

Influenza and pneumococcal vaccination status and related factors in obese adults: a single-center cross-sectional study

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ABSTRACT

Objective: This study aimed to evaluate influenza and pneumococcal vaccination status and related factors among adults with obesity attending a single-center obesity outpatient clinic.

Methods: This cross-sectional analytical study included 251 obese adults (BMI ≥ 30 kg/m²) who attended an obesity outpatient clinic. Data were collected using a structured face-to-face questionnaire including sociodemographic characteristics, body mass index, presence of chronic disease other than obesity, vaccination status, obesity-related risk perception, and sources of vaccine recommendation. Statistical analyses included Mann–Whitney U test, chi-square test, and multivariable logistic regression.

Results: The study included 251 adults with obesity. The median age was 51 years, the median BMI was 35.7 kg/m², 72.1% of participants were female, and 64.1% had chronic disease other than obesity. Influenza vaccination coverage was 45.8%, while pneumococcal vaccination coverage was 27.1%. Obesity-related risk perception was significantly associated with both influenza and pneumococcal vaccination uptake ($p < 0.001$ for both). In multivariable analysis, absence of obesity-related risk perception was associated with lower odds of influenza vaccination (OR=0.03; 95% CI: 0.02–0.07; $p < 0.001$), whereas the presence of chronic disease other than obesity increased the likelihood of influenza vaccination (OR=3.31; 95% CI: 1.58–6.95; $p = 0.002$). For pneumococcal vaccination, older age increased the likelihood of vaccination (OR=1.06; 95% CI: 1.02–1.09; $p < 0.001$), while absence of obesity-related risk perception was associated with lower vaccination uptake (OR=0.10; 95% CI: 0.04–0.23; $p < 0.001$). Family physicians were the most frequently reported source of vaccine recommendation among vaccinated participants.

Conclusion: These findings suggest that vaccination uptake among adults with obesity, particularly pneumococcal vaccination, may be improved by vaccine-specific counseling that emphasizes obesity-related infection risk, addresses safety concerns and information gaps, and supports clear vaccine recommendations during clinical encounters.

Keywords: Adults, obesity, influenza, pneumococcus, vaccination, risk perception

Introduction

According to the World Health Organization (WHO), obesity is characterized as a chronic, relapsing condition that impacts multiple physiological systems. This condition is associated with an increased risk and severity of cardiovascular diseases, diabetes, specific forms of cancer, and infectious diseases.^[1,2] A mounting body of evidence indicates that structural and functional alterations manifest in both the innate and adaptive components of the immune system in obese individuals, potentially leading to heightened vulnerability to infections.^[3]

Recent epidemiological studies have demonstrated a correlation between obesity and a more severe clinical course, particularly in cases of respiratory tract infections. A substantial body of research, including systematic reviews and meta-analyses published during the course of the COVID pandemic, has demonstrated a positive correlation between obesity and an increased risk of hospitalization, intensive care unit admission, and mortality.^[4,5] Research has also indicated that obesity is associated with elevated rates of complications and hospitalizations in patients infected with influenza.^[6,7]

The increased risk of infection in obese individuals is attributable to a complex interplay of physiological mechanisms, including chronic low-grade inflammation, adipokine imbalance, impaired immune cell function, and metabolic dysfunction.^[3,8] These immunometabolic changes have the potential to influence not only the response to natural infections but also the effectiveness and duration of immunity conferred by vaccines.^[8,9] For this reason, obesity is regarded as a risk factor requiring special consideration with respect to vaccine-preventable diseases.^[2,4]

Research on influenza vaccines has demonstrated that while antibody responses after vaccination are initially sufficient in obese individuals, clinical

protection may be lower compared to healthy individuals of normal weight.^[9,10] It has been documented that obese adults who have received the influenza vaccine have a considerably elevated risk of laboratory-confirmed influenza or influenza-like illness.^[10] Reports have indicated a correlation between obesity and a potential impairment in cellular immune response following vaccination.^[9,11]

