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Knowledge, Attitudes, And Beliefs of Adults and Elderly Outpatients Regarding Pneumococcal Vaccination at Taif Hospital Cluster

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Abstract

Background: Pneumococcal infection is a significant cause of morbidity and mortality among older adults, with lasting impacts on daily functioning and frailty. Despite the effective prevention of pneumococcal disease with a simple vaccination, the vaccination rate is still lower than that advised by the international health authorities.

Aim: This quantitative study aimed to assess the knowledge, attitudes, and beliefs (KABs) of young and elderly outpatients regarding pneumococcal vaccination at the Taif hospital cluster, Kingdom of Saudia Arab.

Materials and methods: This comparative cross sectional study employed self-administered questionnaire to a cohort of elderly and younger adult participants, selected by using purposive sampling technique. A total of 301 participants were divided into two groups: vaccinated (n=) and unvaccinated (n=) who visirted Taif health cluster. The collected data were analysed using SPSS software, which employed descriptive (frequency and percentage) analysis and inferential statistics, including Pearson's correlation test.

Results: Among the 301 participants (response rate 91%), 32.56% had received the pneumococcal vaccine. Of these, 12.45% were between 20-40 years, 10.75% between 41-60, 8.65% between 61-70 and as little as 2.07% between 71> 80 years of age, indicating lower rates of vaccination among the elderly. Elderly participants were less likely to be vaccinated compared with younger adults. Healthcare providers were recognised as important factors in giving knowledge and recommendations about the use of the vaccine to their patients. Pearson correlation revealed that age, gender, income, health fitness, and vaccination status ($p < 0.001$) were significant and educational level and nationality showed non-significant results.

Conclusions: The healthcare guidance and recommendations significantly influenced vaccine uptake in both the elderly and younger adults. Healthcare providers should be encouraged to provide their patients with the necessary knowledge about pneumococcal vaccination and offer the vaccine to them in order to increase the coverage.

Keywords: Invasive Pneumococcal Disease, Elderly Adults, Vaccination, Pneumococcal Infection, Polysaccharide Pneumococcal Vaccine.

1. Introduction

Pneumonia is an invasive worldwide disease caused by gram-positive pneumococcal bacterial pathogens (Scelfo et al., 2021). The primary reason for Pneumococcal infection is caused by Streptococcus pneumoniae (S. pneumoniae), which is an encapsulated bacterium with a polysaccharide capsule, an essential factor in its virulence (Althobaiti et al., 2025). The transmission of the pneumonia infection is caused by direct contact with respiratory secretions from patients and healthy carriers (Preventation, 2024). Additionally, pneumonia, bacteremia, meningitis, and otitis media are some of the serious pneumococcal infections (Organization, 2024).

Generally, elderly patients with certain comorbidities are at high risk for morbidity and mortality from serious pneumococcal infections (Alshahwan et al., 2019). Additionally, young children (younger than five years), the elderly (65 years or older), pregnant women, individuals with compromised immune systems or specific chronic medical conditions. Alongside, individuals with diabetes mellitus, chronic heart, kidney, liver, lung diseases, cigarette smokers are at high risk to effected by respiratory infections (Grant et al., 2023; Ochoa-Gondar et al., 2023). Global statistics showed that about 14.5 million people had the incidence of severe pneumococcal infections (Ozisik, 2025).

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The spread of pneumococcal infection is progressively increasing day by day in Saudi Arabia, posing a growing public health concern (Faisal Khaled & Alasmari, 2019). In Saudi Arab, there are high-risk factors and a prevalence of infection among younger age individuals having diabetes, cardiovascular diseases, chronic renal, liver and lung diseases, and hemoglobinopathies (Faisal Khaled & Alasmari, 2019). Additionally, innumerable pilgrims return to Saudi Arabia once a year from everywhere in the globe for the Umrah and pilgrim's journey, and transmission of Streptococcus pneumoniae (including antibiotic-resistant strains) between pilgrims is anticipated to occur (Alharbi et al., 2016).

The pneumococcal vaccines are the frontline strategy to reduce the incidence of pneumococcal pneumonia among susceptible populations (Thomas, 2021). According to medical professionals, pneumococcal vaccination is a proven preventive measure; its success in reducing the burden of the disease depends not only on its availability but also on the public's understanding and willingness to engage in preventive behaviours (Althobaiti et al., 2025). Additionally, antibiotics are among the most commonly prescribed medications for the treatment of pneumococcal pneumonia infection (Sattar et al., 2024). The resolution of symptoms typically occurs within an estimated 12 to 36 hours following the initiation of antibiotic therapy. However, inappropriate use, including overuse and misuse of antibiotics, has significantly contributed to the emergence of antimicrobial resistance, leading to therapeutic failure on a global scale (Sattar et al., 2024).

In Saudi Arabia, the pneumococcal vaccine was introduced in 2009, with the incorporation of the National Immunisation Program (Nuorti & Whitney, 2010). The Health Ministry of Saudia Arab reported that the annual pneumococcal vaccination between 2014 and 2018 among Saudi arab children was around 98%. But, low vaccination rates were recorded among adults, only 12.9% despite the fact that they are at high risk of getting affected by pneumonia infection (Althobaiti et al., 2025).

