

ORIGINAL ARTICLE

Evaluating awareness and acceptance of pneumococcal vaccination for pneumonia prevention in Al-Ahsa

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ABSTRACT

Background: Pneumonia caused by *Streptococcus pneumoniae* is a major health problem worldwide. Vaccines are available to prevent pneumococcal pneumonia, but their effectiveness depends on public awareness and acceptance. In Al-Ahsa, Saudi Arabia, limited evidence exists regarding adults' awareness and acceptance of pneumococcal vaccination.

Methods: A cross-sectional, questionnaire-based study was conducted among adults aged 18 years and older in Al-Ahsa. A total of 305 participants were recruited through online and in-person convenience sampling. Data were collected using a structured, prevalidated questionnaire covering demographics, awareness, attitudes, and vaccine uptake and were analyzed using IBM SPSS Statistics (version 26.0; IBM Corp., Armonk, NY, USA). Descriptive and inferential statistics, including chi-square tests, were used.

Results: Most participants (68.5%) had poor overall awareness of pneumococcal disease and vaccination. Only 3.6% had ever received the pneumococcal vaccine. The most common reason for not receiving the vaccine was lack of awareness (66.8%), followed by waiting for a doctor's recommendation (26.1%). Healthcare workers had significantly higher awareness (64.9%) and vaccine uptake (10.8%) than other occupational groups. Nearly half (48.5%) would consider vaccination if recommended by a doctor, and 77.0% were interested in receiving more information, with healthcare staff being the most preferred source.

Conclusion: Awareness and uptake of pneumococcal vaccination among adults in Al-Ahsa were very low, despite their willingness to receive vaccination if recommended by a healthcare provider. Lack of awareness and absence of physician recommendation were the main barriers. Healthcare providers should actively discuss and recommend pneumococcal vaccination, particularly for at-risk adults.

Keywords: Pneumococcal vaccination, awareness, acceptance, Saudi Arabia.

Introduction

Streptococcus pneumoniae is a major cause of morbidity and mortality worldwide, causing infections ranging from mild respiratory tract illness to severe invasive pneumococcal diseases (IPD), including bacteremia and meningitis [1,2]. Among adults, community-acquired pneumonia (CAP) is the most common clinical manifestation and remains a leading cause of hospitalization and mortality, particularly among older adults and individuals with chronic medical conditions

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[3,4]. Vaccination is the primary strategy for preventing pneumococcal disease. Two vaccines are currently approved for adults: the 23-valent pneumococcal polysaccharide vaccine and the 13-valent pneumococcal conjugate vaccine. Both are effective in preventing IPD, although protection against non-bacteremic CAP varies across settings [5,6]. Newer conjugate vaccines have been developed to broaden serotype coverage and enhance immunogenicity [7]. However, their public health impact depends largely on vaccination uptake [8]. In Saudi Arabia, pneumococcal vaccination is recommended for high-risk groups, including older adults and individuals with chronic diseases [9]. Despite these recommendations, vaccine uptake remains suboptimal because of limited public awareness, misconceptions regarding vaccine safety, and inadequate healthcare provider recommendations [10]. Previous studies have consistently reported low awareness and acceptance of adult vaccines, including pneumococcal vaccination, with many individuals unfamiliar with the vaccine or uncertain about its benefits [11,12]. Improving vaccination coverage requires understanding public awareness and the factors influencing vaccine acceptance. Sociodemographic characteristics, access to reliable information, and interactions with healthcare professionals are recognized determinants of vaccination behavior [13]. In addition, perceived barriers - including concerns about side effects, doubts regarding vaccine necessity, and limited access to vaccination services - may further reduce uptake [14]. Acceptance of pneumococcal vaccination is an important component of vaccination behavior because willingness to receive the vaccine may influence whether individuals ultimately seek and receive vaccination. Acceptance may be affected by individuals' knowledge of pneumococcal disease and vaccination, perceptions of vaccine effectiveness and safety, perceived susceptibility to pneumococcal infection, and recommendations from healthcare professionals. In Saudi Arabia, recent evidence has highlighted gaps in knowledge, attitudes, and practices related to pneumococcal infection and vaccination among residents, suggesting that insufficient knowledge and unfavorable perceptions may contribute to lower vaccination acceptance [14,15]. Understanding these factors is therefore important for identifying individuals who are less likely to accept pneumococcal vaccination and for developing targeted educational and public health interventions to improve vaccine uptake. Despite its public health importance, evidence regarding awareness and acceptance of pneumococcal vaccination remains limited in specific regions of Saudi Arabia, including Al-Ahsa. Therefore, this study aimed to assess awareness and acceptance of pneumococcal vaccination among adults in Al-Ahsa and to identify factors associated with these outcomes.

Methods

Study design and setting

A cross-sectional, questionnaire-based study was conducted to assess awareness and acceptance of pneumococcal vaccination among adults aged ≥ 18 years in Al-Ahsa, Saudi Arabia (Supplementary Material). The

study was conducted from September 1, 2025 to 1 May 1, 2026.