In the context of pneumococcal vaccines, obesity is also considered a condition associated with increased risk of pneumonia and invasive pneumococcal disease. The presence of chronic inflammation, diminished respiratory function, and concomitant comorbidities in obese individuals may result in more severe pneumococcal infections. Clinical and epidemiological data demonstrate a correlation between pneumococcal vaccination in high-risk groups and a reduction in the incidence of serious pneumonia and invasive disease. Therefore, it is recommended that obese individuals be prioritized for pneumococcal vaccination.^[6,12]

However, reports indicate that vaccination rates among obese individuals remain below target levels in most countries. A multitude of factors have been demonstrated to influence vaccination behavior, including perceived risk, health literacy, socioeconomic status, and recommendations made by healthcare professionals.^[6,7] Research has demonstrated that recommendations from family physicians, particularly at the primary care level, play a pivotal role in determining adult vaccination behavior.^[7,11]

Although previous studies have described low adult vaccination rates in several high-risk groups, fewer studies have examined vaccination behavior in adults with obesity by simultaneously evaluating obesity-related risk perception and the source of vaccine recommendation. In this context, assessing whether individuals recognize obesity as a condition that may increase the

need for vaccination may help clarify behavioral determinants of vaccine uptake in this population.

This study aimed to evaluate influenza and pneumococcal vaccination status and related factors among adults with obesity attending a single-center obesity outpatient clinic.

Materials and Methods

Study design

This single-center cross-sectional analytical study was conducted between June 2025 and January 2026 in the obesity outpatient clinic of a tertiary teaching and research hospital. The study was designed to evaluate influenza and pneumococcal vaccination status and factors associated with vaccination behavior among adults with obesity.

Study population and sample

The study population consisted of all adults with obesity who attended the obesity outpatient clinic of a tertiary teaching and research hospital during the study period. A total of 258 eligible adults with obesity constituted the study population. Individuals aged 18 years or older with a body mass index (BMI) ≥ 30 kg/m², as defined by the World Health Organization, and who agreed to participate were included. Seven participants were excluded because of incomplete data or failure to complete the questionnaire. Therefore, the final study sample consisted of 251 participants, corresponding to a valid analysis rate of 97.3%.

Since the study aimed to include the entire accessible population of eligible adults with obesity attending the clinic during the study period, no separate sampling procedure was applied. An a priori sample size calculation was not performed. However, the final sample size of 251 participants was considered adequate for the planned descriptive analyses and multivariable

logistic regression models, which included five independent variables.

Data collection

Data were collected from the accessible study population using a structured face-to-face questionnaire administered to eligible adults with obesity who attended the obesity outpatient clinic during the study period. The questionnaire was developed by the researchers based on the relevant literature on adult vaccination, obesity-related infection risk, and determinants of vaccine uptake. No pilot study was conducted, and the questionnaire was not a psychometrically validated scale.

The questionnaire consisted of three sections: sociodemographic characteristics, including age and gender; clinical characteristics, including BMI and the presence of chronic disease other than obesity; and vaccination-related variables, including influenza and pneumococcal vaccination status, obesity-related risk perception, source of vaccine recommendation, and reasons for non-vaccination.

Obesity-related risk perception was assessed using a single researcher-developed yes/no question: "Do you think obesity increases the risk of severe respiratory infections and therefore creates a need for influenza and pneumococcal vaccination?" This question was intended to evaluate whether participants perceived obesity as a condition increasing the need for vaccination, not whether they perceived vaccination itself as risky. Since this item was not part of a validated multidimensional scale, it was interpreted as a simple indicator of perceived risk.

BMI was calculated by dividing body weight in kilograms by the square of height in meters (kg/m²). Vaccination status and the presence of chronic disease other than obesity were recorded based on participant self-report and were not verified

through vaccination cards, electronic health records, or national immunization registry data.

