Ear Cleaning Among the General Population Residing in the Northern Border Region, Saudi Arabia: A Cross-Sectional Study

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Abstract

Self-ear cleaning is widespread in Saudi Arabia, yet public knowledge about proper ear hygiene and associated risks remains variable. This study aimed to assess knowledge, attitudes, and practices regarding self-ear cleaning among adults in the Northern Border Region and to situate the findings within the context of previous studies from other Saudi regions. A cross-sectional online survey was conducted among 534 adults (ages 18–60) residing in the Northern Border Region of Saudi Arabia. Data were collected using a validated questionnaire that assessed sociodemographic characteristics, knowledge, attitudes, practices, and self-reported complications related to self-ear cleaning. Knowledge was evaluated using 8 items, with 1 point per correct response (total score 0–8), and good knowledge was defined as ≥ 5 correct responses. Most participants (89.1%) reported practicing self-ear cleaning, predominantly using cotton buds (73.7%). Although many recognized potential harms (81.4% believed cotton buds could push wax deeper and 78.1% were aware of the risk of eardrum perforation), 64.1% still believed regular self-ear cleaning was necessary, indicating a knowledge–practice gap. Reported complications included otitis externa (50.6%), pain (44.0%), and bleeding (18.9%). In multivariable logistic regression, higher knowledge was independently associated with postgraduate education, healthcare employment, non-smoking status, and a history of hearing problems. Comparative synthesis with previous surveys from other Saudi regions revealed broadly similar prevalence, preferred tools, and complications, suggesting that self-ear cleaning is a common and often risky behavior nationwide. In conclusion, self-ear cleaning is prevalent in the authors' region despite substantial awareness of its risks, and a persistent knowledge–practice gap was observed. While the cross-sectional, convenience-sample design limits causal inference and generalizability, these region-specific findings may help inform targeted educational messages and future interventional studies aimed at promoting safer ear hygiene and reducing avoidable ear-related morbidity in similar settings.



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Keywords: self-ear cleaning; ear wax; cotton bud use; knowledge; attitudes; practices; complications; public health; Saudi Arabia

1. Introduction

Earwax, or cerumen, is a naturally occurring secretion produced by the ceruminous and sebaceous glands in the external auditory canal. It serves several physiological roles, including trapping debris, deterring moisture accumulation, cleansing the ear canal, providing lubrication, and protecting the delicate lining of the ear from foreign materials and microbial invasion [1]. Under normal circumstances, earwax gradually dries, disintegrates, and naturally exits the ear canal as small flakes, without any need for mechanical removal [2].

However, excessive cerumen production or improper clearance can lead to accumulation and impaction, obstructing the ear canal and impairing sound transmission to the eardrum [3]. Cerumen impaction, also known as cerumen obstruction, is a common condition characterized by symptoms such as conductive hearing loss, otalgia, itching, vertigo, and tinnitus. In response to such symptoms or perceived poor ear hygiene, many individuals engage in self-ear-cleaning practices to manually remove earwax [4].

Self-ear cleaning is the practice of inserting various objects into the ear canal to remove cerumen. Despite being culturally widespread and seemingly benign, this practice is medically discouraged [5]. Many people believe that routine earwax removal is essential for cleanliness and comfort, yet empirical evidence indicates that it can be harmful. Manual cleaning can traumatize the delicate ear canal, push wax deeper toward the tympanic membrane, or even cause tympanic membrane perforation [6]. Experts have emphasized that inserting foreign objects into the ear can damage the ossicular chain, promote infection, and lead to complications like otitis externa and persistent tinnitus. Among these practices, the use of cotton buds (Q-tips) has been identified as a leading cause of eardrum perforation, which can occasionally necessitate surgical repair [7].

Cotton buds typically consist of a small piece of cotton wound around one or both ends of a short stick made of plastic, paper, or wood. They were originally marketed for infant care and personal hygiene, but despite longstanding warnings from health professionals, their use for ear cleaning has become common worldwide. Recent clinical reports and guidelines note that cotton-tipped applicators are a frequent cause of cerumen impaction and traumatic tympanic membrane perforation and may contribute to otitis externa and other external-ear injuries [2,8,9]. Consequently, contemporary ear-care recommendations advise against inserting cotton buds into the ear canal for routine cleaning and emphasize education on safer ear-hygiene practices [9].

Cerumen possesses biochemical and immunological properties that are important for maintaining ear health. It continuously migrates outward from the ear canal, facilitated by jaw movements such as talking and chewing. This natural process helps remove trapped debris while preventing contaminants from coming into direct contact with the tympanic membrane. In addition, cerumen contains lysozymes, glycoproteins, immunoglobulins, lipids, and trace elements, which collectively confer bactericidal properties and contribute to local host defense. Consequently, attempts to remove earwax unnecessarily can disrupt these protective functions, predisposing individuals to bacterial and fungal infections [10].

Improper self-ear cleaning, especially when done without visibility or with unsafe objects such as feathers, pins, sticks, matchsticks, or hair clips, can cause additional complications, including abrasions, bleeding, otitis externa, or tympanic membrane perforation.

The risk escalates when such actions are performed routinely or without appropriate knowledge of ear anatomy and hygiene [11].

Globally, self-ear cleaning remains a common but underexplored public health practice. Studies across various populations have shown varying degrees of awareness of the physiological role of earwax, appropriate ear-cleaning methods, and associated hazards [5,12–15]. Understanding local practices is essential to developing targeted health education strategies that reduce preventable injuries and promote ear health. To our knowledge, no previous knowledge, attitudes, and practices (KAP) study has reported self-ear-cleaning KAP among adults in the Northern Border Region of Saudi Arabia while explicitly synthesizing these region-specific findings with published surveys from other Saudi regions. This work, therefore, addresses an important evidence gap by providing region-specific estimates, identifying factors associated with knowledge and practice, and synthesizing Northern Border Region data with published surveys from other Saudi regions to inform future public health planning. In this context, the KAP framework offers a pragmatic way to examine how awareness of ear-health risks (risk perception), beliefs about the necessity and safety of self-cleaning (attitudes), and longstanding hygiene habits (practices) interact to sustain or change behavior. By assessing these three components together, we can move beyond describing prevalence to identify specific cognitive and cultural factors that should be targeted in health-education interventions in this region. Applying the KAP approach in this region, therefore, provides conceptually grounded evidence to guide ear-health promotion and injury-prevention efforts.

