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Beyond COVID-19: knowledge, awareness, perception, and attitudes toward olfactory dysfunction and its causes among the general adult population in Jazan, Saudi Arabia

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ABSTRACT

Background: The sense of smell is often undervalued, yet its loss carries real safety, nutritional, and emotional costs. In Saudi Arabia, public-awareness research has framed smell loss almost exclusively as a COVID-19 symptom, leaving broader understanding unexplored.

Subjects and Methods: A descriptive, analytical cross-sectional survey was conducted among 543 adults in Jazan. A structured, self-administered Arabic questionnaire assessed Knowledge, Awareness, Perception, and Attitude (KAP) domains. Data were analyzed in IBM SPSS version 29 using chi-square tests, Spearman correlation, and multivariable logistic regression.

Results: Mean age was 36.80 ± 13.38 years; 425 (78.3%) participants were male. The overall KAP score was 75.77% ± 17.06%. Knowledge was poor in 283 (52.1%) and good in only 161 (29.7%) participants; the COVID-19-specific item was answered correctly by just 187 (34.4%). Awareness was good in 359 (66.1%) participants. Perception and Attitude were good in 341 (62.8%) and 339 (62.4%) participants, respectively. Health-related occupational background independently predicted good knowledge (adjusted odds ratio [aOR] 1.87%, 95% confidence interval [CI] 1.20–2.92). Bachelor-level education predicted favorable attitude (aOR 1.76), while student status lowered it (aOR 0.47). Knowledge correlated positively with Awareness (rho = 0.500) and, more weakly, with attitude (rho = 0.271).

Conclusion: Public knowledge of olfactory dysfunction beyond COVID-19 remains limited, even though perception and attitude are largely favorable. Targeted health education, aimed at less-educated groups and students, could help close this gap.

Keywords: Anosmia, cross-sectional studies, health knowledge, attitudes, practice, olfaction disorders, Saudi Arabia, Smell.

Introduction

Smell shapes daily life in quiet but important ways. It warns of gas leaks and spoiled food, shapes appetite, and colors mood and memory. Despite this, olfaction has long been treated as the least important human sense. Population studies estimate that roughly one in five adults live with measurable olfactory dysfunction [1].

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Its consequences extend well beyond the nose, touching nutrition, safety, and psychological well-being [2].

The causes of smell loss are varied. Chronic rhinosinusitis and nasal polyps are among the most common, since inflamed or blocked nasal tissue simply prevents odor molecules from reaching receptors [3]. Head trauma, viral infection, aging, and certain medications add further layers to this picture [4]. Coronavirus disease 2019 (COVID-19) briefly made this symptom widely known, though its prevalence varied enormously across viral variants and populations [5].

More striking is olfaction's link to neurodegenerative disease. Smell loss can precede the motor symptoms of Parkinson's disease by several years, reflecting early pathology in the olfactory bulb [6]. A similar pattern holds for prodromal synucleinopathies more broadly, where olfactory testing is now studied as a low-cost screening adjunct [7]. In Alzheimer's disease, declining odor identification has been tied to amyloid and tau burden well before memory symptoms emerge [8], a pattern echoed across other neurodegenerative conditions [9] and confirmed using discrimination testing in early Alzheimer's cohorts [10]. These facts are well known to clinicians. Whether the public shares this knowledge is a separate, largely unanswered question.

In Saudi Arabia, existing awareness research has narrowed almost entirely to this infection framing. A community survey found that respondents recognized anosmia mainly as an early COVID-19 sign, with far less recognition of other causes [11]. Regional work from South-West Saudi Arabia, including Jazan, similarly measured only pandemic-related awareness [12], and broader Saudi knowledge, attitude, and practice (KAP) surveys on COVID-19 followed the same pattern [13]. Meanwhile, validated instruments such as the Olfactory Disorders Questionnaire [14] and its negative-statement subscale [15] already exist to capture the impact of smell loss on quality of life, yet these tools have rarely reached general-population, non-COVID research in this region.

This leaves a clear gap. No study has assessed knowledge, awareness, perception, and attitude toward olfactory dysfunction as a broad condition, independent of COVID-19, in the general adult population of Jazan. The present study was designed to fill exactly this gap.

Subjects and Methods

This research employed a descriptive, analytical cross-sectional design to investigate the level of knowledge, awareness, perception, attitude, and associated sociodemographic factors regarding olfactory dysfunction and its causes among adults in Jazan, Saudi Arabia. The study targeted all residents of Jazan region aged 18 years and above, encompassing individuals with various levels of education and socioeconomic status, thereby offering valuable insights into the level of awareness of olfactory dysfunction and its determinants in the region. Inclusion criteria were adults aged 18 years or older, current residents of Jazan region, and able to read Arabic and provide informed consent. Participants under 18 years of age, non-residents of Jazan region, and those unable or unwilling to consent were excluded, as were incomplete questionnaires. Healthcare professionals and health-science students were not excluded.

The population aged 18 years and above in Jazan region was estimated at 1.4 million according to the 2025 census. Using Raosoft's sample size calculator with a 95% confidence level and 5% margin of error, the minimum required sample size was calculated to be 385 participants. Adjustments to account for a 15% non-response rate and 10% for missing data increased the target sample size to 453. Ultimately, 543 responses were collected using a non-random convenience sampling technique.