Study population and participants

The study population comprised adults aged ≥ 18 years who were permanent residents of Al-Ahsa, Saudi Arabia. Participants were eligible to participate if they met the age and residency criteria and provided informed consent. Participation was voluntary.

Sample size and sampling technique

The required sample size was calculated using the formula $n = Z^2 P (1-P)/d^2$, where $Z = 1.96$ for a 95% confidence level, $P = 50\%$, and $d = 5\%$ as the margin of error. The calculated minimum sample size was approximately 370 participants. A convenience sampling technique was used to recruit participants through both online and in-person approaches. The target sample size was not achieved because incomplete questionnaires were excluded from the analysis.

Data collection and study procedure

Data were collected using a structured questionnaire developed by the authors based on a review of the relevant literature and adapted from previously published studies. The questionnaire collected information on participants' sociodemographic characteristics, awareness of pneumococcal vaccination, sources of vaccination-related information, attitudes and acceptance toward vaccination, perceived barriers, and communication with healthcare providers. The questionnaire was distributed through online and in-person recruitment methods. Before data collection, the questionnaire was pilot-tested among 15 participants to assess its clarity, comprehensibility, and feasibility. Feedback obtained during the pilot testing was considered in the finalization of the questionnaire.

Study variables and measurements

The main study outcomes were awareness and acceptance of pneumococcal vaccination. Sociodemographic characteristics and other factors, including sources of information, attitudes toward vaccination, perceived barriers, and communication with healthcare providers, were also assessed. Overall awareness was categorized as good or poor based on the participants' responses to the awareness-related questions. Acceptance of pneumococcal vaccination was assessed using questionnaire items addressing participants' willingness and attitudes toward receiving the vaccine.

Data quality control

Several measures were undertaken to ensure data quality. The questionnaire was reviewed by the authors and pilot-tested among 15 participants before the main data collection. The pilot testing assessed the clarity, comprehensibility, and feasibility of the questionnaire. The internal consistency of the questionnaire was assessed using Cronbach's alpha and was found to be acceptable ($\alpha = 0.79$).

Eligibility criteria

Adults aged ≥ 18 years who were permanent residents of Al-Ahsa and provided informed consent were eligible to participate. Individuals who did not meet the age or residency criteria or who submitted incomplete questionnaires were excluded from the final analysis.

Statistical analysis

Data were analyzed using IBM SPSS Statistics, version 26.0 (IBM Corp., Armonk, NY, USA). Categorical variables were summarized using frequencies and percentages, whereas continuous variables were presented as means and standard deviations. Associations between categorical variables were assessed using Pearson's chi-square test or Fisher's exact test, as appropriate. A p -value of < 0.05 was considered statistically significant.

Ethical considerations

Ethical approval was obtained from the relevant ethics committee before the commencement of data collection. Participation was voluntary, and informed consent was obtained from all participants before their participation in the study. Participants' confidentiality and privacy were maintained throughout the study, and the collected data were used solely for research purposes.

Results

Table 1 presents the sociodemographic and clinical characteristics of the study participants ($n = 305$). Regarding age distribution, the largest group was 18-24 years (92, 30.2%), while participants aged 55 years and above represented the smallest group (23, 7.5%). The mean age of the participants was 35.1 ± 12.4 years. Considering gender, most participants were males (169; 55.4%). For educational level, most participants had higher education (229, 75.1%). Concerning occupation, the largest category was non-healthcare workers (113, 37.0%). Regarding chronic diseases, the majority of participants reported having no chronic conditions (262, 85.9%).

Table 2 describes the level of awareness of pneumococcal disease and vaccination among the study participants ($n = 305$), as well as their main sources of information. Less than half of the participants reported having heard of pneumococcal disease or the pneumonia it causes (133, 43.6%), while more than half had not (172, 56.4%). Similarly, a smaller proportion reported that they were aware of the existence of a vaccine to prevent pneumococcal pneumonia (96, 31.5%), whereas the majority were not aware (209, 68.5%). Regarding sources of information, healthcare staff were the most commonly reported source (63, 20.7%), followed by mass media (41, 13.4%) and family or friends (36, 11.8%). Awareness campaigns were reported by 22 participants (7.2%), and a small proportion indicated personal study or reading as their source (8, 2.6%). More than half of the participants reported having no source of information (172, 56.4%).

Table 3 presents information on pneumococcal vaccination uptake, reasons for not receiving the vaccine, and communication with healthcare providers. Only a

Table 1. Sociodemographic and clinical characteristics of the study participants in Al-Ahsa ($n = 305$).