2. Materials and Methods

2.1. Study Design and Setting

This cross-sectional descriptive study was conducted in August 2025 among residents of the Northern Border Region, Saudi Arabia.

2.2. Study Population and Sampling

Adults aged 18–60 years residing in the Northern Border Region who were Arabic-speaking, willing to participate, and able to provide informed consent, regardless of nationality, were invited to participate. A non-probability cluster convenience sampling technique was employed to recruit participants from diverse demographic backgrounds across the region. The minimum required sample size of 384 participants was determined using Raosoft's sample size calculator (Raosoft Inc., Seattle, WA, USA), based on a 95% confidence level, a 5% margin of error, and an assumed response distribution of 50%. Ultimately, data were collected and analyzed from 534 eligible participants. Exceeding the calculated minimum sample size aligns with established best practices in cross-sectional epidemiological research, as it increases statistical power, enhances the precision of prevalence estimates, narrows confidence intervals, and enables more robust subgroup and multivariate analyses [16].

The present approach to sample size determination and reporting adheres to the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines. In the present study, the ability to exceed the minimum calculated sample size without protocol deviation or selective recruitment further minimizes the risk of Type I/II errors and supports the reliability and generalizability of the study findings [17,18].

2.3. Data Collection Tool

Data were collected using a structured, self-administered questionnaire developed through a literature review [1] and expert consultation (Supplementary File S1). The instrument included the following sections:

Demographic Data: gender, age, nationality, place of residence, educational level, marital status, occupation, smoking status, family and personal history of hearing problems.

- Beliefs about Ear Self-Cleaning: Participants rated ear self-cleaning as non-beneficial, beneficial, not sure, or harmful.
- Knowledge Assessment: Eight statements regarding ear hygiene and the risks/benefits of various ear self-cleaning practices. For each statement, respondents selected from a 5-point Likert scale: strongly disagree, disagree, neutral, agree, or strongly agree. Items assessed understanding of cotton bud use, alternative cleaning methods, and awareness of potential complications.
- Practice and Attitude Assessment: Questions addressed whether respondents practiced self-ear cleaning, what part of the ear they cleaned (inside, outside, or both), which ear was cleaned more frequently, and which tools were used (cotton buds, keys, matchsticks, feathers, tissues, or other objects). Items also captured reported complications (e.g., otitis externa, pain, bleeding, no complication), as well as the duration and frequency of cotton bud use.
- Sources of Information: Participants selected all applicable information sources (doctors, friends/family, social media, TV, internet, hospital posters/flyers, newspapers, or others).

The questionnaire was distributed electronically via Google Forms using a variety of social media platforms.

2.4. Scoring System for Knowledge and Classification

Knowledge was evaluated based on responses to eight core statements. Scoring followed these principles:

- Each correct attitude received 1 point; incorrect or neutral responses received 0 points.
- Correct answers were as follows: Disagreement (disagree/strongly disagree) with the use of cotton buds, towel, or water for cleaning; agreement (agree/strongly agree) that ears are best not cleaned; disagreement (disagree/strongly disagree) that cotton buds are effective for wax removal; and agreement (agree/strongly agree) that cotton buds can cause infection, eardrum perforation, or wax impaction.

For example: “Cotton buds should be used to clean the ears”, correct answer: Disagree/Strongly disagree (score = 1); “It is best not to clean the ears”, correct answer: Agree/Strongly agree (score = 1); “Cotton buds can cause an ear infection/perforation/push wax deeper”, correct: Agree/Strongly agree (score = 1 for each). The total knowledge score ranged from 0 to 8. For analytical purposes, knowledge was dichotomized as “good” (≥ 5 correct responses) versus “poor” (< 5 correct responses). This threshold was chosen to reflect the distribution of scores in our sample (i.e., distinguishing participants who answered the majority of items correctly) and to remain consistent with cut-offs used in previous KAP surveys [19,20]. We acknowledge that dichotomizing a continuous score is to some extent arbitrary, but this categorization enabled a practical interpretation of knowledge level and facilitated binary logistic regression modeling.

2.5. Ethical Approval and Participant Consent

The study protocol was reviewed and approved by the Local Bioethics Committee of Northern Border University, Saudi Arabia (Decision No. 53-25-H, 25 May 2025). Participation was entirely voluntary, and electronic informed consent was obtained before the questionnaire could be accessed. No personal identifiers were collected, and all data were stored on password-protected devices accessible only to the research team.

2.6. Data Management and Statistical Analysis

Data from Google Forms were exported to IBM SPSS Statistics version 29.0 (IBM Corp., Armonk, NY, USA) for analysis. Categorical variables (e.g., self-ear cleaning practice, complications, knowledge category) are summarized as frequencies and percentages. Group comparisons were performed using the chi-square test or Fisher's exact test where appropriate. Variables associated with good knowledge in univariable analysis ($p < 0.10$) were entered into a multivariable binary logistic regression model to identify independent predictors, and results are reported as adjusted odds ratios with 95% confidence intervals. A two-sided p -value < 0.05 was considered statistically significant.

3. Results

3.1. Sociodemographic Characteristics

A total of 534 participants were included in the study, comprising 60.7% males and 39.3% females. Most respondents were Saudi nationals (97.6%), residing in the Northern Border Region, and primarily within the 40–49-year age group (35.0%). The majority held a bachelor's degree (60.3%) and were married (70.4%). Nearly half of the participants were non-healthcare workers (47.0%), while 81.5% reported being non-smokers (Table 1).