A considerable amount of research has been published that investigates the awareness levels and need for pneumococcal vaccination (Faisal Khaled & Alasmari, 2019; Farrar et al., 2023; Kirubarajan et al., 2023). The previous studies have primarily focused on determining the prevalence and clinical outcomes of pneumococcal disease among Saudi adults, with limited investigation into psychosocial determinants. This limitation can lead to missed opportunities regarding the inadequate awareness, unfavourable health attitudes, and misperceptions among the elderly population that may impede pneumococcal vaccine uptake (Amin et al., 2019). Furthermore, no study has been conducted within the Taif hospital cluster, which serves a large outpatient population in Taif city. This study is considered significant as it provides localised insights into the factors influencing vaccination behaviour, offering valuable evidence for designing targeted interventions to improve pneumococcal vaccine uptake in this targeted region. The limited availability of data on the prevalence of pneumococcal vaccination in Saudi Arabia provides the rationale for conducting this comparative cross-sectional investigation.

The objective of this study was to assessed the prevalence and knowledge, attitudes, and beliefs (KABs) of pneumococcal vaccination among elderly participants and younger adults within the studied sample.

The study aimed to answer the following research questions:

1. To what extent participant's knowledge, attitudes, and beliefs (KAB) do compromise with healthcare recommendations for pneumococcal vaccine uptake?
2. How significant is the participant's characteristics do affect their (KAB)?
3. To what degree do healthcare recommendations can influence vaccine uptake in Elderly and younger adults?
4. What measures can be implemented to encourage healthcare providers to offer the vaccine and increase coverage?

2. Literature Review

2.1. Epidemiology and vaccine effectiveness in adults and the elderly

Bulkhi et al. recently conducted a meta-analysis to assessed pneumococcal vaccine effectiveness in reducing hospitalisation and mortality among the elderly residents. It included 35 studies (cohort, RCTs, case-control), covering ~1.65 million vaccinated vs 2.62 million unvaccinated older adults. The results underscored that the pneumonia-related hospitalisation has been reduced significantly among those given PPV/PPSV and PCV13, especially in those >75 years and people with chronic conditions. Additionally, all-cause mortality was also reported as decreased among the elderly aged>60 to 75 (Bulkhi et al., 2025).

Elmahdy et al. assessed the knowledge and attitude of older people towards the common vaccinations such as influenza, pneumococcal and cold (Elmahdy et al., 2023).

The results showed that there was a positive correlation between knowledge and attitude score (r 0.196, p =<0.05). These data showed a realistic perspective on the impact of vaccination on the cure process in older adult populations.

2.2. Knowledge of pneumococcal disease and vaccines among adults and healthcare providers

Althobaiti et al. recently conducted a cross-sectional study in Saudi Arabia in 2024-2025. The study included (n=1,230) participants who showed a moderate level of knowledge (average knowledge score ≈ 58.6%) about pneumococcal infection and vaccination, with higher attitude (70.6%) and practice (68%) scores. But despite attitudes, many (≈ 38.3%) had not received the vaccine, and many could not recall their vaccination status (Althobaiti et al., 2025). However, it indicates that the ageing population is not paying much attention to pneumococcal vaccination as they are more susceptible to these infections and complications (Elmahdy et al., 2023). The main reasons are their ageing factors, decreasing immunity, diabetes and high cholesterol that play a central role in the susceptibility to respiratory infections (Watson & Wilkinson, 2021).

Alyazidi et al. conducted a study in Jeddah, Saudia Arab, among older adults in residential home care centres. The results found that about 77.5% of participants had not received the vaccine, and about half did not know about the pneumococcal vaccine. Despite the lower rates of vaccination uptake, the participants overall showed positive attitudes and concerns when informed about the effectiveness of the pneumococcal vaccination (Alyazidi et al., 2020).

2.3. Attitudes and beliefs that shape vaccine uptake in adults and elderly outpatients

Although knowledge tends to be moderate to low, attitudes and beliefs are often more positive. Another study conducted by Althobaiti et al. evaluated the knowledge, attitude and practices followed for vaccination. It is important to note that only ~58.6% participants responded to their knowledge, which was marked as average, and ~70.6% expressed a positive attitude toward pneumococcal vaccination. However, about 65-70% showed a positive attitude that they would be willing to be vaccinated if offered (Althobaiti et al., 2025). Alyazidi et al. discussed the barriers and complications faced by the residents of Jeddah city, especially older adults. The most recurring barriers included not having been advised by healthcare providers regarding the importance of vaccination, lack of awareness about which type of vaccine is suitable, eligibility, and low awareness rates. Many expressed willingness to learn and accept vaccination when recommended (Alyazidi et al., 2020).

Baashar et al. showed that belief attributes (such as perceived susceptibility, perceived severity, trust in vaccine safety) aligned with vaccination coverage: people who believe vaccination is beneficial, safe and recommended are more likely to have been vaccinated. On the other hand, many do not have those beliefs on the effectiveness of vaccination because of lack of information and provider recommendation (Baashar et al., 2025).

3. Materials and Methods

3.1 Study Design

This comparative study used cross-sectional study design to measure the KABs related to pneumococcal vaccination among Taif city residents. The study was conducted in Taif Health cluster, kingdom of Saudi Arab.

3.2 Study Population and Sampling

A total of 301 participants were included in the study, consisting of two groups: 98 vaccinated individuals and 203 unvaccinated individuals. The study participants comprised both pneumococcal-vaccinated and unvaccinated outpatients attending various departments of the Taif Health Cluster, Saudi Arabia. Participants included both male and female patients, encompassing a wide age range from 20 years to over 80 years. The study enrolled Saudi nationals as well as non-Saudi residents in order to ensure representation of the diverse population seeking healthcare services within the hospital cluster. A rate of 301 completed their questionnaires through a Monkey Survey format at a response rate of 90.75%.