Variable	No. (%)
Age groups (years)	
18-24	92 (30.2%)
25-34	68 (22.3%)
35-44	58 (19.0%)
45-54	64 (21.0%)
55+	23 (7.5%)
Mean $\pm$ SD	35.1 $\pm$ 12.4
Gender	
Male	169 (55.4%)
Female	136 (44.6%)
Highest educational level	
Basic education	4 (1.3%)
Secondary education	72 (23.6%)
High education	229 (75.1%)
Job title	
Not working	83 (27.2%)
Student	60 (19.7%)
Healthcare field	37 (12.1%)
Non-healthcare field	113 (37.0%)
Retired	12 (3.9%)
Chronic diseases (re-categorized)	
None	262 (85.9%)
Respiratory diseases	6 (2.0%)
Diabetes	6 (2.0%)
Hypertension	2 (0.7%)
Diabetes + hypertension	2 (0.7%)
Hematologic disorders	5 (1.6%)
Endocrine disorders	1 (0.3%)
Renal disease	1 (0.3%)
Gastrointestinal disorders	1 (0.3%)
Other / unspecified	19 (6.2%)

Bold value indicates statistical significance ($p < 0.05$).

small proportion of participants reported ever receiving the pneumococcal vaccine (11, 3.6%), while most had not received it (222, 72.8%), and some were unsure (72, 23.6%). Regarding reasons for not receiving the vaccine, the most commonly reported reason was lack of awareness about the vaccine (197, 66.8%). Other reasons included waiting for a doctor's recommendation (77, 26.1%), believing that the vaccine is not necessary (46, 15.6%), concerns about side effects (19, 6.4%), difficulty accessing the vaccine (5, 1.7%), and other unspecified reasons (7, 2.4%). Considering communication with healthcare providers, only a very small proportion of participants reported having ever discussed the pneumococcal vaccine with a healthcare provider (12, 3.9%), while the vast majority had not (293, 96.1%).

Table 4 illustrates participants' attitudes toward pneumococcal vaccination and their general perceptions of vaccines. Nearly half of the participants reported that they would consider getting the pneumococcal vaccine if recommended by a doctor (148, 48.5%), while 121

Table 2. Awareness of pneumococcal disease, vaccination, and sources of information among study participants in Al-Ahsa (n = 305).

Item	No. (%)
Heard of pneumococcal disease or the pneumonia it causes	
Yes	133 (43.6%)
No	172 (56.4%)
Aware that a vaccine exists to prevent pneumococcal pneumonia	
Yes	96 (31.5%)
No	209 (68.5%)
Source of information about pneumococcal disease	
Health care staff	63 (20.7%)
Mass media	41 (13.4%)
Family/friends	36 (11.8%)
Awareness campaigns	22 (7.2%)
My study/readings	8 (2.6%)
None	172 (56.4%)

Table 3. Pneumococcal vaccination uptake and provider communication among study participants in Al-Ahsa (n = 305).

Variable	No. (%)
Ever received the pneumococcal vaccine	
Yes	11 (3.6%)
No	222 (72.8%)
Not sure	72 (23.6%)
Reasons for not receiving the vaccine	
I don't know about this vaccine	197 (66.8%)
Worried about side effects	19 (6.4%)
Waiting for a doctor's recommendation	77 (26.1%)
I don't think it's necessary	46 (15.6%)
I can't get it easily	5 (1.7%)
Others	7 (2.4%)
Ever discussed the pneumococcal vaccine with a healthcare provider	
Yes	12 (3.9%)
No	293 (96.1%)

Table 4. Attitudes toward pneumococcal vaccination and general vaccine perceptions among study participants in Al-Ahsa (n = 305).

Variable	No. (%)
Would consider getting the vaccine if the doctor advised	
Yes	148 (48.5%)
Maybe	121 (39.7%)
No	36 (11.8%)
Belief that vaccines are generally safe and effective	
Strongly disagree	4 (1.3%)
Disagree	16 (5.2%)
Neutral	129 (42.3%)
Agree	93 (30.5%)
Strongly agree	63 (20.7%)
Likelihood of recommending the pneumococcal vaccine to others	
Very unlikely	47 (15.4%)
Unlikely	44 (14.4%)
Not sure	113 (37.0%)
Likely	44 (14.4%)
Very likely	57 (18.7%)