The data collection was conducted through a self-administered questionnaire following a comprehensive literature review. Knowledge and awareness items were adapted from a Saudi community olfactory-dysfunction survey and reframed beyond COVID-19; perception items were adapted from the Questionnaire of Olfactory Disorders–Negative Statements (QOD-NS) and its brief version; and attitude and health-seeking items were developed for this study following standard KAP methodology. In this study, the KAP framework was applied to four domains: knowledge, awareness, perception, and attitude. The questionnaire was provided in Arabic and composed of 43 questions, divided into six sections.

The first section collected sociodemographic information, including age, sex, nationality, and other relevant characteristics such as history of smell loss and presence of a chronic nasal or sinus condition. The second section assessed participants' knowledge of olfactory dysfunction through 12 true/false/"I do not know" items, including questions on terminology, olfactory diseases, and consequences of those diseases. The third section measured awareness of olfactory dysfunction through 6 yes/no items. Prior exposure to the terms "anosmia" and "loss of smell," knowledge of causes other than COVID-19, recognition of persistent smell loss as a warning sign of underlying disease, knowledge of the ear, nose, and throat (ENT) doctor's role, knowledge of its impact on nutrition, mood, and quality of life, and knowledge of where to seek medical assistance were all evaluated. The fourth section assessed perception of the impact of smell loss through 6 five-point Likert items. Two negatively phrased statements (P5 and P6) evaluated the belief that smell loss is a small problem not worth worrying about, while four statements addressed the perceived impact of smell loss on quality of life, daily safety, enjoyment of food, and mood or social life. The fifth section evaluated attitudes and health-seeking behavior toward smell loss through 6 five-point Likert items, two of which (AT5 and AT6) were negatively phrased. The final section identified participants' primary sources of information regarding olfactory dysfunction.

Each domain was scored separately. For Knowledge and Awareness, a correct response scored 1 and an incorrect or "I do not know" response scored 0. Perception and Attitude items were scored on a 5-point Likert scale (1–5). Each domain score was converted to a percentage, and respondents were classified using Bloom's cutoffs: good (≥80%; termed "favorable" for Attitude), moderate (≥60% to <80%), and poor (<60%). Content validity

was assessed by a panel of experts, and face validity was checked to confirm comprehension of the Arabic wording.

Two negatively phrased items from both the Perception and Attitude domains were omitted from scoring due to inadequate internal consistency (Cronbach's alpha 0.572 and 0.568) and an unexpectedly elevated level of agreement, indicating a potential acquiescence artefact. Consequently, the scores were derived from the four positively phrased items within each domain, potentially exaggerating favorable perceptions.

Data collection took place between 4 and 10 October 10, 2026, using a self-administered online questionnaire. The questionnaire was piloted with 30 participants to assess its clarity before it was finalized. The questionnaire link was distributed through various social media platforms such as WhatsApp, Telegram, X (Twitter), and Snapchat. An explanatory page detailed the study objectives, confidentiality protections, and participants' rights. Responses were monitored regularly for completeness, and incomplete or incoherent entries were excluded from the final dataset.

Data were analyzed using IBM SPSS (version 29). Descriptive statistics, including frequencies, percentages, means, standard deviations (SD), medians, and interquartile ranges (IQR), were used to summarize participant characteristics and responses. Normality was tested using the Kolmogorov–Smirnov test. Chi-square tests were performed to assess associations between participant characteristics and good knowledge and favorable attitude. The evaluation of internal consistency was conducted with Cronbach's alpha. The correlation between domain scores was assessed using Spearman's coefficient. Multivariable binary logistic regression analysis was conducted to identify independent predictors of good knowledge and favorable attitude regarding olfactory dysfunction, with results expressed as adjusted odds ratios (aORs) and 95% confidence intervals (CIs). Variables with $P < 0.20$ in the bivariate analysis were entered into the models, with sex and age forced into both. Model fit was assessed with the Hosmer–Lemeshow test and Nagelkerke R^2, and discrimination with the area under the receiver operating characteristic (ROC) curve. A P value of less than 0.05 was considered statistically significant for all tests performed in the analysis. The study adhered to the Strengthening Reporting of Observational Studies in Epidemiology (STROBE) guidelines.

Ethical approval was granted by the Standing Committee for Scientific Research at Jazan University (Reference No. REC-48/04/2027, dated October 4, 2026). All study procedures followed institutional and national ethical standards and the principles of the Declaration of Helsinki. Prior to participation, individuals were informed about the study objectives, confidentiality measures, and the voluntary nature of participation, and electronic informed consent was obtained.