The dependent variables were influenza vaccination status and pneumococcal vaccination status. The independent variables were age, BMI, gender, presence of chronic disease other than obesity, and obesity-related risk perception.

Statistical analysis

Statistical analyses were performed using the Jamovi software (version 2.6.22.0). The distribution of continuous variables was assessed using the Shapiro–Wilk test. Given the non-normal distribution of the variables age ($W=0.989$; $p=0.046$) and body mass index (BMI) ($W=0.880$; $p<0.001$), descriptive statistics were presented as median and interquartile range (IQR). Categorical variables were expressed as number and percentage. Non-parametric tests were utilized for the purpose of conducting intergroup comparisons.

The Mann–Whitney U test was employed for the analysis of continuous variables in comparisons between pairs of groups, while the chi-square test was utilized for categorical variables. Initially, univariate analyses were conducted to ascertain the factors associated with influenza and pneumococcal vaccination status.

To identify the independent predictors of influenza and pneumococcal vaccination status, multivariable logistic regression analyses were performed. In both models, the dependent variable was defined as vaccination status (Yes/No). The following variables were included in the multivariable models: age, BMI, obesity-related risk perception, presence of chronic disease other than obesity, and gender. The results of the study were reported as odds ratio (OR) and 95% confidence interval (CI). The model's fit was evaluated by measuring deviance, Akaike information criterion (AIC), and pseudo R^2 values.

Ethical considerations

Ethics committee approval was obtained from the relevant institutional ethics committee (09.10.2024; No: 2024/18/11). The research was conducted in accordance with the principles of the Declaration of Helsinki. Informed consent was obtained from all participants included in the study.

Results

The final study sample comprised 251 adults with obesity, and all analyses were performed on this sample. The median age of the participants was 51 years (IQR: 17.0), and the median BMI was 35.7 kg/m² (IQR: 5.68). The demographic characteristics of the sample are displayed in Table 1.

Findings related to the influenza vaccine

The median age of individuals who received the influenza vaccine was 52 years (IQR: 18.5), while it was 48 years (IQR: 15.0) for those who did not receive the vaccine. A subsequent analysis revealed no statistically significant difference in age between the groups (Mann–Whitney $U=6663$, $p=0.054$). The median BMI was 36.8 (interquartile range [IQR]: 6.08) kg/m² in the influenza-vaccinated group and 35.2 (IQR: 4.35) kg/m² in the unvaccinated group, and no significant difference was found between the groups in terms of BMI (Mann–Whitney $U=6770$, $p=0.082$).

A statistically significant relationship was identified between obesity-related risk perception and influenza vaccination status ($\chi^2=108$, $p<0.001$). Positive obesity-related risk perception was reported by 90.4% (104/115) of influenza-vaccinated participants and by 25.0% (34/136) of unvaccinated participants. No statistically significant association was found between gender and influenza vaccination status ($\chi^2=1.94$, $p=0.164$).

A statistically significant relationship was also identified between the presence of chronic disease

other than obesity and influenza vaccination status ($\chi^2=18.4$, $p<0.001$). Chronic disease other than obesity was present in 78.3% (90/115) of influenza-vaccinated participants and in 52.2% (71/136) of unvaccinated participants (Table 2).

Findings related to the pneumococcal vaccine

The median age of individuals who received the pneumococcal vaccine was 57 (IQR: 16) years, while it was 48 (IQR: 15) years in individuals who did not receive the vaccine. A statistically significant difference was found between the groups in terms of age (Mann–Whitney $U=3911$, $p<0.001$). The median BMI was 36.5 (IQR: 6.20) kg/m^2 in the pneumococcal-vaccinated group and 35.5 (IQR:

5.13) kg/m^2 in the non-vaccinated group. A Mann–Whitney U-test was performed, and the result indicated that there was no significant difference in BMI between the two groups ($U=5509$, $p=0.203$).