Table 1. Sociodemographic characteristics of participants ($n = 534$).

Variable	Category	Frequency	Percent
Gender	Male	324	60.7
	Female	210	39.3
Age	18–25 years	136	25.5
	26–39 years	102	19.1
	40–49 years	187	35.0
	50–60 years	109	20.4
	61+ years	100	18.7
Nationality	Saudi	521	97.6
	Non-Saudi	13	2.4
	Uneducated	7	1.3
	Primary	3	0.6
Educational Level	Intermediate	12	2.2
	Secondary	80	15.0
	Diploma	64	12.0
	Bachelor's	322	60.3
	Postgraduate	46	8.6
Marital Status	Single	140	26.2
	Married	376	70.4
	Divorced	12	2.2
	Widowed	6	1.1
Occupation	Student	110	20.6
	Healthcare worker	41	7.7
	Non-healthcare worker	251	47.0
	Not working	132	24.7
Smoking	No	435	81.5
	Yes	99	18.5

Data are presented as frequencies and percentages (%).

3.2. Family and History of Hearing Problems

Most participants ($n = 506$; 94.8%) reported no family history of hearing problems, and a similarly high proportion ($n = 496$; 92.9%) indicated no personal history of hearing issues.

3.3. Knowledge Regarding Self-Ear Cleaning

Participants demonstrated mixed perceptions about self-ear cleaning. Nearly half (44.7%) believed it to be safe, although 26.8% disagreed and 28.5% were neutral. More than half (54.1%) supported the use of cotton buds, but one-quarter opposed it. Safer alternatives, such as damp towels or flannels, were endorsed by 46.8% of respondents, and 39.4% favored using only water.

Opinions on avoiding ear cleaning were split: 35.7% agreed and 42.1% disagreed. Although 38.4% considered cotton buds effective for removing wax, perceived risks were high: 63.1% associated them with infection, 78.1% with eardrum perforation, and 81.4% with pushing wax deeper into the canal. Furthermore, 64.1% supported the need for regular self-ear cleaning. Detailed distribution of responses is presented in Table 2.

Table 2. Participants' knowledge towards ear cleaning ($n = 534$).

Question No.	Strongly Disagree, n (%)	Disagree n (%)	Neutral n (%)	Agree n (%)	Strongly Agree n (%)
Self-ear cleaning is safe	35 (6.6)	108 (20.2)	152 (28.5)	169 (31.6)	70 (13.1)
Cotton buds should be used	36 (6.7)	98 (18.4)	111 (20.8)	219 (41.0)	70 (13.1)
A damp towel/flannel should be used	27 (5.1)	110 (20.6)	147 (27.5)	203 (38.0)	47 (8.8)
Only water should be used	38 (7.1)	166 (31.1)	120 (22.5)	160 (30.0)	50 (9.4)
Best not to clean ears	47 (8.8)	178 (33.3)	118 (22.1)	122 (22.8)	69 (12.9)
Cotton buds are effective for wax	72 (13.5)	147 (27.5)	110 (20.6)	155 (29.0)	50 (9.4)
Cotton buds cause infection	6 (1.1)	62 (11.6)	129 (24.2)	233 (43.6)	104 (19.5)
Cotton buds cause perforation	6 (1.1)	44 (8.2)	67 (12.5)	254 (47.6)	163 (30.5)
Cotton buds push wax deeper	5 (0.9)	27 (5.1)	67 (12.5)	233 (43.6)	202 (37.8)
Necessary to self-ear clean regularly	18 (3.4)	62 (11.6)	112 (21.0)	237 (44.4)	105 (19.7)

Data are presented as frequencies (n) and percentages (%).

3.4. Practices and Methods of Ear Self-Cleaning

Among the 534 participants, 42.7% reported cleaning only the outside of the ear, 12.9% only the inside, 33.5% both areas, and 10.9% did not practice self-ear cleaning. Most respondents (78.1%) cleaned both ears equally. Cotton buds were the most used tool (73.7%), followed by other objects (17.6%), tissues (3.8%), keys (2.3%), and matchsticks and feathers (1.3% each) (Table 3).

Table 3. Practices and methods of ear self-cleaning among participants ($n = 534$).

Category	Frequency	Percent
Practices of ear self-cleaning		
Only clean the outside of the ear	228	42.7
Clean the inside of the ear only	69	12.9
Clean both outside and inside	179	33.5
Do not practice ear self-cleaning	58	10.9
Which ear is frequently cleaned?		
Both ears equally	417	78.1
Right ear more	37	6.9
Left ear more	22	4.1
Do not practice ear self-cleaning	58	10.9
Tools used for self-ear cleaning		
Cotton bud	351	73.7
Key	11	2.3
Matchstick	6	1.3
Feather	6	1.3
Tissues	18	3.8
Other objects	84	17.6

Data are presented as frequencies and percentages (%).

3.5. Complications Associated with Ear Self-Cleaning

Among self-reported complications, otitis externa was the most frequent (50.6%), followed by ear pain (44.0%), while bleeding was the least common (18.9%). Notably, over one-quarter (26.4%) of participants reported no complications (Figure 1).