Results

Of 543 participants, 425 (78.3%) were male and 118 (21.7%) were female (**Table 1**). Mean age was 36.80 ± 13.38 years (median 34.00, IQR 25.00–45.00; range 18–80). Most respondents were Saudi (522%, 96.1%), urban residents (346%, 63.7%), married (359%, 66.1%), and held a Bachelor's degree (330%, 60.8%). A total of 158

Table 1. *Sociodemographic and clinical characteristics of the study participants (N = 543).*

Characteristic	n	%
Sex		
Male	425	78.3
Female	118	21.7
Age group (years)		
18–25	149	27.4
26–35	141	26.0
36–45	120	22.1
46–55	83	15.3
>55	50	9.2
Nationality		
Saudi	522	96.1
Non-Saudi	21	3.9
Place of residence		
Urban (city)	346	63.7
Rural (village)	197	36.3
Educational level		
Secondary or below	188	34.6
Bachelor	330	60.8
Postgraduate	25	4.6
Marital status		
Single	167	30.8
Married	359	66.1
Divorced/Widowed	17	3.1
Has children		
Yes	352	64.8
No/not applicable	191	35.2
Employment status		
Employed	377	69.4
Not employed	86	15.8
Student	80	14.7
Occupational background		
Health-related	158	29.1
Non-health	385	70.9
Monthly family income (SAR)		
<5,000	122	22.5
5,000–9,999	128	23.6
10,000–15,000	212	39.0
>15,000	81	14.9
Body mass index category (kg/m²)		
Underweight (<18.5)	24	4.4
Normal (18.5–24.9)	238	43.8
Overweight (25.0–29.9)	200	36.8
Obese (≥30.0)	81	14.9
Personal history of smell loss		
Yes	359	66.1
No	184	33.9
Family member/friend with prolonged smell loss		
Yes	301	55.4
No	242	44.6
Chronic nasal or sinus disease		
Yes	288	53.0
No	144	26.5
Not sure	111	20.4
Age (years), mean ± SD	36.80 ± 13.38	
Body mass index (kg/m²), mean ± SD	25.75 ± 4.69	

Note. SD = standard deviation; SAR = Saudi riyal. Percentages are of the total sample (*N* = 543) and may not sum to 100% because of rounding.

participants (29.1%) reported a health-related occupation or field of study. Personal history of smell loss was reported by 359 (66.1%) participants, and 301 (55.4%) reported a family member or friend with prolonged smell loss. Chronic nasal or sinus disease was present in 288 (53.0%) participants, while 111 (20.4%) were unsure. Mean body mass index (BMI) was 25.75 ± 4.69 kg/m², with 81 participants (14.9%) classified as obese.

At the item level (**Table 2**), correct knowledge responses ranged from 50.8% (K7, neurodegenerative disease) to 72.7% (K9, safety hazards of gas leaks and smoke) for all items except K10. The COVID-19-specific item, K10, had the lowest correct-response rate overall: only 187 participants (34.4%) correctly identified it as false, while 238 (43.8%) wrongly agreed and 118 (21.7%) selected "I do not know." Items on neurodegenerative disease (K7) and head injury (K4) drew the highest "I do not know" rates, at 38.5% and 36.5% respectively. Awareness items scored consistently higher, ranging from 69.6% (persistent smell loss as a warning sign) to 84.2% (impact on nutrition, mood, and quality of life).

Domain scores are summarised in **Table 3**. The Knowledge domain had a mean score of 59.99% ± 26.32% (median 58.33%), with only 161 participants (29.7%) reaching Bloom's "good" cutoff and 283 (52.1%) classified as poor. Awareness scored higher at 78.12% ± 27.08%, with 359 participants (66.1%) rated good. Because of an acquiescence artefact in the six-item scales (see Methods), Perception and Attitude were scored from four positively worded items each, yielding means of 83.08% ± 17.19% and 81.91% ± 18.65%, with good ratings in 341 (62.8%) and 339 (62.4%) participants respectively. The overall KAP score averaged 75.77% ± 17.06% (median 78.65%). Cronbach's alpha ranged from 0.694 (Perception) to 0.790 (Knowledge).

Figure 1 shows that the two negatively worded items in each domain drew unexpectedly high agreement: 40.9% for P5, 36.1% for P6, 43.8% for AT5, and 38.7% for AT6, confirming the wording-direction artefact addressed in scoring. **Figure 2** shows that "Doctor and health worker" (part of the 1,463 total selections, mean 2.69 sources per respondent) was the leading information source, while 52 participants (9.6%) reported no information source at all.

Bivariate analysis (**Table 4**) linked good knowledge to several factors, including health-related occupational background (41.8% vs. 24.7%, $\chi^2(1) = 15.70$, $P < 0.001$), chronic nasal/sinus disease (38.5% vs. 25.0%, $\chi^2(2) = 27.86$, $P < 0.001$), and personal history of smell loss (33.7% vs. 21.7%, $\chi^2(1) = 8.35$, $P = 0.004$). Favorable attitude was linked to several factors, including marital status ($\chi^2(2) = 14.60$, $P < 0.001$) and field data collector ($\chi^2(2) = 44.95$, $P < 0.001$); the latter reflects a methodological rather than a clinical effect.

In multivariable regression (**Table 5**), health-related occupational background independently predicted good

Table 2. *Item-level responses to the knowledge and awareness domains (N = 543).*