3.3 Study Setting and Procedures

This study was conducted at the Taif Health Cluster, Kingdom of Saudi Arabia, over a period of four months. Phase I, which lasted one month, was dedicated to the planning stage and involved surveying related literature, establishing standard inclusion and exclusion criteria, developing and validating the study questionnaire, and obtaining the necessary approvals and registration, including permission from the hospital authority. Phase II, conducted over the course of one month, focused on the distribution and collection of the questionnaires from the study participants. Phase III extended over one to

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two months and encompassed the statistical analysis of the collected data, interpretation of the results, and the preparation of the results and discussion section, followed by drawing conclusions and formulating recommendations.

3.4 Data Collection Procedures

A modified self-administered online questionnaire was designed for this study based on the theory of planned behaviours and the Health Belief Model (Ajzen, 1991; Janz & Becker, 1984). The questionnaire consisted of 25 items and six sub-sections, including knowledge of pneumococcal infection and immunisation, perceived vaccination risks, personal normative beliefs, attitude towards vaccination, facilitating conditions of vaccination, and characteristics of respondents. The questionnaire was translated into Arabic and English for ease of understanding.

3.5 Statistical Analysis

Data were analysed using the Statistical Package for the Social Sciences (SPSS, version 23). Descriptive statistics, including frequency and percentage distributions, were employed to summarise the demographic characteristics of participants. Additionally, Pearson's correlation coefficient was employed to assess the relationship between participants' characteristics and their knowledge, attitudes, and beliefs (KAB) regarding pneumococcal vaccination. The strength and direction of linear associations between continuous and categorical variables were investigated using the Pearson correlation. A p-value of less than 0.05 was considered statistically significant.

3.6 Ethical Considerations

The study was conducted in accordance with the ethical principles of the Declaration of Helsinki, originally adopted in 1964, and adhered to the STROBE (Strengthening the Reporting of Observational Studies in Epidemiology) guidelines for observational research reporting. Ethical approval for this study was obtained from the appropriate institutional review board, and all procedures were conducted in accordance with established ethical guidelines. Informed consent was obtained from all participants prior to data collection. However, the confidentiality of the collected information was strictly maintained to ensure the privacy and protection of participants' personal data.

4. Results

4.1 Sociodemographic Information

Figure 1 illustrates the individual percentages of both males and females and the total percentage of vaccinated and unvaccinated participants by gender. The results showed that males were more responsive to getting vaccinated than the female participants.

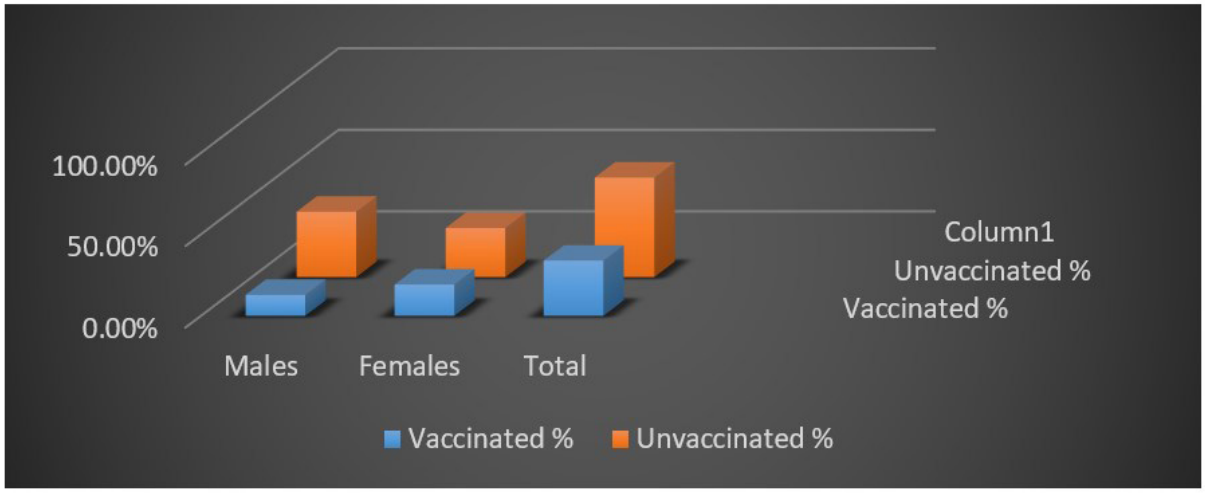

Figure 1: Percentages of vaccinated and unvaccinated participants regarding gender

The effect of participants' age on their vaccination status is presented in Figure 2. It is clear that the highest vaccination responses are shown within the age group of 20-40 years, followed by the 41-60 years old participants and so on. It is important to note that the rates of responses declined with the increase in age.

Figure 3 depicts that the vaccination coverage is

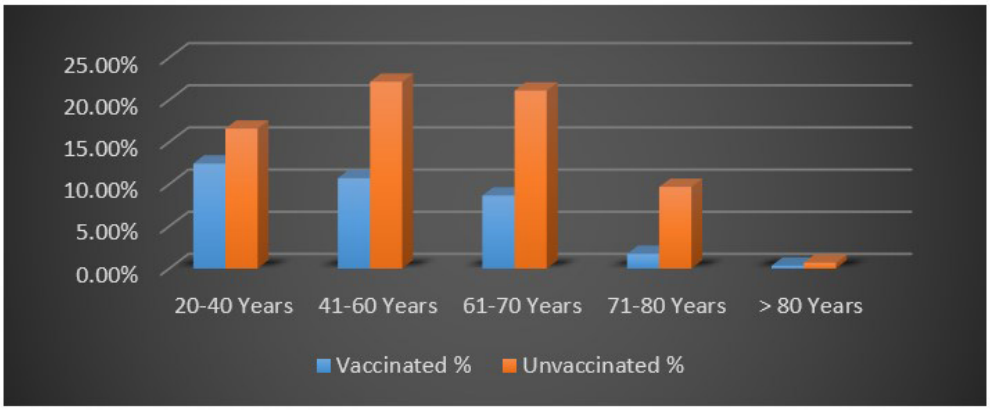

Figure 2: Percentage distribution of vaccinated and unvaccinated participants related to age

substantially lower among Saudi participants compared to their unvaccinated proportion: approximately 70–75% unvaccinated vs. 35–40% vaccinated. In the non-Saudi group, the difference is minimal, but the overall proportion is very small.