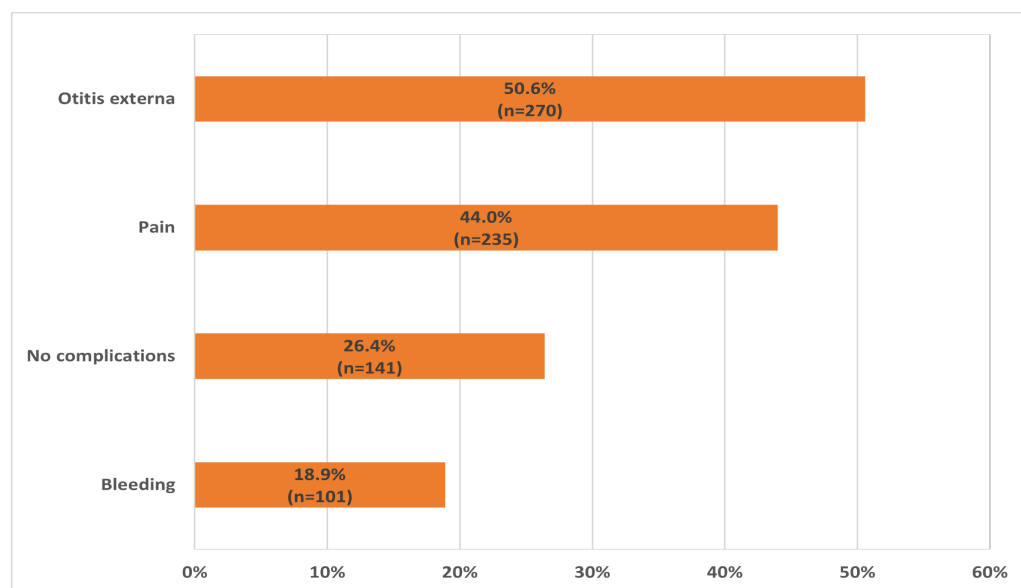


Figure 1. Participants reported complications associated with ear self-cleaning ($n = 534$).

3.6. Duration and Frequency of Cotton Bud Use

More than half (51.3%) reported using cotton buds for over five years, and 23.4% for less than five years. About one-fourth (25.3%) did not use cotton buds for ear cleaning (Figure 2A). Cotton buds were used occasionally by 54.9% of participants, once daily by 17.6%, twice daily by 3.6%, and three or more times daily by 2.2%, while 21.7% did not use them at all (Figure 2B).

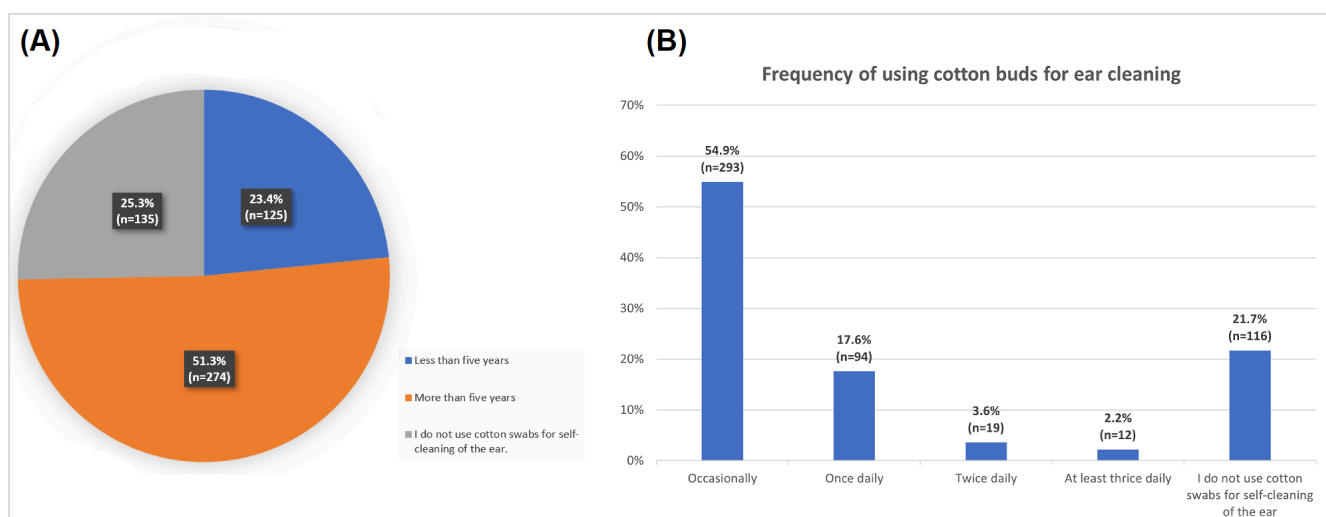


Figure 2. Duration (A) and frequency (B) of cotton bud use for ear self-cleaning among study participants. Data are presented as frequencies and percentages (%). ($n = 534$).

3.7. Attitudes Toward Professional Ear Cleaning

Over half (57.3%) agreed that ear cleaning should be performed by a healthcare professional, 18.5% disagreed, and 24.2% were neutral (Figure 3).

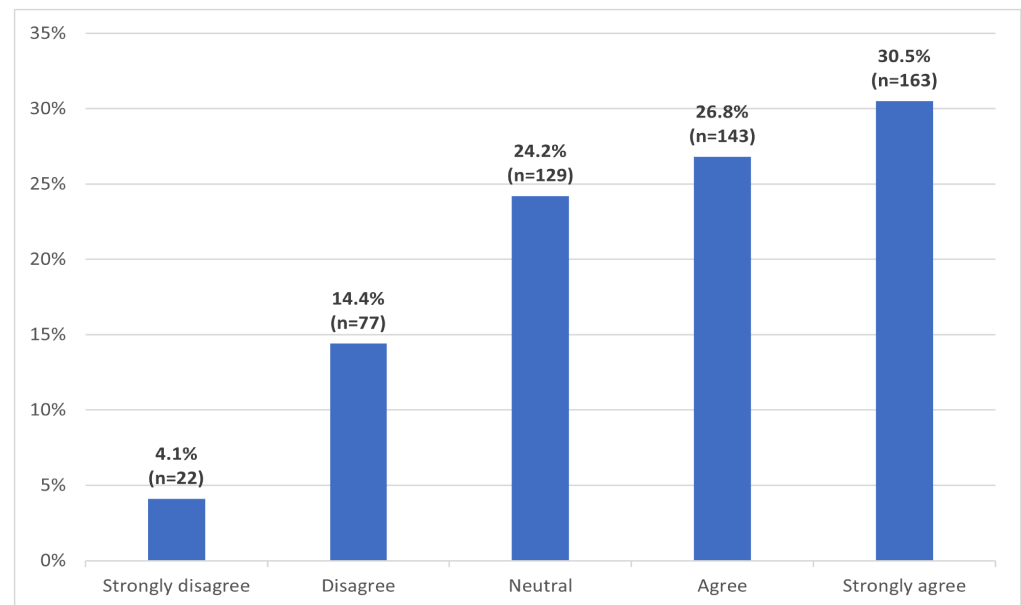


Figure 3. Participants' Preferences for Ear Cleaning by a Doctor ($n = 534$).