Item	Correct response	Correct, n (%)	Incorrect, n (%)	"I do not know", n (%)
Panel A. Knowledge domain (12 items; True / False / I do not know)				
K1. The sense of smell can be partially or completely lost due to medical conditions.	True	372 (68.5)	40 (7.4)	131 (24.1)
K2. Complete loss of smell is called anosmia, and reduced smell is called hyposmia.	True	342 (63.0)	68 (12.5)	133 (24.5)
K3. A blocked or inflamed nose (chronic sinusitis or nasal polyps) can cause loss of smell.	True	345 (63.5)	52 (9.6)	146 (26.9)
K4. A head injury can cause loss of smell.	True	282 (51.9)	63 (11.6)	198 (36.5)
K5. The ability to smell naturally declines with increasing age.	True	297 (54.7)	88 (16.2)	158 (29.1)
K6. Certain medications can affect the sense of smell.	True	306 (56.4)	68 (12.5)	169 (31.1)
K7. Loss of smell can be one of the early signs of some brain or nerve diseases such as Parkinson's or Alzheimer's disease.	True	276 (50.8)	58 (10.7)	209 (38.5)
K8. Losing the sense of smell can reduce the ability to taste and enjoy food.	True	352 (64.8)	75 (13.8)	116 (21.4)
K9. Loss of smell can be dangerous because a person may not detect gas leaks, smoke, or spoiled food.	True	395 (72.7)	46 (8.5)	102 (18.8)
K10. Loss of smell only ever happens because of COVID-19.	False	187 (34.4)	238 (43.8)	118 (21.7)
K11. Smell disorders can sometimes be treated or improved by a doctor.	True	368 (67.8)	58 (10.7)	117 (21.5)
K12. A specialist (ENT) doctor can evaluate problems with the sense of smell.	True	387 (71.3)	31 (5.7)	125 (23.0)
Panel B. Awareness domain (6 items; Yes / No)				
A1. Before this survey, had you ever heard the terms "anosmia" or "loss of smell" as a medical problem?	Yes	426 (78.5)	117 (21.5)	—
A2. Are you aware that loss of smell can result from causes other than COVID-19?	Yes	429 (79.0)	114 (21.0)	—
A3. Are you aware that persistent loss of smell can be a warning sign of an underlying disease?	Yes	378 (69.6)	165 (30.4)	—
A4. Are you aware that an ENT doctor can assess and help with smell problems?	Yes	441 (81.2)	102 (18.8)	—
A5. Are you aware that loss of smell can affect nutrition, mood, and quality of life?	Yes	457 (84.2)	86 (15.8)	—
A6. Do you know where you could seek medical help if you lost your sense of smell?	Yes	414 (76.2)	129 (23.8)	—

Note. Knowledge items scored 1 if correct and 0 if incorrect or "I do not know"; Awareness items scored 1 for "Yes". K10 is the only reverse-keyed item. "—" = not applicable.

Table 3. *Domain scores, internal-consistency reliability, and Bloom's classification of the four study domains (N = 543).*

Domain	k	α	Mean % ± SD (95% CI)	Median % (IQR)	Good ≥ 80%, n (%)	Moderate ≥ 60% to < 80%, n (%)	Poor < 60%, n (%)
Knowledge	12	0.790	59.99 ± 26.32 (57.78–62.20)	58.33 (41.67–83.33)	161 (29.7)	99 (18.2)	283 (52.1)
Awareness	6	0.738	78.12 ± 27.08 (75.84–80.39)	83.33 (66.67–100.00)	359 (66.1)	74 (13.6)	110 (20.3)
Perception a	4	0.694	83.08 ± 17.19 (81.63–84.53)	87.50 (75.00–100.00)	341 (62.8)	140 (25.8)	62 (11.4)
Attitude a	4	0.707	81.91 ± 18.65 (80.34–83.47)	87.50 (68.75–100.00)	339 (62.4)	132 (24.3)	72 (13.3)
Overall KAP score	26	—	75.77 ± 17.06 (74.34–77.21)	78.65 (66.41–88.02)	246 (45.3)	224 (41.3)	73 (13.4)

Note. k = number of items; α = Cronbach's alpha; CI = confidence interval; IQR = interquartile range. Scores are percentages of the maximum; Bloom's cutoffs: good ≥ 80%, moderate ≥60% to <80%, poor <60%. All distributions were non-normal ($P < 0.001$).

[a]Four positively worded items only (P1–P4; AT1–AT4); the two negatively worded items in each domain were excluded because of low internal consistency (six-item α = 0.572 for Perception and 0.568 for Attitude).