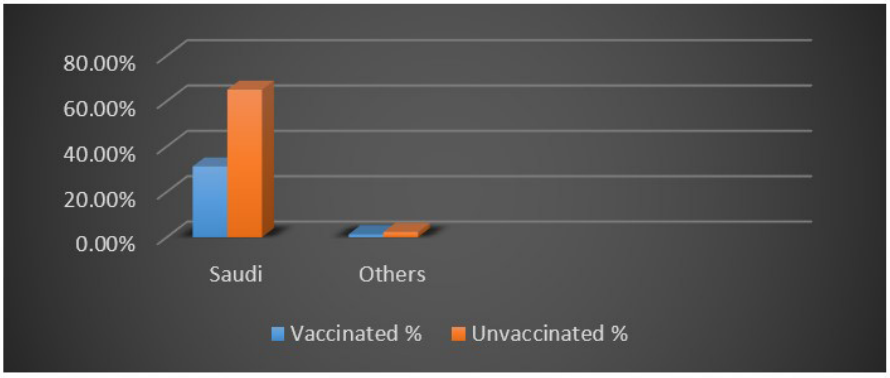

Figure 3:Percentages of vaccinated and unvaccinated participants in relation to nationality

Figure 4 shows the vaccination status of the participants according to their health fitness. Participants classified as either very fit or mildly frail exhibited the lowest vaccination uptake. In contrast, individuals with good fitness levels demonstrated the highest vaccination coverage. Moreover, participants who were clinically stable with adequately managed comorbid conditions reported the highest rates of vaccination.

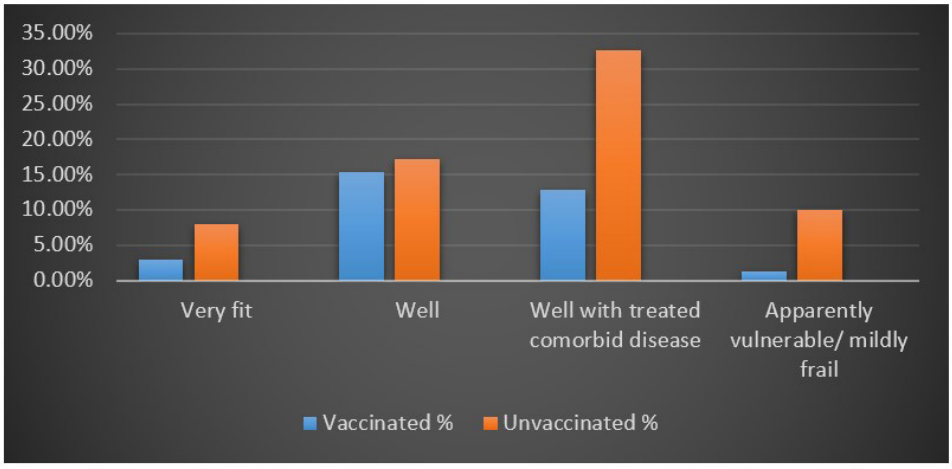

Figure 4:Percentages of vaccinated and unvaccinated patients in relation to their health fitness

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The effect of participants' income on their vaccination status is shown in Figure 5. However, the lowest income participants (≤ 5000 Riyals) had the highest rate of vaccination, followed by those (5000-1000 Riyals). In contrast, participants with earnings of > 15000 riyals were found to be the least vaccinated.

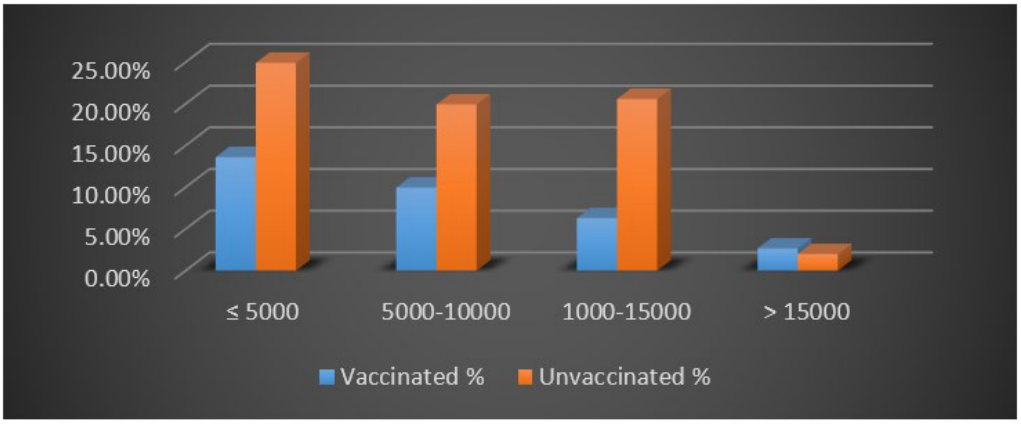

Figure 5:Percentages of vaccinated and unvaccinated patients regarding their income

Figure 6 shows vaccination status by educational attainment. Participants with college-level education comprised the largest share of the sample and exhibited a substantially greater absolute percentage of unvaccinated individuals than vaccinated individuals. Preparatory or less and secondary groups had low absolute representation with minimal differences between vaccinated and unvaccinated percentages. On the other hand, the other education category was negligible compared to the other two groups.