3.8. Sources of Information

The most common sources of information regarding ear care were social media (49.8%) and friends or family (38.1%), followed by doctors (36.5%) and the internet (30.4%). Fewer participants obtained information from television (11.0%) or hospital posters/flyers (8.3%) (Figure 4).

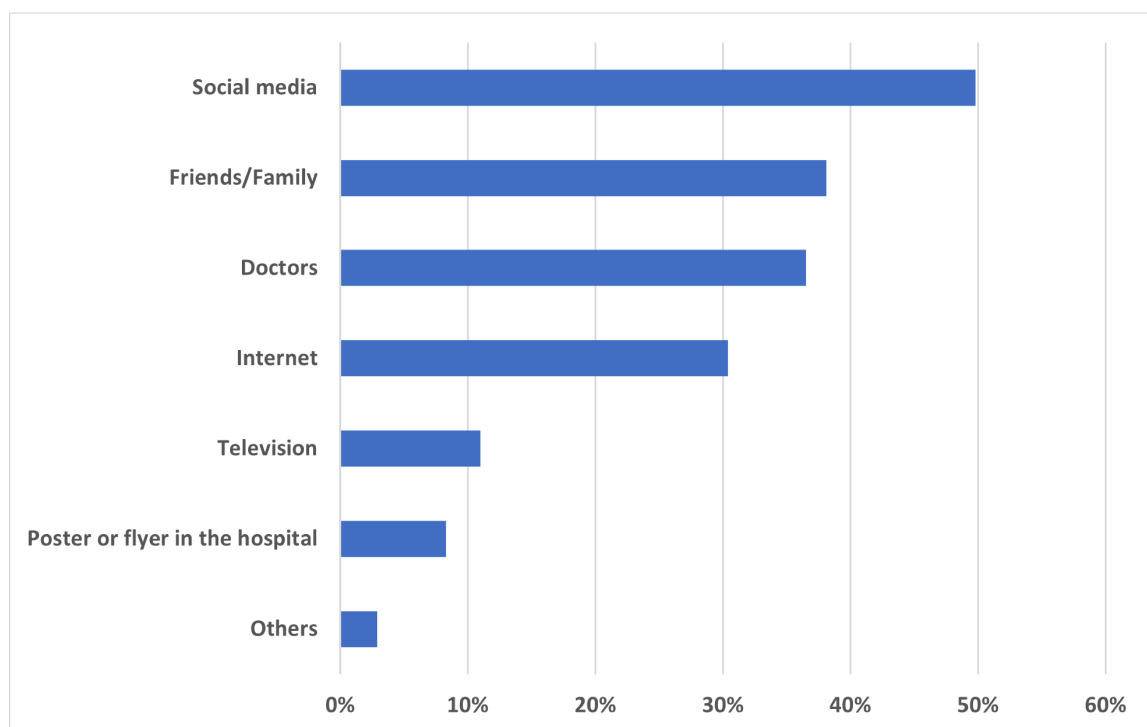


Figure 4. Sources of Information on Ear Cleaning ($n = 534$).

3.9. Association Between Sociodemographic Factors and Knowledge

Significant associations were found between overall knowledge and age, educational level, occupation, and history of hearing problems. Higher knowledge levels were observed among participants aged 50–60 years, those with postgraduate degrees, healthcare workers,

and those with prior hearing problems. No significant associations were detected for gender, nationality, marital status, or family history of hearing problems (Table 4).

Table 4. Association between demographic variables and overall knowledge ($n = 534$).

		Overall Knowledge		<i>p</i> -Value
		Poor ($n = 337$)	Good ($n = 197$)	
Sex	Male	202 (59.9)	122 (61.9)	0.650
	Female	135 (40.1)	75 (38.1)	
Age	18–25 years	91 (27.0)	45 (22.8)	0.005 *
	26–39 years	71 (21.1)	31 (15.7)	
	40–49 years	122 (36.2)	65 (33.0)	
	50–60 years	53 (15.7)	56 (28.4)	
Nationality	Saudi	329 (97.6)	192 (97.5)	0.905
	Non-Saudi	8 (2.4)	5 (2.5)	
Educational Level	Uneducated	5 (1.5)	2 (1.0)	0.001 *
	Primary	1 (0.3)	2 (1.0)	
	Intermediate	8 (2.4)	4 (2.0)	
	Secondary	65 (19.3)	15 (7.6)	
	Diploma	42 (12.5)	22 (11.2)	
Marital Status	Bachelor's	197 (58.5)	125 (63.5)	0.796
	Postgraduate	19 (5.6)	27 (13.7)	
	Single	93 (27.6)	47 (23.9)	
	Married	233 (69.1)	143 (72.6)	
	Divorced	7 (2.1)	5 (2.5)	
Occupation	Widowed	4 (1.2)	2 (1.0)	0.003 *
	Student	81 (24.0)	29 (14.7)	
	Healthcare worker	17 (5.0)	24 (12.2)	
	Non-healthcare worker	153 (45.4)	98 (49.7)	
Family History of Hearing Problems	Not working	86 (25.5)	46 (23.4)	0.895
	No	319 (94.7)	187 (94.9)	
History of Hearing Problems	Yes	18 (5.3)	10 (5.1)	0.005 *
	No	321 (95.3)	175 (88.8)	
	Yes	16 (4.7)	22 (11.2)	

Data are presented as frequencies and percentages (%). Chi-square or Fisher's exact tests were applied when appropriate. * Statistically significant at p -value < 0.05 .