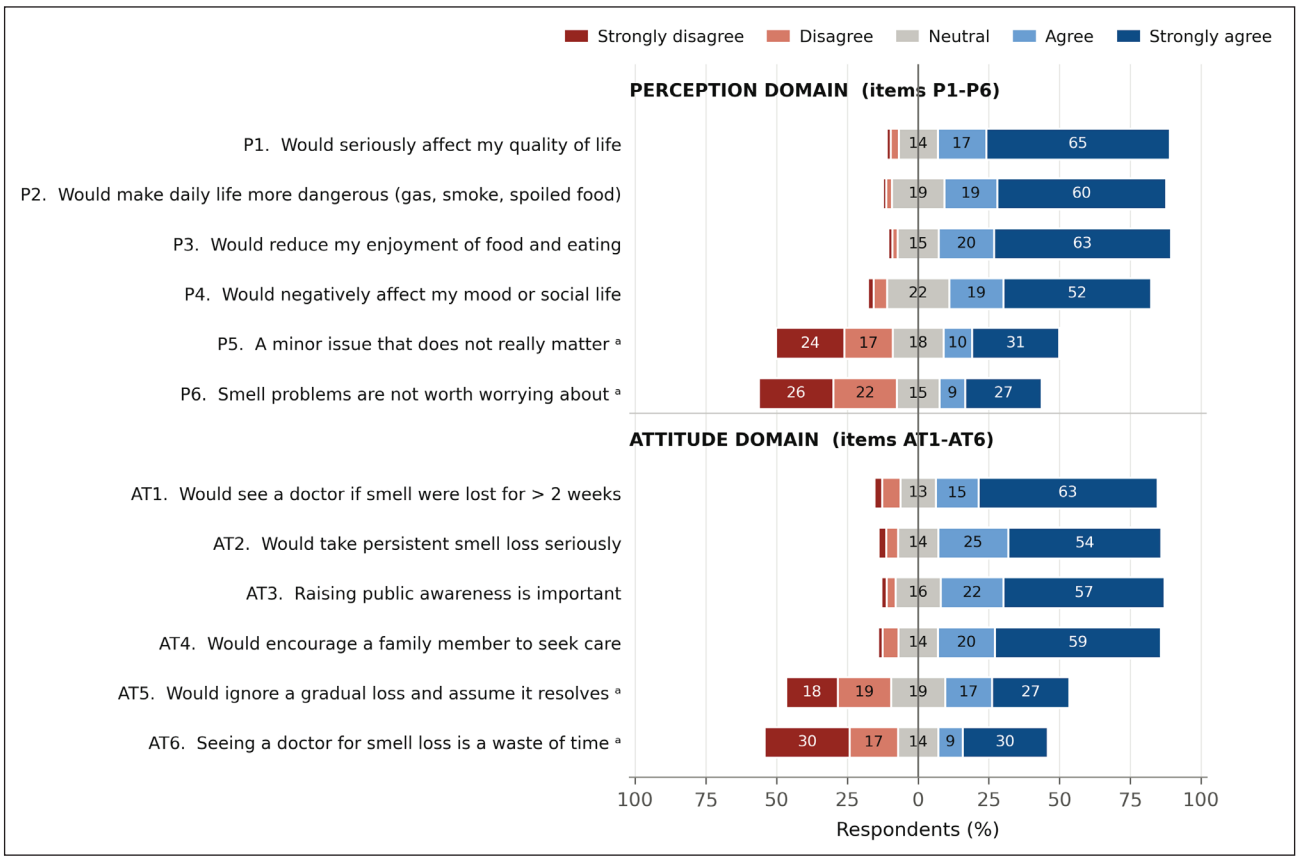


Figure 1. *Distribution of responses to the twelve Perception and Attitude items of the questionnaire (N = 543).*

Note: Diverging stacked bars are centered on the neutral midpoint; labels are percentages of the total sample, shown for segments ≥7.5%

[a]Negatively worded item (agreement indicates an unfavorable view); responses are plotted uncoded..

knowledge (aOR 1.87%, 95% CI 1.20–2.92, $P = 0.006$), while "unsure" chronic disease status lowered it (aOR 0.29%, 95% CI 0.14–0.62, $P = 0.001$). For favourable attitude, Bachelor-level education raised the odds (aOR 1.76%, 95% CI 1.12–2.77, $P = 0.015$), student status lowered them (aOR 0.47%, 95% CI 0.24–0.94, $P = 0.033$), and field data collector remained a strong independent effect (aOR 6.97%, 95% CI 3.83–12.71, $P < 0.001$). Both models showed acceptable discrimination (area under the ROC curve 0.710 and 0.733, respectively).

Table 6 shows that Knowledge correlated moderately with Awareness (rho = 0.500, $P < 0.001$) and more weakly with Perception (rho = 0.330) and Attitude (rho = 0.271, both $P < 0.001$). Age correlated weakly with Knowledge (rho = 0.086, $P = 0.046$) and Awareness (rho = 0.125, $P =$