A statistically significant association was found between obesity-related risk perception and pneumococcal vaccination status ($\chi^2=41.7$, $p<0.001$). Positive obesity-related risk perception was reported by 88.2% (60/68) of pneumococcal-vaccinated participants and by 42.6% (78/183) of unvaccinated participants.

The presence of chronic disease other than obesity was significantly associated with pneumococcal vaccination status ($\chi^2=6.16$, $p=0.013$). Chronic disease other than obesity was present in 76.5%

Table 1. Demographic characteristics of adults with obesity and their vaccination status with influenza and pneumococcal vaccines.

Variable	n (%) or Median (IQR)
Age (years)	51 (17)
BMI (kg/m^2)	35.7 (5.7)
Gender	
Female	181 (72.1)
Male	70 (27.9)
Presence of chronic disease other than obesity	
Yes	161 (64.1)
No	90 (35.9)
Positive obesity-related risk perception	
Yes	138 (55.0)
No	113 (45.0)
Those who have received the influenza vaccine	115 (45.8)
Those who have received the pneumococcal vaccine	68 (27.1)

Table 2. Comparison of demographic and clinical characteristics according to influenza vaccination status among obese adults.

Variable	Influenza vaccine*		Test	p
	Yes	No		
Age, median (IQR)	52 (18.5)	48 (15.0)	Mann–Whitney $U=6663$	0.054
BMI, median (IQR)	36.8 (6.1)	35.2 (4.4)	Mann–Whitney $U=6770$	0.082
Positive obesity-related risk perception, n (%)	104 (90.4)	34 (25.0)	$\chi^2=108$	<0.001
Presence of chronic disease other than obesity, n (%)	90 (78.3)	71 (52.2)	$\chi^2=18.4$	<0.001
Female gender, n (%)	78 (67.8)	103 (75.7)	$\chi^2=1.94$	0.164

* Group sizes: vaccinated n=115; non-vaccinated n=136.

(52/68) of pneumococcal-vaccinated participants and in 59.6% (109/183) of unvaccinated participants. However, no statistically significant relationship was found between gender and pneumococcal vaccination status ($\chi^2=0.0001$, $p=0.991$) (Table 3).

Among vaccinated participants, family physicians were the most frequently reported source of recommendation for both influenza and pneumococcal vaccines (influenza: 56.5%; pneumococcal: 47.1%). Other specialist physicians and pharmacists were also reported as recommendation sources, but at lower frequencies. These findings describe the distribution of recommendation sources among vaccinated participants and should not be interpreted as directly measuring physicians' vaccination practices or attitudes (Table 4).

The most frequent reason for not receiving the influenza vaccine was concern about vaccine-related adverse effects (33.1%), followed by the perception that vaccination was not needed (25.0%). For pneumococcal vaccination, the most

frequent reason was insufficient information about the vaccine (47.5%), followed by fear of adverse effects (15.8%) and the perception that vaccination was not needed (15.3%). Cost-related barriers, difficulty accessing healthcare facilities, previous negative vaccine experience, lack of physician recommendation, and religious or cultural concerns were reported less frequently (Table 5).

Multivariable logistic regression analyses

Multivariable logistic regression analyses were performed to evaluate the independent effects of age, BMI, obesity-related risk perception, presence of chronic disease other than obesity, and gender on vaccination status.

Multivariable logistic regression analysis for influenza vaccination (Model 1)

To assess the independent determinants of influenza vaccination status, a multivariable logistic regression analysis was performed. The model included age, BMI, obesity-related risk perception, presence of chronic disease other

Table 3. Comparison of demographic and clinical characteristics according to pneumococcal vaccination status among adults with obesity.