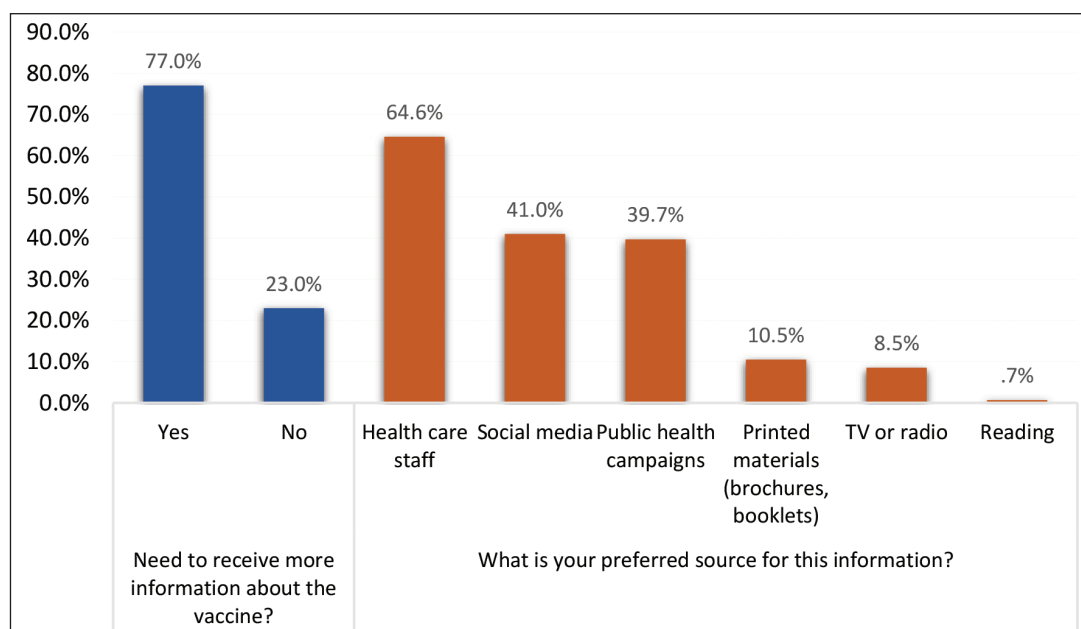


Figure 1. Information needs & preferred sources regarding pneumococcal vaccine among study participants in Al-Ahsa (n = 305).

(39.7%) responded “maybe,” and a smaller proportion reported that they would not consider it (36, 11.8%). Regarding beliefs about vaccine safety and effectiveness, 93 participants (30.5%) agreed, and 63 (20.7%) strongly agreed that vaccines are generally safe and effective. A large proportion reported a neutral stance (129, 42.3%), while smaller proportions disagreed (16, 5.2%) or strongly disagreed (4, 1.3%). About recommending the pneumococcal vaccine to others, 113 participants (37.0%) were not sure, while 57 (18.7%) reported they were very likely and 44 (14.4%) likely to recommend it. On the other hand, 47 (15.4%) indicated they were very unlikely and 44 (14.4%) unlikely to recommend the vaccine.

Figure 1 demonstrates participants’ interest in receiving more information about the pneumococcal vaccine and their preferred sources for such information. A large proportion of participants expressed interest in receiving additional information (235, 77.0%), while 70 (23.0%) reported no interest. Regarding preferred sources of information, healthcare staff were the most commonly selected source (197, 64.6%), followed by social media (125, 41.0%) and public health campaigns (121, 39.7%). Other sources included printed materials such as brochures and booklets (32, 10.5%), TV or radio (26, 8.5%), and reading (2, 0.7%).

Table 5 shows the association between participants’ characteristics and the overall awareness level of pneumococcal disease and vaccination. There was no statistically significant association between age group and awareness level ($p = 0.808$), with the proportion of good awareness ranging from 26.1% among those aged 55+ to 34.4% among those aged 45-54. Similarly, gender was not significantly associated with awareness ($p = 0.841$), with comparable levels of good awareness among males (32.0%) and females (30.9%).

Educational level also showed no significant association ($p = 0.203$), although good awareness was higher among participants with higher education (33.6%) compared to secondary education (23.6%). In contrast, job title was significantly associated with awareness level ($p = 0.001$), with participants working in the healthcare field having the highest proportion of good awareness (64.9%), compared to lower percentages among non-healthcare workers (25.7%), those not working (26.5%), students (31.7%), and retired individuals (16.7%). No significant association was observed between the presence of chronic diseases and awareness ($p = 0.604$), with similar proportions of good awareness among those with (34.9%) and without (30.9%) chronic conditions. A statistically significant association was also found between the source of information and awareness level ($p = 0.001$). Higher proportions of good awareness were reported among those who obtained information from personal study/readings (75.0%), healthcare staff (71.4%), and awareness campaigns (68.2%), compared to lower levels among those relying on family/friends (47.2%) and mass media (43.9%). Participants who reported having no source of information had the lowest proportion of good awareness (11.6%).

The multivariate logistic regression analysis identified occupation and the source of information about pneumococcal disease as significant independent predictors of good awareness (Table 6). Participants working in the healthcare field had significantly higher odds of having good awareness compared with those who were not working (AOR = 5.12, 95% CI: 2.23-11.77, $p < 0.05$). In contrast, age group, gender, educational level, and the presence of chronic diseases were not significantly associated with awareness level, as all corresponding confidence intervals included the null value. Regarding sources of information, participants who obtained information from healthcare staff were 19

Table 5. Factors associated with the overall awareness level of pneumococcal disease and vaccination among study participants in Al-Ahsa (n = 305).