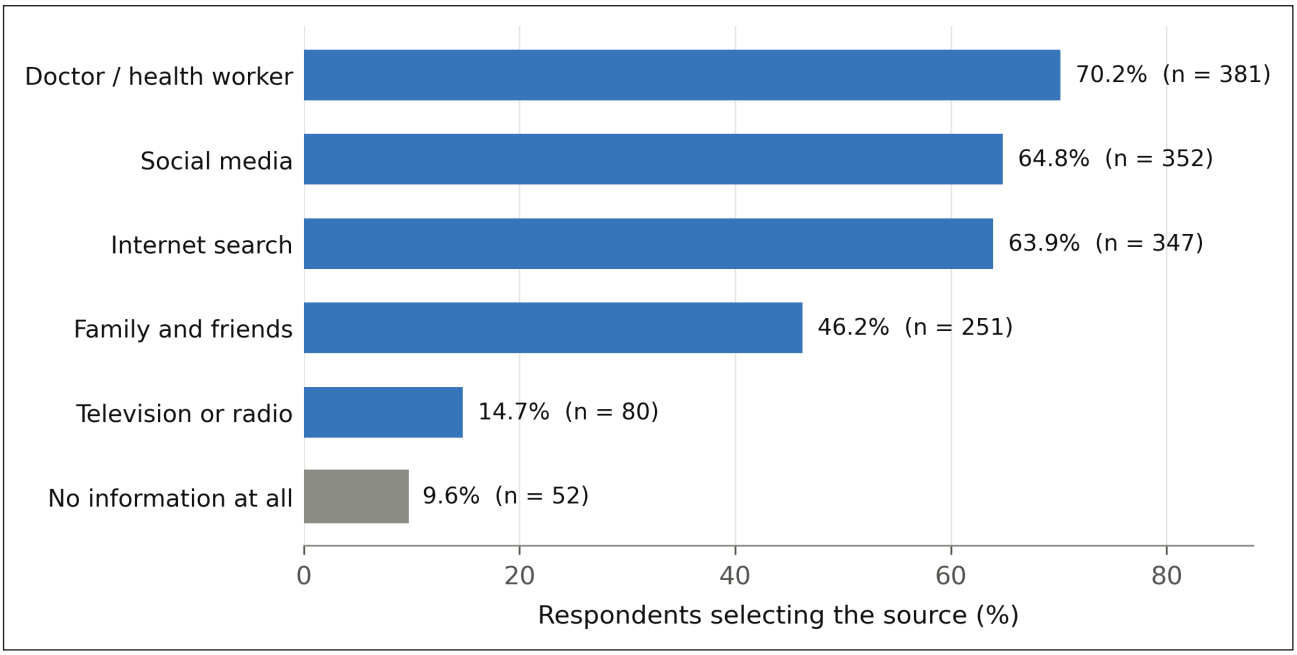


Figure 2. *Reported sources of health information about smell disorders (N = 543; multiple responses permitted).*

Note: Multiple responses were permitted, so percentages sum to more than 100%. The "No information at all" category is shown in grey.

0.004), but not with Perception or Attitude. BMI showed no significant correlation with any domain score.

Discussion

This study aimed to measure knowledge, awareness, perception, and attitude toward olfactory dysfunction beyond COVID-19, among adults in Jazan. The central finding is a clear mismatch: Awareness, Perception, and Attitude scores were consistently good, yet formal Knowledge lagged well behind, with barely three in ten participants reaching the "good" threshold. This gap was sharpest for item K10, where fewer than half of respondents rejected the idea that smell loss happens only because of COVID-19.

This pattern fits earlier Saudi work closely. The community survey [11] similarly found that COVID-19 dominated public understanding of smell loss, even though general pandemic knowledge was otherwise reasonable. Regional Jazan-based data collected earlier in the pandemic showed comparable strengths in general COVID-19 awareness [12], suggesting that infection-specific messaging reached this population well, while messaging about other causes did not. Other Saudi KAP surveys on COVID-19 report a similar split between broad awareness and gaps in specific, technical knowledge [13]. Studies from Malaysia [16] and Pakistan [17] on other health topics echo this: general attitudes often outpace detailed knowledge, particularly where the topic is less discussed in daily clinical encounters [16,17].

Health-related occupational background stood out as the strongest independent predictor of good knowledge, nearly doubling the odds compared to non-health backgrounds. This aligns with findings from a Chinese general-population KAP survey, where occupation and education level were similarly independent predictors of higher knowledge scores [18]. Education showed a comparable pattern here for Attitude: Bachelor-level education raised the odds of a favorable attitude, while student status lowered them. Students may simply have had less life experience with illness or aging-related health conditions, both of which can build practical understanding over time. A Bangladeshi Mpox KAP study reported a similar education-linked pattern in attitude scores, reinforcing that formal schooling shapes health attitudes even when direct topic exposure is limited [19].

The correlation pattern also deserves comment. Knowledge correlated moderately with Awareness but only weakly with Perception and Attitude. This suggests that favorable attitudes toward smell loss do not require detailed factual knowledge; they may instead rest on general health-conscious dispositions, an idea consistent with the sequential knowledge–attitude relationship reported in a Chinese pneumonia and COVID-19 KAP study, where knowledge predicted attitude but with a modest effect size [18]. The item-level finding that neurodegenerative causes drew the highest "do not know" rate is particularly relevant, since even patients with chronic rhinosinusitis, a far more common cause of smell loss, often experience real functional and social burden without recognizing it clearly as an illness [20].

Age and BMI showed weak or negligible associations with domain scores here. This somewhat contrasts with basic olfactory-science findings, where BMI relates inversely to actual smell sensitivity [21,22]. The distinction is important: this study measured public knowledge and attitude, not objective olfactory function, so a null BMI relationship here does not contradict physiological findings elsewhere. It simply confirms these are different constructs.

Table 4. *Bivariate association between participant characteristics and good knowledge and favorable attitude toward olfactory dysfunction (N = 543).*

