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Low uptake of seasonal influenza vaccination in Al-Jouf region of Saudi Arabia

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ABSTRACT

Introduction: Seasonal influenza is a contagious viral respiratory condition typically occurring in the fall to early spring months of the year globally. The risk of infection from seasonal influenza can be greatly reduced with vaccination. Unfortunately, research has indicated that the seasonal influenza vaccination rate in Saudi Arabia is low. This study assessed the uptake of seasonal influenza vaccination among adults residing in Al-Jouf region, Saudi Arabia.

Materials and Methods: A cross-sectional survey targeting adults (20–80 years) residing in Al-Jouf region, Saudi Arabia, was conducted to gather information about their sociodemographic characteristics, chronic conditions, knowledge about periodic health examinations (PHE), regular use of PHE, and uptake of seasonal influenza vaccination. Comparative statistics and a multivariate logistic regression analysis were conducted to determine characteristics associated with the uptake of seasonal influenza vaccination.

Results: A total of 624 respondents completed the survey and participated in this study. Among the participants, 27.4% indicated they visited their primary healthcare centers or hospitals every year to get a seasonal influenza vaccination. The regression analysis showed that the odds of getting a seasonal influenza vaccination were higher among employed respondents (Odds Ratio [OR] = 1.73; $P = 0.039$), respondents who were employees of the healthcare sector (OR = 2.31; $P = 0.001$), and those with a higher PHE Knowledge Score (OR = 1.22; $P = 0.008$), compared to their counterparts.

Conclusions: Seasonal influenza is a serious condition warranting appropriate prevention measures, including vaccination. However, this study confirmed low rates of seasonal influenza vaccination in Al-Jouf Region of Saudi Arabia. Interventions to boost vaccination uptake, in particular among unemployed individuals, those not working in the healthcare sector, and those with lower PHE knowledge Scores, are therefore recommended.

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1. Introduction

Seasonal influenza is a contagious viral respiratory condition typically occurring in the fall to early spring months of the year globally (WHO, 2023). Common symptoms include fever, chills,

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headache, nasal congestion, cough and body aches; however, severe cases can lead to death (WHO, 2023). Individuals with comorbid conditions are more likely to become infected with seasonal influenza (National Foundation for Infectious Disease, 2018) and are more likely to experience severe cases than individuals without such conditions as evidenced by higher rates of emergency department visits and hospitalization (Near et al., 2022). The World Health Organization (WHO) estimates that between 290,000 to 650,000 deaths can be attributed to seasonal influenza each year (WHO, 2022). In Saudi Arabia in 2020, 4.58% of total deaths were attributed to seasonal influenza and pneumonia (World Health Rankings, 2020). Saudi Arabia ranks 82nd in the world for their seasonal influenza mortality rate of 30.9 per 100,000 persons (World Health Rankings, 2020). A meta-analysis of 62,431 from 18 studies of Hajj pilgrims documented an overall prevalence rate

of 5.9% for influenza type A and 3.6% for influenza type B (Safarpour et al., 2022).

The risk of infection and burden from seasonal influenza can be greatly reduced with vaccination (WHO, 2023). Because new viral strains of influenza are constantly emerging, the influenza vaccination is reformulated regularly, and annual vaccination from influenza is recommended (Keilman, 2019). WHO recommends the influenza vaccine for the following high-risk groups: pregnant women, children aged 6–59 months, older adults, individuals with chronic conditions, and healthcare workers (WHO, 2012). In 2015, the Saudi Thoracic Society (STS) recommended that unless contraindicated, all persons aged 6 months and older should be vaccinated annually for seasonal influenza (Zeitouni et al., 2015). The seasonal influenza vaccine is now mandatory for individuals participating in the annual Hajj pilgrimage in Saudi Arabia but is not required among the general adult population (Safarpour et al., 2022).