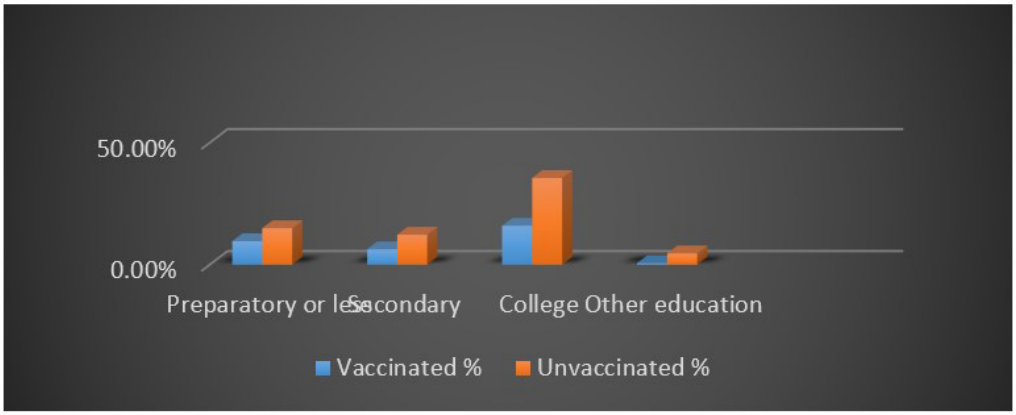

Figure 6: Percentages of vaccinated and unvaccinated patients regarding their Education

Figure 7 illustrates the percentages of vaccinated and unvaccinated participants according to the visited hospital department. The cardiology department prevailed at the highest rate of unvaccinated, while the Gastroenterology and the surgery departments revealed the highest rate of vaccination. The least of vaccination was from the Coronary, Oncology, Haematology, and Nephrology in respective deciding order.

4.2 Descriptive Statistics

Table 3 shows the distribution of responses to knowledge, attitude, and normative statements on pneumonia vaccination among vaccinated and unvaccinated participants (N = 301). The descriptive analysis revealed that perceptions of the pneumonia vaccine varied notably between vaccinated and unvaccinated participants. Regarding knowledge, 26.2% of vaccinated individuals selected somewhat disagree when asked whether the vaccine prevents pneumonia, as compared with 28.2% of unvaccinated participants who chose somewhat agree. Similarly, 14.6% of vaccinated respondents acknowledged being at higher risk for pneumonia (somewhat agree), while a greater proportion of unvaccinated participants (9.0%) strongly disagreed, indicating a tendency among

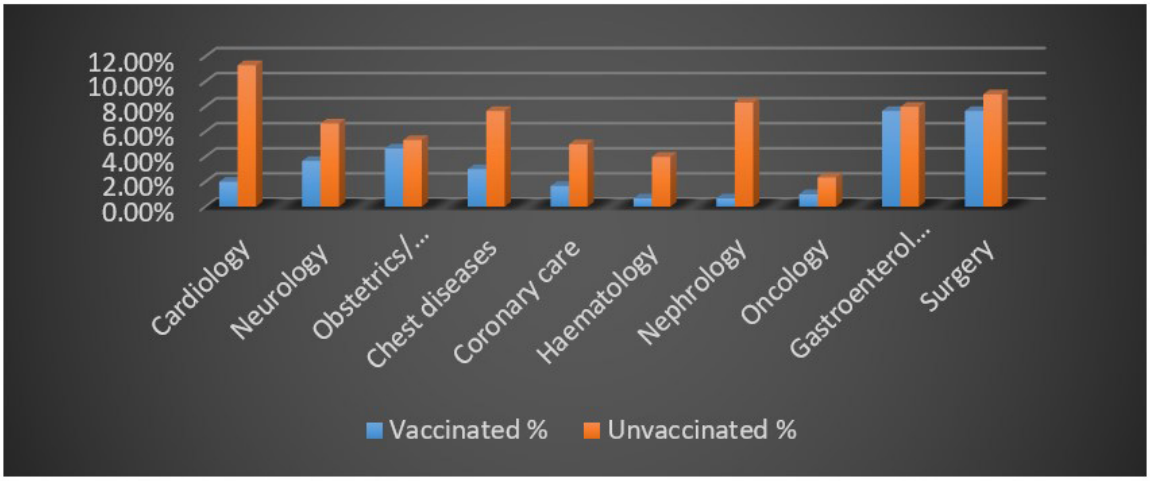

Figure 7: Percentages of vaccinated and unvaccinated participants regarding the visited departments

the unvaccinated to underestimate susceptibility. In terms of attitudes, stronger endorsement of vaccination was observed among the vaccinated (11.0%), who strongly agreed that vaccines are a practical way to protect health, compared to only 2.1% of unvaccinated participants. In contrast, 12.3% of vaccinated respondents strongly agreed that taking the pneumonia vaccine was a wise approach. The importance of age-specific vaccination was also emphasised more by the vaccinated, with 15.6% strongly agreeing that adults over 65 should be vaccinated, compared to 11.0% of unvaccinated participants who explicitly disagreed. Safety perceptions followed a similar trend, as 11.0% of vaccinated respondents strongly agreed that the vaccine is safe compared with 15.3% of unvaccinated, yet more unvaccinated participants expressed scepticism through somewhat disagree (12.0%) and disagree (5.6%). Normative beliefs further highlighted this divide (20.3%) of vaccinated participants strongly agreed that the recommendations of doctors are highly important, compared with 34.2% of unvaccinated participants.