Factor	Overall awareness level		p-value
	Poor No. (%)	Good No. (%)	
Age in years			0.808
18-24	61 (66.3%)	31 (33.7%)	
25-34	50 (73.5%)	18 (26.5%)	
35-44	39 (67.2%)	19 (32.8%)	
45-54	42 (65.6%)	22 (34.4%)	
55+	17 (73.9%)	6 (26.1%)	
Gender			0.841
Male	115 (68.0%)	54 (32.0%)	
Female	94 (69.1%)	42 (30.9%)	
Highest educational level			0.203 [^]
Basic education	2 (50.0%)	2 (50.0%)	
Secondary education	55 (76.4%)	17 (23.6%)	
High education	152 (66.4%)	77 (33.6%)	
Job title			0.001*
Not working	61 (73.5%)	22 (26.5%)	
Student	41 (68.3%)	19 (31.7%)	
Healthcare field	13 (35.1%)	24 (64.9%)	
Non-healthcare field	84 (74.3%)	29 (25.7%)	
Retired	10 (83.3%)	2 (16.7%)	
Chronic diseases			0.604
Yes	28 (65.1%)	15 (34.9%)	
No	181 (69.1%)	81 (30.9%)	
Source of information about pneumococcal disease			0.001*
Health care staff	18 (28.6%)	45 (71.4%)	
Family/friends	19 (52.8%)	17 (47.2%)	
Awareness campaigns	7 (31.8%)	15 (68.2%)	
Mass media	23 (56.1%)	18 (43.9%)	
My study/readings	2 (25.0%)	6 (75.0%)	
None	152 (88.4%)	20 (11.6%)	

AOR: Adjusted odds ratio; CI: confidence interval.

* $p < 0.05$ (significant).

times more likely to have good awareness compared with those who reported no information source (AOR = 19.0, 95% CI: 9.27-38.95, $p < 0.05$). Similarly, awareness campaigns (AOR = 16.29, 95% CI: 5.64-47.05), family/friends (AOR = 6.80, 95% CI: 3.20-14.47), mass media (AOR = 5.95, 95% CI: 2.82-12.58), and personal study/readings (AOR = 22.81, 95% CI: 4.28-121.31) were all significantly associated with higher odds of good awareness compared with having no information source.

Discussion

This study found that awareness of pneumococcal disease and vaccination among adults in Al-Ahsa was inadequate, while vaccine uptake was very low. Awareness and vaccination uptake were higher among healthcare workers and among participants who received information from healthcare professionals or other reliable sources. The most prominent barriers to vaccination were lack of awareness and the absence of physician recommendation,

whereas concerns regarding vaccine safety, side effects, and access were less frequently reported. These findings suggest that informational and provider-related factors may play a greater role than negative attitudes in the low uptake of pneumococcal vaccination in this population. The low level of awareness observed in this study is consistent with previous Saudi studies reporting insufficient knowledge regarding pneumococcal disease and vaccination among the general population and high-risk groups [15–18]. Alharbi et al. [17] reported poor knowledge among nearly two-thirds of more than 13,000 participants, while El-Gamal et al. [18] identified widespread misconceptions regarding pneumococcal pneumonia and vaccination. Similar findings have been reported internationally, suggesting that limited awareness represents a broader public health challenge rather than a problem specific to Al-Ahsa. The relatively limited emphasis on pneumococcal vaccination within adult immunization programs may contribute to this

Table 6. Binary logistic regression analysis of factors associated with good awareness regarding pneumococcal disease.

Predictor	AOR	95% CI
Age group (years)		
18-24 (Ref)	1	
25-34	0.73	0.36-1.41
35-44	0.94	0.48-1.93
45-54	1.02	0.53-2.02
55+	0.70	0.25-1.94
Gender		
Male (Ref)	1.13	0.64-1.72
Female	1	
Highest educational level		
Secondary education/lower (Ref)	1	
High education	1.52	0.84-2.76
Job title		
Not working (Ref)	1	
Student	1.28	0.62-2.67
Healthcare field	5.12	2.23-11.77*
Non-healthcare field	0.96	0.50-1.82
Retired	0.55	0.11-2.73
Chronic diseases		
Yes (Ref)	1.19	0.61-2.38
No	1	
Source of information about pneumococcal disease		
None (Ref)	1	
Health care staff	19.0	9.27-38.95*
Family/friends	6.80	3.20-14.47*
Awareness campaigns	16.29	5.64-47.05*
Mass media	5.95	2.82-12.58*
My study/readings	22.81	4.28-121.31*

ORA: Adjusted odds ratio

CI: Confidence interval.