		Good knowledge (≥ 80%) n = 161 (29.7%)				Favorable attitude (≥ 80%) n = 339 (62.4%)			
Characteristic	**n**	**n (%)**	**χ^2**	**df**	**P**	**n (%)**	**χ^2**	**df**	**P**
Sex			1.30	1	0.253		2.71	1	0.099
Male	425	121 (28.5)				273 (64.2)			
Female	118	40 (33.9)				66 (55.9)			
Age group (years)			8.81	4	0.066		1.43	4	0.839
18–25	149	37 (24.8)				90 (60.4)			
26–35	141	49 (34.8)				93 (66.0)			
36–45	120	29 (24.2)				75 (62.5)			
46–55	83	25 (30.1)				52 (62.7)			
>55	50	21 (42.0)				29 (58.0)			
Body mass index category			**8.71**	**3**	**0.033**		1.50	3	0.683
Underweight (<18.5)	24	5 (20.8)				17 (70.8)			
Normal (18.5–24.9)	238	82 (34.5)				148 (62.2)			
Overweight (25.0–29.9)	200	46 (23.0)				127 (63.5)			
Obese (≥30.0)	81	28 (34.6)				47 (58.0)			
Nationality[a]			**4.24**	**1**	**0.039**		0.75	1	0.385
Saudi	522	159 (30.5)				324 (62.1)			
Non-Saudi	21	2 (9.5)				15 (71.4)			
Place of residence			**9.07**	**1**	**0.003**		3.40	1	0.065
Urban (city)	346	118 (34.1)				206 (59.5)			
Rural (village)	197	43 (21.8)				133 (67.5)			
Educational level			**6.69**	**2**	**0.035**		5.77	2	0.056
Secondary or below	188	43 (22.9)				107 (56.9)			
Bachelor	330	111 (33.6)				219 (66.4)			
Postgraduate	25	7 (28.0)				13 (52.0)			
Marital status			**11.51**	**2**	**0.003**		**14.60**	**2**	**< 0.001**
Single	167	36 (21.6)				97 (58.1)			
Married	359	123 (34.3)				238 (66.3)			
Divorced/Widowed	17	2 (11.8)				4 (23.5)			
Has children			**9.46**	**1**	**0.002**		0.62	1	0.431
Yes	352	120 (34.1)				224 (63.6)			
No/not applicable	191	41 (21.5)				115 (60.2)			
Employment status			3.72	2	0.155		10.47	2	0.005
Employed	377	121 (32.1)				246 (65.3)			
Not employed	86	22 (25.6)				56 (65.1)			
Student	80	18 (22.5)				37 (46.3)			
Monthly family income (SAR)			3.36	3	0.339		7.50	3	0.058
<5,000	122	30 (24.6)				66 (54.1)			
5,000–9,999	128	35 (27.3)				82 (64.1)			
10,000–15,000	212	68 (32.1)				132 (62.3)			
>15,000	81	28 (34.6)				59 (72.8)			
Occupational background			**15.70**	**1**	**< 0.001**		0.10	1	0.749
Non-health background	385	95 (24.7)				242 (62.9)			
Health-related background	158	66 (41.8)				97 (61.4)			
Personal history of smell loss			**8.35**	**1**	**0.004**		**5.15**	**1**	**0.023**
No	184	40 (21.7)				127 (69.0)			
Yes	359	121 (33.7)				212 (59.1)			
Family/friend history of smell loss			**16.91**	**1**	**< 0.001**		1.99	1	0.158
No	242	50 (20.7)				159 (65.7)			
Yes	301	111 (36.9)				180 (59.8)			
Chronic nasal/sinus disease			**27.86**	**2**	**< 0.001**		**13.74**	**2**	**0.001**
No	144	36 (25.0)				104 (72.2)			
Yes	288	111 (38.5)				180 (62.5)			
Not sure	111	14 (12.6)				55 (49.5)			
Field data collector[b]			1.13	2	0.569		44.95	2	< 0.001
1	230	63 (27.4)				179 (77.8)			
2	8	3 (37.5)				7 (87.5)			
3	305	95 (31.1)				153 (50.2)			

Note: n (%) = participants reaching the "good" cutoff (≥ 80%) within each stratum; χ^2 = Pearson chi-square; df = degrees of freedom; bold = $P < 0.05$.

[a]Association with good knowledge is unreliable (2 events among 21 non-Saudi participants; continuity-corrected $P = 0.069$) and is not carried forward.

[b]Questionnaire administered by three field data collectors (collector 1, $n = 230$; collector 2, $n = 8$; collector 3, $n = 305$).

Strengths and Limitations

This study benefits from a large sample, a psychometrically screened instrument, and multivariable analysis adjusting for key confounders. However, convenience sampling through social media likely over-represents younger, more educated, and digitally connected individuals, a bias noted in comparable online KAP surveys using similar recruitment methods [23]. The sample consisted mainly of males (78.3%) and was obtained through convenience sampling online, hence constraining the applicability of the results to the broader Jazan population. The strong field data collector effect on attitude scores further suggests uncontrolled variation

Table 5. *Multivariable binary logistic regression models identifying independent predictors of good knowledge (Panel A) and favorable attitude (Panel B) toward olfactory dysfunction (N = 543).*