Unfortunately, research has indicated that the seasonal influenza vaccination rate in Saudi Arabia is relatively low. Six studies conducted among Saudi citizens that had been published between October 19, 2017 and October 18, 2022 were identified in the literature. In general, seasonal influenza vaccination rates reported in these studies ranged from 12.7% to 55.0% (Alhazmi et al., 2019; Aljamili, 2020; Barry et al., 2020; Fayed et al., 2021; Sales et al., 2021; Minshawi et al., 2022). However, these studies inquired about seasonal influenza vaccination status in different ways. For example, one survey study of Arabic speaking individuals aged ≥ 15 years conducted in Riyadh city reported that 55.0% of respondents were vaccinated at the time of the survey (Aljamili, 2020). Two other survey studies assessed past seasonal influenza vaccination status, finding 19.5% among a nationwide sample of adults (Fayed et al., 2021), and 44.3% of a sample, residents from Riyadh province, had been vaccinated any time in the past (Barry et al., 2020). Minshawi et al. (2022) examine seasonal vaccination rates in relation to the COVID-19 pandemic, finding 40% of Saudi adults were vaccinated before the COVID-19 pandemic but only 25.7% were vaccinated during the pandemic. Surveillance data on vaccination rates among Hajj pilgrims found only 13.8% of pilgrims between 2007 and 2012 were vaccinated for both seasonal influenza and pneumonia (Zafer et al., 2018). Although vaccination status was measured in different ways, taken as a whole, these studies indicate that seasonal influenza vaccination rates are well below the levels dictated by seasonal influenza vaccination guidelines. As such, continued monitoring of seasonal influenza vaccination status of Saudi citizens should be undertaken to guide efforts to improve vaccination rates. This study was undertaken for that purpose.

2. Materials and methods

An analytical cross-sectional survey design was used for this study.

2.1. Data collection instrument

A member of the study team (NA) developed a survey questionnaire, which consisted of socio-demographic questions, questions about presence of chronic conditions, knowledge about periodic health examinations (PHE), and regular use of PHE, reported on elsewhere (Al-Etesh et al., 2020; Alzahrani et al., 2022), and questions about the use of seasonal influenza and pneumococcal conjugate vaccinations. Then the questionnaire was reviewed by experts in the field of primary care and general medicine and modified based on their inputs to ensure its content validity. After modifications, the reliability of the questionnaire was determined with a Cronbach's Alpha of 0.867.

2.2. Sample

When the survey was fielded, there were 63 primary healthcare centers operated by Ministry of Health to serve 531,952 residents in Al-Jouf region (Ministry of Health, 2021; General Authority for Statistics, 2019). 63.76% of Al-Jouf residents (339,181 residents) were adults aged ≥ 20 years (General Authority for Statistics, 2019). Therefore, the desired minimum target number of respondents for this study was 384 to ensure a 95% confidence level and a 5% margin of error. To be eligible to complete the survey, respondents had to be current residents of the Al-Jouf Region and 20–80 years of age. Adults ≤ 19 years of age and those from outside of the region were excluded.

2.3. Data collection process

The study used a convenience sampling frame, where the study team approached potentially eligible respondents in public locations (commercial complexes, parks, government office buildings) in five communities in Al-Jouf Region (Skaka city, Tabarjal governorate, Dumat Al-Jandal governorate, Al-Qurayyat governorate, and Swayer center) between December 1, 2020 and January 31, 2021 and invited them to complete the survey. The study team determined eligibility; described the focus, the voluntary nature, and confidential nature of the study; and answered potential respondents' study-related questions. A written informed consent process was completed with eligible and interested respondents before they were given the self-administered survey instrument (in their choice of Arabic or English language) to complete.

2.4. Measures

The dependent variable -- seasonal influenza vaccination status -- was measured with the question, "Do you visit primary healthcare centers or hospitals every year (periodically and regularly) - while you are healthy - in order to get the flu vaccination?" Yes responses to the question were coded as 1 and no responses were coded as 0.