Variable	Pneumococcal vaccine*		Test	p
	Yes	No		
Age, median (IQR)	57.0 (16.0)	48.0 (15.0)	Mann-Whitney U=3911	<0.001
BMI, median (IQR)	36.5 (6.2)	35.5 (5.1)	Mann-Whitney U=5509	0.203
Positive obesity-related risk perception, n (%)	60 (88.2)	78 (42.6)	$\chi^2=41.7$	<0.001
Presence of chronic disease other than obesity, n (%)	52 (76.5)	109 (59.6)	$\chi^2=6.16$	0.013
Female gender, n (%)	49 (72.1)	132 (72.1)	$\chi^2=0.0001$	0.991

* Group sizes: vaccinated n=68; non-vaccinated n=183.

Table 4. Sources of vaccination recommendation for influenza and pneumococcal vaccines among vaccinated obese individuals

Recommendation source	Influenza vaccine (n=115) n (%)	Pneumococcal vaccine (n=68) n (%)
Family physician	65 (56.5)	32 (47.1)
Other specialist physicians	27 (23.5)	19 (27.9)
Pharmacist	21 (18.3)	15 (22.1)
Other	2 (1.7)	2 (2.9)

than obesity, and gender. Model fit indices were as follows: deviance=214, Akaike information criterion (AIC)=226, McFadden $R^2=0.382$, and Nagelkerke $R^2=0.547$.

In multivariable analysis, the likelihood of receiving the influenza vaccine was significantly lower among participants without obesity-related risk perception compared with those with positive obesity-related risk perception (OR=0.03; 95% CI: 0.02–0.07; $p<0.001$). The presence of chronic disease other than obesity independently increased the likelihood of receiving the influenza vaccine (OR=3.31; 95% CI: 1.58–6.95; $p=0.002$). Subsequent analyses revealed that age, BMI, and gender did not demonstrate independent effects on influenza vaccination status ($p > 0.05$) (Table 6).

Multivariable logistic regression analysis for pneumococcal vaccination (Model 2)

A multivariable vaccination logistic regression model was established to evaluate the independent determinants of pneumococcal vaccination status. The model included age, BMI, obesity-related risk perception, presence of chronic disease other than obesity, and gender. Model fit indices were as follows: deviance=230, AIC=242, McFadden $R^2=0.217$, and Nagelkerke $R^2=0.325$.

The analysis results indicated that age independently increased the likelihood of receiving the pneumococcal vaccine (OR=1.06; 95% CI: 1.02–1.09; $p<0.001$). The likelihood of receiving the pneumococcal vaccine was significantly lower among participants without obesity-related risk

Table 5. Reasons for non-vaccination against influenza and pneumococcal vaccines among unvaccinated obese individuals.

Reason for not getting vaccinated	Influenza (n=136) n (%)	Pneumococcal (n=183) n (%)
I don't think I need to be vaccinated	34 (25.0)	28 (15.3)
I don't think vaccines are necessary	19 (14.0)	16 (8.7)
I believe vaccines are ineffective	19 (14.0)	9 (4.9)
I don't have enough information about the vaccine	11 (8.1)	87 (47.5)
I'm afraid of the side effects of vaccines	45 (33.1)	29 (15.8)
Social security does not cover it / the fee is too high	2 (1.5)	6 (3.3)
Access to healthcare facilities is difficult	–	1 (0.5)
I had a bad experience with a vaccine before	3 (2.2)	3 (1.6)
My doctor did not recommend vaccination	2 (1.5)	4 (2.2)
Negative religious/cultural thoughts	1 (0.7)	–

Table 6. Multivariable logistic regression analysis of factors associated with influenza and pneumococcal vaccination among adults with obesity.