* $p < 0.05$ (significant).

knowledge gap. Unlike previous studies that identified older age and higher educational level as predictors of better knowledge [19,20], this study found no significant association between awareness and age, gender, or education. This difference may partly reflect the relatively young and highly educated study population, which resulted in limited variability in these characteristics. In contrast, occupation was significantly associated with awareness, with healthcare workers demonstrating higher awareness, consistent with previous Saudi and international studies [15,17,21]. Information source was also associated with awareness, with participants obtaining information from healthcare professionals, personal study, or awareness campaigns showing higher awareness than those relying on less formal sources. This supports the importance of credible and accessible health education [22]. Vaccine uptake was similarly low, with only 3.6% of participants reporting previous pneumococcal vaccination. This finding is consistent with national and international reports of inadequate adult pneumococcal vaccination coverage [23]. Although Center AH [24] reported higher vaccination coverage

among elderly individuals in Saudi Arabia, that study focused specifically on an age group targeted by national vaccination recommendations. In the present study, uptake remained low even among older participants, highlighting a potential gap between vaccination recommendations and their implementation. The findings also indicate that physician recommendation represents an important opportunity for improving vaccination uptake. Lack of awareness and waiting for a physician's recommendation were the most frequently reported barriers, while many participants indicated willingness to receive the vaccine if recommended by a healthcare provider. Similar findings were reported by Alharbi et al. [17] and El-Gamal et al. [18], who identified inadequate physician recommendation as an important contributor to low pneumococcal vaccination uptake. The relatively low frequency of reported concerns regarding safety, side effects, or access further suggests that informational and behavioral barriers may be more prominent than vaccine hesitancy in this population. The higher uptake observed among healthcare workers and participants with chronic diseases, as well as among those receiving

information from healthcare professionals, further supports the potential role of healthcare encounters in promoting vaccination [11,25,26,27]. From a clinical and public health perspective, these findings highlight the need to strengthen provider-patient communication and incorporate pneumococcal vaccination assessment and recommendation into routine healthcare visits, particularly for adults at increased risk. Public awareness campaigns and reliable educational resources may complement provider recommendations by addressing the identified knowledge gap. The strong preference for receiving information from healthcare professionals further emphasizes their potential role in improving vaccine acceptance and uptake [28]. These interventions may help address the persistent gap between national vaccination recommendations and their implementation [17,18,24,26].

Strengths and limitations

This study has several strengths. To our knowledge, it is the first to evaluate awareness and acceptance of pneumococcal vaccination in Al-Ahsa, addressing an important gap in the Saudi literature. The inclusion of participants from a broad age range and diverse occupational backgrounds enabled meaningful subgroup comparisons. Additionally, the use of a structured questionnaire ensured standardized and consistent data collection. Nevertheless, several limitations should be acknowledged. The cross-sectional design precludes causal inference. The study population was predominantly young and highly educated, which may limit the generalizability of the findings to the broader population, particularly older adults and individuals with lower educational attainment. Vaccination status was self-reported and therefore may be subject to recall bias. Furthermore, the small number of vaccinated participants may have limited the robustness of some statistical analyses. Finally, history of pneumonia and specific pneumococcal vaccine types were not assessed, which may have provided additional clinical insights. Although the calculated sample size was 370 participants, only 305 participants were ultimately recruited, representing 82.4% of the target sample. This under-recruitment may have reduced the statistical power and precision of the study estimates, particularly for subgroup analyses with relatively small numbers of participants. It may also limit the generalizability of the findings to other populations and settings. Nevertheless, the available sample provided meaningful information regarding the primary study outcomes. Future larger and multicenter studies are warranted to confirm and further validate these findings.

Conclusion

This study demonstrated low awareness and uptake of pneumococcal vaccination among adults in Al-Ahsa despite generally positive attitudes and a willingness to be vaccinated if recommended by a healthcare provider. The main barriers were limited awareness and the absence of physician recommendations rather than concerns regarding vaccine safety or access. These findings highlight the need for targeted public health

interventions to improve pneumococcal vaccination coverage. Structured educational campaigns should be implemented to increase public awareness, while healthcare providers should play a more active role in recommending pneumococcal vaccination during routine clinical encounters, particularly for high-risk groups such as older adults and individuals with chronic diseases.

List of Abbreviations

AOR	Adjusted odds ratio
CAP	Community-acquired pneumonia
CI	Confidence interval
IBM	International Business Machines
IPD	Invasive pneumococcal disease
IRB	Institutional Review Board
PCV13	13-Valent pneumococcal conjugate vaccine
PPSV23	23-Valent pneumococcal polysaccharide vaccine
SD	Standard deviation
SPSS	Statistical Package for the Social Sciences

Conflicts of interest

The authors declare that they have no conflict of interest regarding the publication of this article.

Consent to participate

The authors consent to the publication of this manuscript in the Annals of Middle Eastern Medicine.

Ethical approval

Ethical approval was granted by the Institutional Review Board (IRB) of King Faisal University under number KFU-REC-2025-AUG-ETHICS3533 on 27/8/2025.

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Supplementary content (If any) is available online.