Independent variables included a series of socio-demographic measures and health-related measures. Socio-demographic characteristics included age (≥ 40 years old coded as 1 and 20–39 years old coded as 0), sex (female coded as 1 and male coded as 0), and level of education (college degree coded as 1 and less than college degree coded as 0), employment status (employed coded as 1 and unemployed coded as 0), healthcare worker (yes coded as 1 and no coded as 0), and area of residence (coded as Skaka City = 2, governorates [Tabarjal, Dumat Al-Jandal and Al-Qurayyat] coded as 1, and Swayer Center coded as 0). Health-related independent variables included a measure of knowledge about periodic health examinations and three measures about chronic disease status.

The knowledge variable was measured by summing the responses to seven questions on general knowledge about and components of periodic health examinations. The responses to the individual questions were coded as 1 for the correct answer and coded as 0 for the wrong answer, with the summary measure ranging from 0 to 7. The seven questions were: 1) "Do you have any prior information about periodic health examination for adults?"; 2) "According to your information, the periodic health examination (for adults) means a person visits primary healthcare centers and hospitals only in cases of illness or complaint?"; 3) "According to your information, the periodic health examination (for adults) means regularly seeking periodic health examination at specific and regular times while he / she is healthy (not complaining of any illness?"; 4) "The measurement of weight and height is one of the components of the periodic health examination?"; 5) "When you visit a primary care provider, asking about your smok-

ing status is one of the components of periodic health examination?”; 6) “When you visit a primary care provider, asking about your daily physical activity is one of the components of periodic health examination?”; and 7) “When you visit a primary care provider, asking about fastening seat belt is one of the components of periodic health examination?”.

Chronic disease status was measured with diagnoses of diabetes, hypertension, and hyperlipidemia; responses to the chronic disease questions were dichotomized as 1 for yes, has the chronic condition, and 0 for no, does not have the chronic condition.

2.5. Statistical analysis plan

Summary statistics (e.g., frequency distribution and percentages) were employed to characterize the respondents in this study and describe their responses to the survey questions. Comparisons were made using the *t*-test (for continuous measures) and Chi-square (for binary measures) between respondent groups based on the outcome of interest (influenza vaccination) and socio-demographic characteristics and health status. A multivariate logistic regression analysis was conducted to examine the association between socio-demographic characteristics and flu vaccination status among the study sample. Analyses were undertaken using Stata/SE 16.0 (Stata Corp, College Station, Texas, USA). The alpha was set at 0.05.

2.6. Research ethics review

The Qurayyat Health Affairs Research Ethics Committee of the Saudi Arabia Ministry of Health approved the study protocol (Approval number: H-13-S-017) date (24/11/2020). The study

details were also shared with the local ethical review board to obtain community acceptance and improve data collection.

3. Results

A total of 624 adults completed the survey. Descriptive statistics indicated that 56.6% of respondents were between the ages of 20 and 39 years while 43.4% were 40 years of age or older. Two-thirds (66.7%) of respondents were male. More than three-fourths (78.4%) of respondents at a college degree while just under three-fourths (73.4%) were employed. Half of respondents live in the governorates of the region, 42.6% were from Skaka City, and 5.6% were from Swayer Center. Few respondents reporting having one of the three chronic conditions: 8% reporting having diabetes, 4.5% reported having hypertension, and 7.9% reported having hyperlipidemia. Respondents’ knowledge of PHEs was high, with an average score of 5.26 (SD = 1.34). See Table 1.

Just over a quarter of respondents (27.4%) indicated they visited their primary healthcare centers or hospitals every year to get a seasonal influenza vaccination. Significantly higher proportions of employed respondents reported getting annual seasonal influenza vaccinations than unemployed respondents (30.6% vs 18.7%, respectively, *p* = 0.003). Similarly, significantly higher proportions of respondents who work in the healthcare sector reported getting annual seasonal influenza vaccinations than those not working in the healthcare sector (48.5% vs 23.4%, respectively, *p* < 0.001). Those who reported getting annual seasonal influenza vaccinations had significantly higher PHE knowledge scores than those who reported not getting annual seasonal influenza vaccinations (5.54, SD = 1.26 vs 5.15, SD = 1.36, respectively, *p* = 0.001).

Table 1
Characteristics of Respondents, Overall and By Seasonal Influenza Vaccination Status.