Predictor (reference category)	aOR	95% CI for aOR	P
Panel A. Outcome: good knowledge (Bloom's ≥ 80%); events = 161/543 (29.7%)			
Sex (ref. Male)			
Female	1.65	0.98–2.79	0.062
Age, per additional year (continuous)	1.01	0.99–1.03	0.351
Nationality (ref. Saudi)			
Non-Saudi a	0.30	0.07–1.36	0.118
Place of residence (ref. Rural / village)			
Urban (city)	1.55	0.99–2.42	0.055
Educational level (ref. Secondary or below)			
Bachelor	1.34	0.83–2.16	0.226
Postgraduate	0.99	0.36–2.72	0.980
Marital status (ref. Single)			
Married	1.24	0.69–2.26	0.471
Divorced/Widowed	0.33	0.07–1.63	0.173
Employment status (ref. Employed)			
Not employed	1.09	0.56–2.11	0.805
Student	0.96	0.46–1.99	0.912
Occupational background (ref. Non-health)			
Health-related background	**1.87**	**1.20–2.92**	**0.006**
Personal history of smell loss (ref. No)			
Yes	1.19	0.68–2.10	0.543
Family/friend history of smell loss (ref. No)			
Yes	1.22	0.72–2.07	0.460
Chronic nasal or sinus disease (ref. No)			
Yes	1.14	0.65–2.01	0.639
Not sure	**0.29**	**0.14–0.62**	**0.001**
Model fit: omnibus $\chi^2(15) = 66.86$, $P < 0.001$; Nagelkerke $R^2 = 0.165$; Hosmer–Lemeshow $\chi^2(8) = 9.72$, $P = 0.285$; area under the ROC curve = 0.710 (95% CI 0.660–0.760).			
Panel B. Outcome: favorable attitude (Bloom's ≥ 80%); events = 339/543 (62.4%)			
Sex (ref. Male)			
Female	*0.98*	*0.60–1.60*	*0.929*
Age, per additional year (continuous)	1.00	0.98–1.02	0.883
Place of residence (ref. Rural / village)			
Urban (city)	0.71	0.47–1.09	0.122
Educational level (ref. Secondary or below)			
Bachelor	**1.76**	**1.12–2.77**	**0.015**
Postgraduate	0.84	0.33–2.19	0.727
Marital status (ref. Single)			
Married	1.61	0.93–2.80	0.089
Divorced/Widowed	0.38	0.10–1.38	0.141
Employment status (ref. Employed)			
Not employed	*0.84*	*0.43–1.66*	*0.621*
Student	**0.47**	**0.24–0.94**	**0.033**
Monthly family income (ref. <5,000 SAR)			
5,000–9,999	1.17	0.63–2.19	0.622
10,000–15,000	1.36	0.74–2.49	0.316
>15,000	1.44	0.71–2.95	0.315
Personal history of smell loss (ref. No)			
Yes	1.52	0.84–2.73	0.162
Chronic nasal or sinus disease (ref. No)			
Yes	1.18	0.65–2.13	0.579
Not sure	0.85	0.45–1.62	0.627
Field data collector (ref. Collector 3)			
Collectors 1–2	**6.97**	**3.83–12.71**	**<0.001**
Model fit: omnibus $\chi^2(16) = 96.57$, $P < 0.001$; Nagelkerke $R^2 = 0.222$; Hosmer–Lemeshow $\chi^2(8) = 17.24$, $P = 0.028$; area under the ROC curve = 0.733 (95% CI 0.691–0.774).			

Table 6. *Spearman rank-order correlations among the four domain scores, age, and body mass index (N = 543).*

Variable	1	2	3	4	5	6
1. Knowledge	—					
2. Awareness	**0.500**	—				
3. Perception	**0.330**	**0.367**	—			
4. Attitude	**0.271**	**0.357**	**0.470**	—		
5. Age (years)	**0.086**	**0.125**	*0.060*	*0.007*	—	
6. BMI (kg/m²)	*−0.010*	*−0.074*	*−0.076*	*−0.084*	**0.239**	—

Note. Spearman's rho; bold = $P < 0.05$ (two-tailed).

in how the questionnaire was administered. Self-reported data also carry social-desirability bias, and knowledge was assessed by questionnaire rather than objective olfactory testing. Excluding two negatively phrased items from the Perception and Attitude scores increased reliability, but it may overestimate positive views and limits comparison with research using the full measures.

Clinical Implications and Future Research

These findings support targeted public-health messaging that moves beyond COVID-19, particularly toward less-educated groups and students. Given the diagnostic and safety importance of smell loss, awareness campaigns modeled on successful topic-specific education efforts [24] could improve early recognition of sinonasal, traumatic, and neurodegenerative causes. Future work should use probability sampling, incorporate objective olfactory testing, and track whether improved knowledge translates into earlier medical help seeking.

Conclusion

This cross-sectional analysis including 543 persons in Jazan (mostly male, selected by online convenience sampling) revealed that public perception and attitude toward olfactory dysfunction are largely favorable, but formal knowledge remains limited and heavily anchored to COVID-19. Only 29.7% of participants demonstrated

good knowledge, and just 34.4% correctly rejected COVID-19 as the sole cause of smell loss. Health-related occupational background independently predicted better knowledge, whereas Bachelor-level education predicted a more favorable attitude and student status a less favorable one. These findings confirm a real, regionally specific knowledge gap that extends beyond the pandemic framing. Targeted health education addressing sinonasal, traumatic, age-related, and neurodegenerative causes of smell loss is needed, particularly for younger and less-educated segments of the population, to support timely recognition and appropriate medical care seeking.

List of Abbreviations

aOR	Adjusted odds ratio;
BMI	Body mass index;
CI	Confidence interval;
COVID-19	Coronavirus disease 2019;
ENT	Ear, nose, and throat;
IQR	Interquartile range;
KAP	Knowledge, attitude, and practice (in this study, knowledge, awareness, perception, and attitude);
QOD-NS	Questionnaire of Olfactory Disorders–Negative Statements;
ROC	Receiver operating characteristic;
SAR	Saudi riyal;
SD	Standard deviation;
STROBE	Strengthening Reporting of Observational Studies in Epidemiology.

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Consent for participation

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Data availability

All the data is available in the current manuscript.

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Supplementary content (If any) is available online.

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