Table 3: Distribution of responses to knowledge, attitude, and normative statements on pneumonia vaccination among vaccinated and unvaccinated participants (N = 301)

Statements	**STA n (%)**	**SWA n (%)**	**NAND n (%)**	**SWDA n (%)**	**SDA n (%)**	**Chi (p)**
Knowledge Statements						
The pneumonia vaccine keeps vaccinated people from getting pneumonia Vaccinated Unvaccinated	23(7.6) 38(12.6)	40(13.3) 85(28.2)	27(9.0) 44(14.6)	79(26.2) 25(8.3)	1(0.3) 11(3.7)	0.370
I am at high risk for pneumonia Vaccinated Unvaccinated	23(7.6) 38(12.6)	44(14.6) 79(26.2)	13(4.3) 36(12.0)	13(4.3) 23(7.6)	5(1.7) 27(9.0)	0.129
An unvaccinated person with pneumonia will probably get pneumonia Vaccinated Unvaccinated	24(8.0) 46(15.3)	49(16.3) 90(29.9)	19(6.3) 37(12.3)	4(1.3) 23(7.6)	2(0.66) 7(2.3)	0.513
Attitude statements						
Vaccinations are a practical way to protect my health Vaccinated Unvaccinated	33(11.0) 64(2.13)	41(13.6) 80(26.6)	16(5.3) 29(9.6)	6(2.0) 26(8.6)	2(0.6) 4(1.2)	0.239

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Cont. Table 3

Statements	STA n (%)	SWA n (%)	NAND n (%)	SWDA n (%)	SDA n (%)	Chi (p)
In general, I consider vaccines to be a safe protection Vaccinated Unvaccinated	30(10.0) 59(19.6)	46(15.3) 86(28.6)	14(4.7) 23(7.6)	5(1.7) 27(9.0)	3(1.0) 8(2.7)	0.000
I believe it is a wise Idea to take the pneumonia vaccine Vaccinated Unvaccinated	37(12.3) 53(17.6)	36(12.0) 74(24.6)	17(5.6) 37(12.3)	3(1.0) 22(7.3)	5(1.7) 16(5.3)	0.023
I believe it is important for healthy individuals over the age of 65 to have the pneumonia vaccine. Vaccinated Unvaccinated	47(15.6) 54(17.9)	26(8.6) 65(21.6)	17(5.6) 29(9.6)	2(0.6) 22(7.3)	6(2.0) 33(11.0)	0.000
I believe that the pneumonia vaccine is a safe protection Vaccinated Unvaccinated	33(11.0) 46(15.3)	37(12.3) 76(25.2)	16(5.3) 28(9.3)	7(2.3) 36(12.0)	5(1.7) 17(5.6)	0.078
Normative statement						
Recommendations of my doctors and healthcare providers are highly important. Vaccinated Unvaccinated	61(20.3) 103(34.2)	28(9.3) 65(21.6)	2(0.6) 12(4.0)	6(2.0) 13(4.3)	1(0.3) 10(3.3)	0.015

Table 4 shows the distribution of participants' responses on knowledge, attitude, and facilitating condition statements related to pneumococcal vaccination according to vaccination status. The results demonstrate generally low awareness and provider engagement regarding pneumococcal vaccination among both vaccinated and unvaccinated participants. Only about one-third of vaccinated individuals (33.7%) and 30.5% of unvaccinated individuals reported having been told about a vaccine that protects against pneumonia. Therefore, a limited level of vaccine-related communication and awareness was indicated ($p = 0.520$). Moreover, around one-quarter of both vaccinated (24.5%) and unvaccinated (25.2%) participants incorrectly believed that the pneumonia vaccine and influenza vaccine are the same ($p = 0.951$). These findings clearly reflected the inadequate knowledge differentiation between vaccine types.

A very small proportion of participants (12.2% vaccinated and 20.7% unvaccinated) reported being informed about the pneumonia vaccine by their healthcare providers. Conversely, 14.3% of vaccinated individuals stated that their doctor believed they should receive the vaccine ($p = 0.127$). A considerable gap in physician-driven vaccine recommendation and practice has been noted, as only 10.2% of vaccinated respondents reported that their doctor had directly offered them the pneumococcal vaccine ($p = 0.607$). In terms of facilitating conditions, 48% of vaccinated participants and 43.3% of unvaccinated respondents reported having a regular private doctor ($p = 0.899$). On the other hand, 59.2% of vaccinated and 48.7% of unvaccinated participants had visited a primary care provider within the past year ($p = 0.177$). Despite these relatively frequent healthcare interactions, vaccination rates remained low, which clearly showed that residents have missed opportunities for vaccine uptake within primary care settings.

4.3 Pearson Correlation Analysis

Table 5 depicts the results of the Pearson correlation analysis. The Pearson correlation analysis revealed several significant associations between the participants' sociodemographic variables and the study constructs.

Table 4: Participants' responses regarding knowledge, attitude, and facilitating conditions toward pneumococcal vaccination (n = 301).