References

1. Olarte L, Jackson MA. *Streptococcus pneumoniae*. *Pediatr Rev.* 2021;42(7):349–59. <https://doi.org/10.1542/pir.2020-0062>
2. Örtqvist Å, Hedlund J, Kalin M. *Streptococcus pneumoniae*: epidemiology, risk factors, and clinical features. In: *Seminars in respiratory and critical care medicine*. New York, NY: Copyright© 2005 by Thieme Medical Publishers, Inc., 333 Seventh Avenue; 2005. Vol. 26, No. 06, pp 563–74. <https://doi.org/10.1055/s-2005-925523>
3. World Health Organization. *Pneumococcal disease*. Geneva, Switzerland: WHO; 2023.
4. Wang GM, Tao W, Pang XY, Xin Y, Gou ZH, Wang Y. Global, regional, and national burden of pneumococcal disease among children and adolescents aged <20 years from 1990 to 2021: a predictive analysis. *Front Public Health.* 2025;13:1675854. <https://doi.org/10.3389/fpubh.2025.1675854>

5. Bonten MJ, Huijts SM, Bolkenbaas M, Webber C, Patterson S, Gault S, et al. Polysaccharide conjugate vaccine against pneumococcal pneumonia in adults. *N Engl J Med*. 2015;372(12):1114–25. <https://doi.org/10.1056/NEJMoa1408544>
6. Centers for Disease Control and Prevention. Pneumococcal vaccination: summary of who and when to vaccinate. Atlanta, GA: Centers for Disease Control and Prevention; 2022.
7. Chiavarini M, Boccalini S, Bechini A, Barash A, Castellana E, Senape A, et al. Pneumococcal vaccination offer and schedules in adults in EU countries: an update. *Hum Vaccin Immunother*. 2025;21(1):2563953. <https://doi.org/10.1080/21645515.2025.2563953>
8. Ozisik L. The new era of pneumococcal vaccination in adults: what is next? *Vaccines (Basel)*. 2025;13(5):498. <https://doi.org/10.3390/vaccines13050498>
9. Alharbi NS, Al-Barrak AM, Al-Moamary MS, Zeitouni MO, Idrees MM, Al-Ghobain MO, et al. The Saudi Thoracic Society pneumococcal vaccination guidelines-2016. *Ann Thorac Med*. 2016;11(2):93–102. <https://doi.org/10.4103/1817-1737.180030>
10. Saudi Ministry of Health. Adult immunization guidelines. Riyadh, Saudi Arabia: Saudi Ministry of Health; 2022.
11. Aldhahir AM, Alyami MM, Alasimi AH, Alqahtani AM, Mousa RE, Alqahtani SA, et al. Awareness, uptake, and barriers to vaccination against respiratory tract infections in patients with diabetes mellitus: a multicenter study in Saudi Arabia. *Hum Vaccin Immunother*. 2025;21(1):2585544. <https://doi.org/10.1080/21645515.2025.2585544>
12. Almusalam YA, Ghorab MK, Alanezi SL. Prevalence of influenza and pneumococcal vaccine uptake in Saudi type 2 diabetic individuals. *J Family Med Prim Care*. 2019;8(6):2112–9. https://doi.org/10.4103/jfmpc.jfmpc_265_19
13. Godin G, Vézina-Im LA, Naccache H. Determinants of influenza vaccination among healthcare workers. *Infect Control Hosp Epidemiol*. 2010;31(7):689–93. <https://doi.org/10.1086/653614>
14. Wheelock A, Thomson A, Sevdalis N. Social and psychological factors underlying adult vaccination behavior: lessons from seasonal influenza vaccination in the US and the UK. *Expert Rev Vaccines*. 2013;12(8):893–901. <https://doi.org/10.1586/14760584.2013.814841>
15. Althobaiti WS, Alnefaie AD, Althaali KM, Alsufyani OM, Shebany YM, Atalla AA, et al. Pneumococcal infection and vaccination-related knowledge, attitudes and practices among Saudi residents. *Pathogens*. 2025;14(7):711. <https://doi.org/10.3390/pathogens14070711>
16. Faisal Khaled HA, Alasmari MA. Knowledge attitude and practices about pneumococcal infection and vaccination patients who visit the primary health at Taif centers, KSA. *Med Sci*. 2019;23(100):855–68.
17. Alharbi MB, Alshehri AJ, Alkawardi SA, Harshan AA, Abdulrahman OA. Knowledge, attitude, and practice of taking the pneumonia vaccine among adults in the Kingdom of Saudi Arabia. *IJMDC*. 2022;6(1):117–26. <https://doi.org/10.24911/IJMDC.51-1636248184>
18. El-Gamal F, Khamis Z, Sulaimani AE, Alradadi E, Alharbi B, Yousaf SY. Pattern and determinants of the knowledge, attitude and practice towards pneumococcal vaccine among the population in Saudi Arabia. *Int J Med Dev Countries*. 2024;8(2):747–54. <https://doi.org/10.24911/IJMDC.51-1703533245>
19. Michel JP, Goldberg J. Education, healthy ageing and vaccine literacy. *J Nutr Health Aging*. 2021;25(5):698–701. <https://doi.org/10.1007/s12603-021-1627-1>
20. Lu PJ, O'Halloran A, Kennedy ED, Williams WW, Kim D, Fiebelkorn AP, et al. Awareness among adults of vaccine-preventable diseases and recommended vaccinations, United States, 2015. *Vaccine*. 2017;35(23):3104–15. <https://doi.org/10.1016/j.vaccine.2017.04.028>
21. Alshammari TM, Yusuff KB, Aziz MM, Subaie GM. Healthcare professionals' knowledge, attitude and acceptance of influenza vaccination in Saudi Arabia: a multicenter cross-sectional study. *BMC Health Serv Res*. 2019;19(1):229. <https://doi.org/10.1186/s12913-019-4054-9>
22. Alzahrani SH. The impact of health beliefs and trust in health information sources on SARS-CoV-2 vaccine uptake. *Front Public Health*. 2024;12:1340614. <https://doi.org/10.3389/fpubh.2024.1340614>
23. Bish A, Yardley L, Nicoll A, Michie S. Factors associated with uptake of vaccination against pandemic influenza: a systematic review. *Vaccine*. 2011;29(38):6472–84. <https://doi.org/10.1016/j.vaccine.2011.06.107>
24. Center AH. Assessment the awareness of the elderly patient's knowledge and attitudes among pneumococcal vaccination in Kingdom of Saudi Arabia *Ann Rom Soc Cell Biol*. 2023;27:441–60
25. Haviari S, Bénet T, Saadatian-Elahi M, André P, Loulergue P, Vanhems P. Vaccination of healthcare workers: a review. *Hum Vaccin Immunother*. 2015;11(11):2522–37. <https://doi.org/10.1080/21645515.2015.1082014>
26. Mokaddas E, Al-Jardani AK, Saeed NK, Doiphode S, Senok A, Joury J, et al. Invasive pneumococcal disease in the Gulf region: a narrative review of incidence, burden, and vaccine strategies. *Front Public Health*. 2025;13:1589366. <https://doi.org/10.3389/fpubh.2025.1589366>
27. Saied SM, Saied EM, Kabbash IA, Abdo SA. Vaccine hesitancy: beliefs and barriers associated with COVID-19 vaccination among Egyptian medical students. *J Med Virol*. 2021;93(7):4280–91. <https://doi.org/10.1002/jmv.26910>
28. Wan SW, Choe L, Daariin AB, Wong GJ, Tan KK. Determinants of pneumococcal vaccination among older adults: a scoping review. *Public Health*. 2024;237:245–60. <https://doi.org/10.1016/j.puhe.2024.10.008>