3.10. Association Between Participant Characteristics and Cotton Bud Use

Cotton bud use was significantly associated with nationality, family history of hearing problems, history of hearing problems, and overall knowledge. Saudi participants and those with poor knowledge, family history, or previous ear problems were more likely to use cotton buds. No significant associations were observed for gender, age, education, marital status, or occupation (Table 5).

Table 5. Association Between Demographic/Clinical Variables and Cotton Bud Use for Ear Cleaning.

		Cotton Bud Use for Ear Cleaning		<i>p</i> -Value
		Users ($n = 409$)	Non-Users ($n = 125$)	
Sex	Male	239 (58.4)	85 (68.0)	0.055
	Female	170 (41.6)	40 (32.0)	
Age	18–25 years	102 (24.9)	34 (27.2)	0.902
	26–39 years	79 (19.3)	23 (18.4)	
	40–49 years	146 (35.7)	41 (32.8)	
	50–60 years	82 (20.0)	27 (21.6)	
Nationality	Saudi	403 (98.5)	118 (94.4)	0.009 *
	Non-Saudi	6 (1.5)	7 (5.6)	

Table 5. Cont.

		Cotton Bud Use for Ear Cleaning		p-Value
		Users (n = 409)	Non-Users (n = 125)	
Educational Level	Uneducated	5 (1.2)	2 (1.6)	0.242
	Primary	3 (0.7)	0 (0.0)	
	Intermediate	10 (2.4)	2 (1.6)	
	Secondary	68 (16.6)	12 (9.6)	
	Diploma	44 (10.8)	20 (16.0)	
	Bachelor's	247 (60.4)	75 (60.0)	
Marital Status	Postgraduate	32 (7.8)	14 (11.2)	0.463
	Single	106 (25.9)	34 (27.2)	
	Married	289 (70.7)	87 (69.6)	
	Divorced	8 (2.0)	4 (3.2)	
Occupation	Widowed	6 (1.5)	0 (0.0)	0.879
	Student	87 (21.3)	23 (18.4)	
	Healthcare worker	31 (7.6)	10 (8.0)	
	Non-healthcare worker	189 (46.2)	62 (49.6)	
Family History of Hearing Problems	Not working	102 (24.9)	30 (24.0)	0.013 *
	No	393 (96.1)	113 (90.4)	
History of Hearing Problems	Yes	16 (3.9)	12 (9.6)	0.042 *
	No	385 (94.1)	111 (88.8)	
Overall Knowledge	Yes	24 (5.9)	14 (11.2)	<0.00 *
	Poor	285 (69.7)	52 (41.6)	
	Good	124 (30.3)	73 (58.4)	

Data are presented as frequencies and percentages (%). Chi-square or Fisher's exact tests were applied when appropriate. * Statistically significant at p -value < 0.05.

3.11. Factors Associated with Overall Knowledge

In univariable logistic regression, age, educational level, occupation, smoking status, and history of hearing problems were significantly associated with good knowledge, whereas gender was not (Table 6). Multivariable logistic regression showed that educational level, occupation, smoking status, and history of hearing problems remained independently associated with good knowledge (Table 7). Age group did not retain a statistically significant association with knowledge after adjustment for these covariates.

Table 6. Univariable logistic regression analysis for factors associated with overall knowledge regarding self-ear cleaning.

Variable	Category	Crude OR	95% CI	p-Value
Sex	Male vs. Female	1.09	0.76–1.56	0.650
Age	50–60 vs. 18–25	2.14	1.27–3.59	0.004 *
Education	Secondary vs. Postgraduate	0.16	0.07–0.37	<0.001 *
Occupation	Healthcare worker vs. Student	3.94	1.86–8.37	<0.001 *
Smoking	No vs. Yes	1.82	1.12–2.96	0.016 *
History of Hearing Problems	No vs. Yes	0.40	0.20–0.78	0.007 *

OR: Odds ratio, CI: Confidence interval. * Statistically significant at p -value < 0.05.

Model diagnostics indicated no evidence of problematic multicollinearity (variance inflation factor range: 1.008–1.556). The model demonstrated good fit (Hosmer–Lemeshow $\chi^2 = 8.898$, $p = 0.351$) and acceptable discrimination (area under the ROC curve = 0.695, 95% CI: 0.649–0.741). Standardized residuals were within acceptable limits (maximum = 2.33), and Cook's distance values were all below 1 (maximum = 0.899), indicating no influential observations. The model explained 14.7% of the variance in knowledge (Nagelkerke $R^2 = 0.147$) and correctly classified 67.2% of cases.

Table 7. Multivariable logistic regression analysis for factors associated with overall knowledge regarding self-ear cleaning.

Predictor	Odds Ratio	95% CI (Lower–Upper)	<i>p</i> -Value
Age group			
26–39 years vs. 18–25	0.72	0.31–1.66	0.439
40–49 years vs. 18–25	0.98	0.41–2.38	0.967
50–60 years vs. 18–25	2.03	0.82–5.02	0.126
Educational Level			
Secondary vs. Postgraduate	0.19	0.08–0.46	0.001 *
Diploma vs. Postgraduate	0.34	0.15–0.78	0.014 *
Bachelor's vs. Postgraduate	0.47	0.24–0.92	0.027 *
Occupation			
Healthcare worker vs. Student	3.93	1.63–9.81	0.003 *
Non-healthcare worker vs. Student	1.67	0.73–3.79	0.225
Not working vs. Student	1.49	0.66–3.34	0.334
Smoking (No vs. Yes)	2.24	1.28–3.91	0.005 *
History of Hearing Problems (No vs. Yes)	0.30	0.15–0.62	0.001 *

OR: Odds ratio, CI: Confidence interval. * Statistically significant at *p*-value < 0.05.