Variable	Influenza vaccination			Pneumococcal vaccination		
	OR*	95% CI	p	OR*	95% CI	p
Age (years)	1.00	0.97 – 1.03	0.929	1.06	1.02–1.09	<0.001
BMI (kg/m ²)	0.97	0.90 – 1.04	0.327	0.99	0.93–1.06	0.844
Obesity-related risk perception (negative vs positive)	0.03	0.02 – 0.07	<0.001	0.10	0.04–0.23	<0.001
Presence of chronic disease other than obesity (Yes vs No)	3.31	1.58 – 6.95	0.002	1.38	0.67–2.87	0.382
Female (vs male)	1.07	0.50 – 2.29	0.869	1.32	0.64–2.70	0.452

* ORs were reported as “vaccinated (Yes)”. For obesity-related risk perception, “negative” refers to participants who did not perceive obesity as increasing the need for vaccination, whereas “positive” refers to participants who perceived obesity as increasing the need for vaccination.

perception compared with those with positive obesity-related risk perception (OR=0.10; 95% CI: 0.04–0.23; $p<0.001$). BMI, the presence of chronic disease other than obesity, and gender did not show statistically significant independent associations with pneumococcal vaccination status ($p>0.05$) (Table 6).

Discussion

The most striking finding of this study was that a considerable proportion of adults with obesity had not received influenza and especially pneumococcal vaccination despite being followed in an obesity outpatient clinic. Vaccination uptake appeared to be closely related to whether participants recognized obesity as a condition increasing the need for vaccination. Pneumococcal vaccination was particularly limited and was more common among older participants, whereas influenza vaccination was more common among participants with chronic disease other than obesity. These findings suggest that awareness of obesity-related infection risk and vaccine-specific information needs are central issues in this clinical population.

The finding that obesity-related risk perception was associated with both vaccines suggests that recognition of obesity as a condition increasing the need for vaccination may be an important behavioral determinant of vaccine uptake. Participants who perceived obesity as increasing the need for influenza and pneumococcal vaccination were more likely to report being vaccinated. Previous studies have also shown that perceived disease risk, perceived severity, and perceived benefits of vaccination are important determinants of adult vaccination behavior.^[13,14] However, in the present study, risk perception was measured using a single yes/no question rather than a validated multidimensional scale. Therefore, this finding should be interpreted as

reflecting a simple perceived-risk indicator rather than a comprehensive psychological construct.

Among vaccinated participants, family physicians were the most frequently reported source of recommendation for both influenza and pneumococcal vaccines. This finding indicates that family physicians may be an important source of vaccine information for adults with obesity. Published evidence indicates that physician recommendation is one of the important predictors of adult vaccine acceptance, and clear vaccine recommendations from primary care physicians have been associated with increased vaccination uptake.^[14,15] However, the present study did not directly evaluate family physicians' knowledge, attitudes, or clinical practices regarding obesity-related vaccination. Therefore, this result should be interpreted as a patient-reported distribution of recommendation sources rather than evidence of physician behavior.

The low proportion of participants reporting lack of physician recommendation as the main reason for non-vaccination should also be interpreted cautiously. In the present study, the most common barriers were concern about vaccine-related adverse effects for influenza vaccination and insufficient information for pneumococcal vaccination. Previous studies have described missed opportunities for adult immunization in healthcare settings, particularly when vaccination is not discussed during encounters with high-risk individuals.^[16] In our study, however, the data do not allow direct conclusions about whether such missed opportunities occurred, because vaccination counseling practices were not observed directly.

The influenza and pneumococcal vaccination rates observed in this study were 45.8% and 27.1%, respectively. These rates may be considered suboptimal in light of previous adult vaccination coverage reports and national studies showing insufficient vaccination uptake among high-

risk groups. Previous reports have also shown that influenza vaccination rates in high-risk groups often remain below desired levels, while pneumococcal vaccination rates are generally lower than influenza vaccination rates.^[17,18] It is noteworthy that the reasons for non-vaccination differed by vaccine type. Concern about adverse effects was the most common reason for not receiving the influenza vaccine, whereas insufficient information was the leading reason for not receiving the pneumococcal vaccine. This suggests that influenza vaccine hesitancy may be driven mainly by safety concerns, while pneumococcal under-vaccination may be more closely related to limited awareness and insufficient knowledge.