Supplementary material

Questionnaire

Demographic Information

1. Age:
2. Gender:
 - a. Male
 - b. Female
3. Educational Level:
 - a. No formal education
 - b. Primary
 - c. Secondary
 - d. Tertiary
4. Occupation:
5. Have you ever been diagnosed with any chronic illness (e.g., diabetes, asthma, COPD, CKD)?
 - a. Yes
 - b. No
 - c. If yes, please specify :

Section B: Awareness of pneumococcal disease and vaccination

6. Have you heard of pneumococcal disease or pneumococcal pneumonia ?
 - a. Yes
 - b. No
7. If yes, how did you hear about it? (Select all that apply)
 - a. Healthcare professional
 - b. Media (TV, radio, internet)
 - c. Friends or family
 - d. Health campaigns
 - e. Other _____:

8. Are you aware that there is a vaccine to prevent pneumococcal pneumonia ?
 - a. Yes
 - b. No

Section C: Acceptance and attitudes toward the vaccine

10. Have you ever received the pneumococcal vaccine ?
 - a. Yes
 - b. No
 - c. Not sure
11. If no, what are your reasons for not getting vaccinated? (Select all that apply)
 - a. Not aware of the vaccine
 - b. Concerned about side effects

- c. Do not believe it is necessary
- d. Vaccine is too expensive
- e. Lack of access
- f. Waiting for doctor's recommendation
- g. Other _____:

12. Would you consider getting vaccinated if recommended by a healthcare provider?

- a. Yes
- b. No
- c. May be

13. Do you believe vaccines are generally safe and effective ?

- a. Strongly agree
- b. Agree
- c. Neutral
- d. Disagree
- e. Strongly disagree

14. How likely are you to recommend the pneumococcal vaccine to others ?

- a. Very likely
- b. Likely
- c. Not likely
- d. Not at all likely

Section D: Access and information needs

15. Have you ever discussed the pneumococcal vaccine with a healthcare provider ?

- a. Yes
- b. No

16. Would you like to receive more information about the pneumococcal vaccine ?

- a. Yes
- b. No

17. What would be your preferred source for receiving information? (Select all that apply)

- a. Healthcare provider
- b. Public health campaigns
- c. Social media
- d. Television/radio
- e. Printed materials (flyers, brochures)

- f. Other: _____