	Overall		Yes Flu Vaccine		No Flu Vaccine		P-Value
	N	%	N	%	N	%	
Total	624		171	27.4	453	72.6	
Age							
20 – 39 years	353	56.6	102	28.9	251	71.1	0.340
≥ 40 years	271	43.4	69	25.5	202	74.5	
Sex							
Male	416	66.7	123	29.6	293	70.4	0.087
Female	208	33.3	48	23.1	160	76.9	
Education							
No College Degree	135	21.6	36	26.7	99	73.3	0.828
College Degree	489	78.4	135	27.6	354	72.4	
Employment Status							
Not Employed	166	26.6	31	18.7	135	81.3	0.003*
Employed	458	73.4	140	30.6	318	69.4	
Healthcare Employee							
No	525	84.1	123	23.4	402	76.6	< 0.001*
Yes	99	15.9	48	48.5	51	51.5	
Residence Location							
Swayer Center	35	5.6	12	34.3	23	65.7	0.643
Governorates**	323	51.8	87	26.9	236	73.1	
Skaka City	266	42.6	72	27.1	194	72.9	
Diabetes Diagnosis							
No	574	92.0	162	28.2	412	71.8	0.120
Yes	50	8.0	9	18.0	41	82.0	
Hypertension Diagnosis							
No	596	95.5	162	27.2	434	72.8	0.565
Yes	28	4.5	9	32.1	19	67.9	
Hyperlipidemia Diagnosis							
No	575	92.1	158	27.5	417	72.5	0.886
Yes	49	7.9	13	26.5	36	73.5	
PHE Knowledge Score	Mean	SD	Mean	SD	Mean	SD	
	5.26	1.34	5.54	1.26	5.15	1.36	0.001*

Notes: N = Number, PHE = Periodic Health Examination, SD = Standard Deviation.

**p* < 0.05.

**Governorates included Tabarjal, Dumat Al-Jandal and Al-Qurayyat.

Results of the multivariate regression analysis indicated that, after controlling for other socio-demographic and health-related characteristics, the three factors found to be significantly associated with respondents reporting they visited their primary health-care centers or hospitals every year to get a seasonal influenza vaccination in the bivariate analysis remained statistically significant. Specifically, the odds of getting a seasonal influenza vaccination were 1.73 times greater among employed respondents than unemployed respondents (SE = 0.46, $p = 0.039$). Respondents who were employees of the healthcare sector were 2.31 times more likely to get a seasonal influenza vaccination than those not employed in that sector (SE = 0.57, $p = 0.001$). The odds of getting a seasonal influenza vaccination were 1.22 times greater among those with a higher PHE Knowledge Score than those with a lower score (SE = 0.09, $p = 0.008$). See Table 2.

4. Discussion

Seasonal influenza vaccinations are recommended for all persons aged 6 months and older in Saudi Arabia (unless contraindicated) (Zeitouni et al., 2015). Nevertheless, the low rates of seasonal influenza vaccinations found in other similar studies of vaccination rates in Saudi Arabia, 12.7% and 37.2% (Alhazmi et al., 2019; Aljamili, 2020; Barry et al., 2020; Fayed et al., 2021; Sales et al., 2021; Minshawi et al., 2022), was confirmed by this study (27.4%). Influenza vaccination rates have been observed in various populations in other Arabian Gulf coast countries at a higher level than observed in this study for Saudi Arabia: 38.9% among health care professionals in United Arab Emirates (Barqawi et al., 2021), 32.8% among patients with diabetes and kidney disease in Eastern Iran (Ebrahimzadeh et al., 2022), and 52.3% of individuals with any one risk factor in Qatar (Dsouza, 2022).