Statement	YES	NO /NO IDEA	Chi (p)
Knowledge			
I have been told about a vaccine that protects from pneumonia Vaccinated Unvaccinated	33(33.7) 62(30.5)	65(66.3) 141(69.5)	0.520
The pneumonia vaccine and the flu vaccine are the same Vaccinated Unvaccinated	24(24.5) 51(25.2)	74(75.5) 152(74.8)	0.951
I have been told by my doctor and healthcare providers about the pneumonia vaccine Vaccinated Unvaccinated	12(12.2) 42(20.7)	86(87.8) 161(79.3)	0.520
My doctor and health care providers believe that I should have the pneumonia vaccine. Vaccinated Unvaccinated	14(14.3) 42(20.7)	84(85.7) 161(79.3)	0.127
My doctor and health care providers have offered me the pneumonia vaccine. Vaccinated Unvaccinated	11(10.2) 32(15.8)	87(88.8) 171(84.2)	0.607
Attitude			
Using vaccines is very important to prevent diseases like pneumonia Vaccinated Unvaccinated	58(59.2) 106(52.2)	40(40.8) 97(47.8)	0.289
Facilitating condition			
I have a private regular doctor for primary care Vaccinated Unvaccinated	47(48.0) 88(43.3)	51(52.0) 115(56.7)	0.899
I visited my primary care provider in the last year Vaccinated Unvaccinated	58(59.2) 99(48.7)	40(40.8) 104(51.2)	0.177
I have been to the hospital emergency department or been to a walk-in clinic in the last year Vaccinated Unvaccinated	77(78.6) 135(66.5)	21(21.4) 68(33.5)	0.342

Gender showed a significant negative correlation with ST_1 ($r = –0.328$, $p < 0.001$), indicating that male and female participants differed in their responses, with females demonstrating relatively higher scores on this construct. Age exhibited a strong positive correlation with ST_1 ($r = 0.398$, $p < 0.001$), indicating that as age increased, participants tended to show more favourable responses within this domain, whereas its correlation with ST_2 was weak and statistically insignificant ($r = –0.051$, $p = 0.381$). A statistically significant positive correlation was also observed between income and ST_1 ($r = 0.162$, $p = 0.005$), implying that individuals with higher income

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levels had more positive responses on this factor.

Health fitness demonstrated a slight but significant positive correlation with ST_1 (r = 0.125, p = 0.030), indicating that participants with better health status tended to exhibit slightly higher scores. Likewise, vaccination status was significantly correlated with ST_1 (r = 0.172, p = 0.003), suggesting that those who were vaccinated showed stronger alignment with the construct's favourable attributes. Conversely, education (r = –0.023, p = 0.686) and nationality (r = –0.035, p = 0.543) were not significantly correlated with either construct, reflecting no meaningful differences in responses based on these variables. Furthermore, a significant moderate positive correlation was found between ST_1 and ST_2 (r = 0.231, p < 0.001), indicating that both constructs were interrelated, and improvements in one domain were likely associated with enhancements in the other.

Table 5: Pearson's correlation analysis

		ST_1	**ST_2**
Gender	Pearson Correlation	-.328**	.028
	Sig. (2-tailed)	.000	.627
	N	300	300
Age	Pearson Correlation	.398**	-.051
	Sig. (2-tailed)	.000	.381
	N	300	300
Education	Pearson Correlation	-.023	-.049
	Sig. (2-tailed)	.686	.399
	N	300	300
Income	Pearson Correlation	.162**	.009
	Sig. (2-tailed)	.005	.873
	N	300	300
Nationality	Pearson Correlation	-.035	-.008
	Sig. (2-tailed)	.543	.888
	N	300	300
Health fitness	Pearson Correlation	.125*	-.029
	Sig. (2-tailed)	.030	.616
	N	300	300
Vaccination	Pearson Correlation	.172**	.007
	Sig. (2-tailed)	0.003	.910
	N	300	300
ST_1	Pearson Correlation	1	.231**
	Sig. (2-tailed)		.000
	N	300	299
ST_2	Pearson Correlation	.231**	1
	Sig. (2-tailed)	.000	

5. Discussion

The nationwide data on the immunisation rates of routine vaccines for pneumococcal infection among Saudi adults are limited. Despite the success of vaccination in preventing lethal diseases, the KABs regarding pneumococcal vaccination are still low in Taif city residents. Among the 301 participants have visited the Taif health cluster, Saudi Arabia, only 98 (32.6 %) reported

receiving pneumococcal vaccination. The highest uptake was in the 20–40 year age group (12.45 %), followed by 41–60 years (10.72 %), with a sharp decline in older age groups, reaching 2.07 % in those aged 71–80 years. This age-related reduction in vaccine uptake indicates that younger adults are more motivated toward pneumococcal immunisation than older residents. However, 59.2 % of vaccinated and 48.7 % of unvaccinated participants had visited a primary care provider in the past year. However, only about 25 % recalled being offered the pneumococcal vaccine by their provider.

A large majority (85.7 %) believed their provider did not deem vaccination necessary, and 68.44 % had never heard about the pneumococcal vaccine from any healthcare professional. Despite a generally favourable attitude toward vaccination (mean knowledge/attitude/belief score ~68 %) and recognition of the importance of vaccines (54.5 %), actual uptake remained low, particularly among the elderly. Overall, the findings underscored that while misconceptions about knowledge persist across both groups, vaccinated participants consistently demonstrated stronger positive attitudes toward vaccine safety, necessity, and normative trust in healthcare providers. Unvaccinated individuals were more ambivalent and more likely to express disagreement towards vaccination uptake.