4. Discussion

This study provides context-specific insights into knowledge, attitudes, and practices regarding self-ear cleaning among adults residing in the Northern Border Region of Saudi Arabia. Our findings show that self-ear cleaning is highly prevalent, with many individuals using cotton buds or other non-recommended objects, and that this behavior persists despite substantial awareness of potential complications. These patterns closely mirror those reported in previous surveys from other Saudi regions, underscoring both the pervasiveness of self-ear cleaning and the persistent gaps in public understanding of the physiological role of cerumen and safe ear hygiene practices [12,15,21–24]. Within the KAP framework, the present results illustrate how risk awareness, perceived necessity of self-cleaning, and widely accepted hygiene norms interact to sustain behavior, even when potential harms are recognized.

4.1. Prevalence and Practices

In our sample, self-ear cleaning was almost universal, with most participants reporting using cotton buds, and a smaller proportion using tissues, alternative objects, or even sharp tools. Cotton buds were by far the preferred method, in line with earlier Saudi studies from Riyadh and Makkah, where a large majority of respondents also reported using cotton buds or similar implements and routinely cleaning both ears [13,14]. Recent multi-region work further indicates that cotton buds remain the predominant tool nationwide, with self-ear cleaning commonly performed at least weekly [12]. The consistency of these findings across different regions suggests that self-ear cleaning is a deeply ingrained hygiene practice in Saudi communities, rather than an isolated behavior confined to specific cities or demographic groups [12,15,21–24].

4.2. Knowledge and Attitudes

Despite substantial awareness of the potential harms of self-ear cleaning in our cohort, many participants continued to engage in this practice. A high proportion recognized that cotton buds could push wax deeper, damage the eardrum, or cause infection, yet more than half still regarded routine self-cleaning as necessary. Similar patterns have been reported in Riyadh and Najran, where most respondents could identify the risks associated with cotton buds but preferred them for self-ear cleaning [14,15]. Studies among parents in the Western region also describe this paradox, with most acknowledging the hazards of cotton swabs while continuing to use them for themselves or their children [24]. Collectively, these observations highlight a recurring knowledge–practice gap, indicating that awareness alone

is insufficient to modify entrenched behaviors and that interventions must also address beliefs, habits, and social norms. In KAP terms, high risk perception coexists with a strong perceived need for self-cleaning and powerful cultural norms around ear hygiene, which together help explain why behavior does not change despite knowledge [25,26].

In our study, higher educational attainment, healthcare employment, and a history of hearing problems were associated with better knowledge and more cautious attitudes. Comparable associations have been documented in other Saudi settings, where advanced education, prior ear-related symptoms, and medical or health-related training were linked to greater awareness and safer practices [15]. These findings point to younger adults and non-healthcare workers as priority groups for targeted education and counseling on safe ear hygiene practices. From a public health perspective, focusing limited resources on these groups may be a pragmatic way to narrow the observed knowledge–practice gap.

4.3. Complications and Health Consequences

A considerable proportion of participants who practiced self-ear cleaning reported complications, most commonly otitis externa, followed by pain and bleeding. These frequencies are broadly comparable to, though somewhat higher than, those documented in surveys from Riyadh and Makkah, where pain and infection were also the predominant adverse outcomes [13,14]. The higher complication burden observed in our region may reflect differences in self-cleaning frequency or technique, or simply more complete self-reporting, but, in all cases, it supports the view that self-ear cleaning is not a benign habit. Consistent with previous work, our findings reinforce that routine or improper self-ear cleaning, especially when performed with poor visibility or inappropriate tools, substantially increases the risk of trauma and infection [5,11,27]. These results underline the potential clinical workload generated by a seemingly minor hygiene practice, particularly in primary-care and ENT services.

4.4. Comparative Synthesis with Other Saudi Regions

The present findings are consistent with the trends reported in surveys conducted in Makkah, Najran, Riyadh, Abha, Jazan, and other regions. In Makkah, Najran, and Riyadh, investigators have similarly documented high rates of self-ear cleaning (up to 84%), a strong preference for cotton buds, and generally moderate-to-good awareness of associated risks, yet continued use of risky cleaning techniques [13–15]. In contrast, selected populations with greater health-related exposure—such as medical students and individuals linked to healthcare settings in Jazan and Abha—have shown higher awareness and less hazardous behavior, suggesting that targeted health education can effectively shift attitudes and practices [12,23]. Although a majority of parents in the Western region were aware of the risks, education delivered by healthcare professionals further improved safer attitudes, even though regular use of cotton swabs remained common [24].

Our study adds to this national picture by characterizing self-ear-cleaning KAP in the Northern Border Region, a previously understudied population. It documents statistical associations between knowledge level and safer practices. It identifies education, occupation, and medical history as important associated factors, thereby complementing city-specific surveys from other parts of Saudi Arabia and providing region-specific evidence for future public health planning. Given our non-probability sampling approach, these data should be interpreted as indicative of patterns within our study population rather than as fully representative prevalence estimates for the entire region.

4.5. Public Health and Clinical Implications

The implications outlined here should be considered hypothesis-generating and exploratory, given the study's cross-sectional design and non-probability sampling approach.

The persistence of self-ear cleaning in our sample, including among participants who were aware of potential complications, indicates a substantial knowledge–practice gap that requires targeted public health action (Figure 5). Building on these findings, Figure 5 summarizes a conceptual, regionally tailored strategy that links routine assessment of local KAP with structured educational, clinical, and policy interventions [19,28,29].