National studies from Türkiye also support the finding that adult vaccination uptake remains insufficient among high-risk groups. In the TEMD Vaccination Study, influenza and pneumococcal vaccination rates among adults with diabetes were reported to be low, particularly for pneumococcal vaccination. Similarly, the diaVAX study showed that physician awareness and structured recommendations may improve influenza and pneumococcal vaccine uptake among patients with diabetes. The TURCAP study also reported low influenza and pneumococcal vaccination rates among adults hospitalized with community-acquired pneumonia. In this context, the present findings are consistent with national evidence showing that adult vaccination coverage remains limited among high-risk groups in Türkiye.^[19-21]

Multivariable logistic regression analyses have identified independent determinants for influenza and pneumococcal vaccination. Obesity-related risk perception was independently associated with both vaccines, whereas chronic disease other than obesity was associated with influenza vaccination and older age was associated with pneumococcal vaccination. These findings suggest that clinical risk and perceived risk may

influence vaccination behavior in different ways. Individuals with additional chronic diseases may have more frequent contact with healthcare services or may receive more vaccine-related counseling, which may partly explain their higher influenza vaccination uptake. For pneumococcal vaccination, the association with age may reflect greater awareness of pneumonia risk or more frequent medical follow-up among older adults.

Strengths of the Study

The primary strength of this study is its focus on adults with obesity, a group that is biologically vulnerable to severe respiratory infections but relatively underrepresented in adult vaccination behavior studies. The simultaneous evaluation of influenza and pneumococcal vaccination allowed comparison of vaccine-specific patterns of uptake and barriers. In addition, the assessment of obesity-related risk perception, recommendation source, and reasons for non-vaccination provided a broader understanding of behavioral and informational factors associated with adult vaccination in this clinical population. The use of multivariable logistic regression analyses also enabled the evaluation of independent factors associated with vaccination uptake.

Weaknesses and limitations of the study

This study has several limitations. First, its cross-sectional design precludes causal interpretation of the associations observed. Second, the study was conducted in a single tertiary obesity outpatient clinic, which may limit the generalizability of the findings to community-based or primary care populations. Third, although the study aimed to include the entire accessible population during the study period, participants were recruited from clinic attendees, and this may have introduced selection bias. Fourth, vaccination status, chronic disease status other than obesity, and reasons for non-vaccination were based on participant self-report and were not verified using vaccination

cards, electronic health records, or national immunization registry data. Therefore, recall bias and social desirability bias may have affected the results, particularly because the questionnaire was administered face to face. Fifth, obesity-related risk perception was measured using a single researcher-developed yes/no item rather than a validated multidimensional scale, limiting the depth and measurement validity of this construct. Sixth, socioeconomic variables such as education level, income, employment status, and health insurance status were not collected and therefore could not be included in the regression models. Finally, the study did not directly evaluate physicians' knowledge, attitudes, or recommendation behaviors; recommendation source was assessed only from the participants' perspective.

Conclusion

Influenza and pneumococcal vaccination status among adults with obesity was associated with obesity-related risk perception and selected clinical factors. The findings indicate that adults with obesity may benefit from clearer information about their risk of severe respiratory infections and the potential role of influenza and pneumococcal vaccination. Vaccine-specific counseling should address safety concerns related to influenza vaccination and information gaps related to pneumococcal vaccination. Strengthening clear and individualized vaccine recommendations during clinical encounters may support preventive health practices in this population.

Ethical approval

This study has been approved by the Samsun University Non-Interventional Research Ethics Committee (approval date: 09.10.2024, number: 2024/18/11). Written informed consent was obtained from the participants.

Author contribution

The authors declare contribution to the paper as follows: Study conception and design: ET, BY; data collection: ET; analysis and interpretation of results: BY; draft manuscript preparation: BY. All authors reviewed the results and approved the final version of the article.

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The authors declare the study received no funding.

Conflict of interest

The authors declare that there is no conflict of interest to disclose.

Generative AI Statement

Generative AI tools were used solely for language editing and improvement of readability. The authors critically reviewed and revised the resulting text and take full responsibility for the final content.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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