The outcomes of Pearson correlation analysis showed major findings by highlighting that age, gender, income, health fitness, and vaccination status ($p < 0.001$) are the key determinants that have influenced participants' perceptions regarding vaccine uptake. In contrast, the educational level and nationality of participants were found to have minimal impact.

The observed vaccination rate of 32.6 % is modest but relatively higher than certain local reports. According to Koksal et al., among adults ≥50 years, low pneumococcal vaccine use was reported. The low coverage is consistent with broader findings in the Eastern Mediterranean region: one multicountry study observed pneumococcal vaccination rates <15 % among eligible adults. The major consequences that were reported are poor awareness, inconsistent provider recommendations, access and cultural barriers among the participants (Koksal et al., 2024).

In a Saudi context, cross-sectional investigations of pneumococcal vaccine patterns have shown similarly low uptake among older adults (Binsuwaidan et al., 2025). Alqahtani et al. conducted a cross sectional study among the Gulf Cooperation Council (GCC) countries' residents. The results documented that the uptake of vaccination as low as 22 % (overall) and even lower among at-risk groups (Alqahtani et al., 2017).

As a result, there is an excessive decline in vaccination with respect to age, which can be explained by multiple factors. Older adults might underestimate their susceptibility to pneumococcal disease, have less exposure to vaccine messaging, or face physical, logistical, or mobility constraints for accessing vaccination services (Al-Hanawi et al., 2021). A significant association was found between educational level and perception toward vaccination ($p = 0.045$), suggesting that higher educational attainment enhances health literacy, enabling better comprehension of vaccine benefits and prompting action. The results are also supported by previous findings in Saudi populations, where higher knowledge and attitude scores correlated with higher education (Alsuhebany et al., 2023).

A critical determinant of vaccine uptake is the behaviour of healthcare providers (de Koning et al., 2024). The fact that only 25 % of participants reported being offered vaccination underscores a considerable missed opportunity. Globally, provider recommendation is one of the strongest predictors of adult immunisation (de Koning et al., 2024). Recent studies in Saudi settings have similarly revealed poor provider adherence. Alshehri et al. conducted a retrospective audit of medical records of discharged internal medicine patients and found no documented immunisation recommendations for pneumococcal vaccination (Alshehri et al., 2023). A systematic review and meta-analysis of interventions aimed at increasing pneumococcal vaccine uptake among older adults confirmed that strategies such as provider reminders, patient education, outreach, and electronic health record prompts significantly improve coverage (Ohta et al., 2025).

Regarding the effectiveness of vaccination, there is recent evidence in Saudi Arab that supported a moderate protective benefit of pneumococcal vaccination among elderly residents (Binsuwaidan et al., 2025; Faisal Khaled & Alasmari, 2019). Farrar et al. reported a systematic review and meta-analysis by investigating the vaccination efficacy of PCV13 and PPSV23. The results showed that PCV13 and PPSV23 are both effective against VT-IPD and VT-pneumococcal pneumonia in adults (Farrar et al., 2023).

Kirubarajan et al. systematically characterised the vaccination interventions utilised in high-income countries and aimed to improve pneumococcal vaccine uptake in older adults. The results showed that there are several determinants that significantly contributed in improved

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vaccine uptake, similar results shown in this study. These factors include a reduction in the rates of hospitalisation, incidence of infection, and mortality associated with pneumococcal disease among older adults who have received the vaccination (Kirubarajan et al., 2023).

Additionally, the advanced pneumococcal vaccine strategies, including PCV15 and PCV20, are increasingly being integrated into adult immunisation recommendations (e.g., ACIP updates) (Kobayashi, 2023). The study findings also underscored key priorities, such as the need to strengthen healthcare providers' proactive engagement in recommending pneumococcal vaccination. Pneumococcal vaccination is a vital immune-modulating system. It is different from influenza vaccination, so that improvement of the knowledge, attitude, and belief should be implemented by the health care provider in order to encourage patients to perceive it when required (Heinemeier et al., 2025). One of the major concerns is enhancing the interest and education of elderly patients to improve their vaccine awareness.

6. Conclusion

In conclusion, this study assessed the knowledge, attitudes, and beliefs (KABs) of young and elderly outpatients regarding pneumococcal vaccination at the Taif hospital cluster. Younger participants were less likely to perceive pneumococcal vaccination compared to adults. The participants' knowledge, attitudes, and beliefs were affected by their sociodemographic characteristics, such as their age, occupation and education levels. Additionally, the study found that healthcare providers are considered as essential parts in providing their patients with the updated knowledge and recommendation to encourage them to accept the vaccine.

6.1 Strengths and Limitations

This study provides valuable insights in updating and collecting the real knowledge of Taif city residents regarding their knowledge, attitude and beliefs on pneumococcal vaccination. This study also contributes to the health records of Saudi health care setting by providing evidences to guide national immunization policy. Nevertheless, some limitations must be acknowledged. The cross-sectional design does not permit causal inference. Self-administered reporting may introduce recall or social desirability bias, particularly among older participants. This single-cluster study in Taif may limit generalizability to other regions of Saudi Arabia.

6.2 Future Recommendations

It is recommended that the educational campaigns specifically targeting older adults (those with lower education) should be organised by the higher authorities in the Kingdom of Saudi Arab. Healthcare providers should be trained and prompted to routinely assess immunisation status and offer pneumococcal vaccines during adult patient encounters. The study also recommends that ensuring vaccine availability, affordability, and access in primary care settings would increase vaccine uptake. Regular monitoring of coverage, stratified by age, education, and comorbidity, enables assessment of progress and highlights disparities in future studies.

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