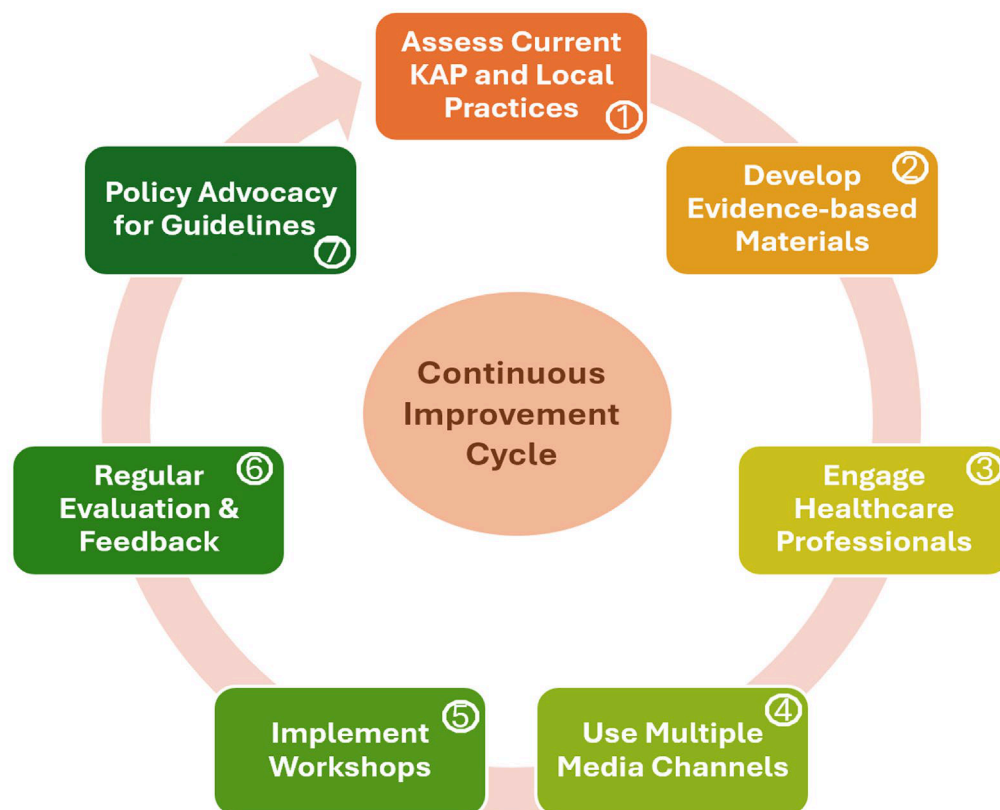


Figure 5. Conceptual public health strategy to address the knowledge–practice gap in self-ear cleaning identified in this study. The framework includes: (1) routine assessment of local KAP and self-ear-cleaning practices; (2) development of evidence-based educational materials on safe ear hygiene and the harms of improper self-ear cleaning; (3) engagement of healthcare professionals to deliver consistent messages during clinical encounters and community outreach; (4) dissemination of key messages through commonly used channels such as social media, schools, hospitals, and community centers; (5) implementation of interactive school- and community-based activities on safe ear hygiene; (6) periodic evaluation and feedback to refine interventions; and (7) policy initiatives to incorporate safe ear hygiene into national and regional health promotion programs.

At the community level, campaigns should emphasize the natural protective role of cerumen and the risks of inserting objects into the ear canal, particularly cotton buds and improvised tools, using channels that our participants reported as common information sources (e.g., social media, schools, and healthcare settings). Clinically, primary-care and ENT providers are well placed to reinforce the message that cerumen removal is usually unnecessary and, when indicated, should be performed by trained professionals rather than self-cleaning.

At the policy level, collaboration among health authorities, educators, and professional bodies could support the development of simple national guidance on safe ear hygiene, the integration of ear-health content into school curricula, and the regular monitoring of self-ear-cleaning behaviors. Such measures would directly address the patterns observed in this study. However, we recognize that any large-scale implementation should be preceded by further evaluative and interventional research to assess feasibility and impact. Within

these constraints, our findings can still inform clinicians and local health planners who are designing educational messages for populations with similar characteristics.

4.6. Strengths and Limitations

The present study benefits from a robust sample, a validated questionnaire, and a rigorous analytic approach, but shares the limitations of self-reported surveys, including recall bias and potential under- or over-reporting of both practices and complications. Additionally, as with comparative studies, our cross-sectional design limits causal inference. Furthermore, the non-probability, cluster-based convenience sampling via online platforms may have introduced selection bias; individuals with limited internet access or lower engagement with social media are likely underrepresented, which restricts the extent to which our findings can be generalized to the entire Northern Border Region. Reported complications were not clinically verified and may therefore be affected by misclassification or differential recall. Finally, although we describe statistical associations among knowledge, demographic factors, and self-ear-cleaning practices, these should be interpreted as correlational rather than causal.

5. Conclusions

In this cross-sectional online survey of 534 adults from the Northern Border Region of Saudi Arabia, self-ear cleaning was highly prevalent, predominantly with cotton buds, despite a relatively high level of awareness of potential harms. Postgraduate education, healthcare employment, non-smoking status, and a history of hearing problems were independently associated with better knowledge.

These findings indicate a persistent knowledge–practice gap and highlight the need for targeted educational interventions that emphasize the natural protective role of cerumen and the risks of inserting objects into the ear canal. Public health strategies in similar settings could involve healthcare providers, schools, and mass media to disseminate clear guidance on safe ear hygiene and to discourage hazardous self-care behaviors. Given the cross-sectional design, self-reported outcomes, and nonprobability sampling approach, our results should primarily be viewed as hypothesis-generating and as a basis for designing future evaluations rather than as definitive evidence for policy change. Future longitudinal and interventional studies are warranted to assess the effectiveness of such programs and to explore context-specific barriers to behavior change in different Saudi regions.

Supplementary Materials: The following supporting information can be downloaded at <https://www.mdpi.com/article/10.3390/hygiene6030044/s1>, Supplementary File S1: The questionnaire in English.

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Abbreviations

The following abbreviations are used in this manuscript:

KAP	Knowledge, Attitude, and Practice
OR	Odds Ratio
CI	Confidence Interval
SPSS	Statistical Package for the Social Sciences

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