To prevent seasonal influenza outbreaks in Saudi Arabia, greater efforts should be undertaken to ensure Saudi citizens and residents have a seasonal influenza vaccine. Saudi Arabia currently has an

influenza surveillance program, requires seasonal influenza vaccines for local religious pilgrims, and has authorized pharmacies to provide the vaccines (Chughtai et al., 2022; Al Awaidi et al., 2018). The Saudi Ministry of Health covers the cost of seasonal influenza vaccinations in their clinics and requires private health insurance plans to cover the vaccinations (Al Awaidi et al., 2018). The Saudi Ministry of Health launched several seasonal influenza vaccination public awareness campaigns in different years to increase vaccination rates among high-risk groups (healthcare workers, pregnant women, patients with chronic conditions, children and older adults) (Ministry of Health, 2014; Ministry of Health, 2015; Ministry of Health, 2020). These efforts have led to an increase vaccination rates among healthcare workers (Chughtai et al., 2022). However, more targeted vaccination campaigns may need to be established to increase vaccination rates among average citizens across the country.

This study found that employed individuals, employees of the healthcare sector, and those with higher PHE knowledge Scores were significantly more likely to regularly get seasonal influenza vaccinations than their counterparts. Of the previous six studies that assessed seasonal influenza vaccination rates among Saudi citizens that had been published between October 19, 2017 and October 18, 2022, only one study conducted adjusted multivariate analyses to identify significant predictors of regular seasonal vaccinations (Alhazmi et al., 2019; Aljamili, 2020; Barry et al., 2020; Fayed et al., 2021; Sales et al., 2021; Minshawi et al., 2022). Specifically, Sales et al. (2021) found positive views on the safety and efficacy of the seasonal influenza vaccine, that the vaccine should be taken at a specific time of the year, and the need to get the vaccine to minimize the risk of getting seasonal influenza were all significantly associated with regular seasonal vaccination rates. No other factors were found in that study to be significantly associated with regular seasonal vaccinations. Taken together, the results of the Sales et al. study suggests the appropriate messaging for a seasonal influenza vaccination campaign while the results of the present study suggest the most appropriate targets – unemployed individuals, those not working in the healthcare sector, and those with lower PHE knowledge Scores. A review of studies of seasonal influenza vaccination uptake in Middle Eastern countries found that increases in vaccination rates could be achieved when the vaccines are recommended by healthcare workers, when required by institutions, and encouraged through educational campaigns delivered through pamphlets and the media (Alalag et al., 2022). An analysis of 65 studies assessing the effect of interventions to improve seasonal vaccination rates identified reminders to clinician, patient outreach, patient and clinician financial incentives, and changes to teams and delivery sites (e.g., workplace vaccination clinics) as significantly associated with improvements in vaccination rates (Odd Ratios range 1.32–1.53, 95% Confidence Interval range = 1.14–1.93) (Lau et al., 2012). Moreover, a study by Nowalk et al. (2010) found that a workplace vaccination intervention that consisted of choice of vaccine administration coupled with an incentive and increased awareness was associated with a significant increase in seasonal influenza vaccination rates. These successful interventions provide options for the Saudi Ministry of Health to adopt to address the low rates of seasonal vaccinations in that country. However, since these interventions were not tested in a similar country as Saudi Arabia, small scale implementation should be considered, and the intervention evaluated before large scale adoption occurs.

This study's findings should be considered in light of several limitations. First, the study relied on self-reported responses which can be affected by social desirability bias, or the tendency of respondents to report what they believe to be the preferred response. Second, this study relied on a convenience sample of

Table 2
Characteristics Associated with Flu Vaccination.

	OR	SE	P-Value
Age	0.80	0.17	0.294
Sex			
Male	ref	–	–
Female	0.80	0.18	0.321
Education			
No College Degree	ref	–	–
College Degree	0.79	0.19	0.317
Employment Status			
Not Employed	ref	–	–
Employed	1.73	0.46	0.039*
Healthcare Sector Employee			
No	ref	–	–
Yes	2.31	0.57	0.001*
Residence Location			
Swayer Center	ref	–	–
Governorates	0.92	0.38	0.848
City	0.95	0.39	0.910
Diabetes Diagnosis			
No	ref	–	–
Yes	0.59	0.24	0.187
Hypertension Diagnosis			
No	ref	–	–
Yes	0.95	0.42	0.910
Hyperlipidemia Diagnosis			
No	ref	–	–
Yes	0.90	0.32	0.777
PHE Knowledge Score	1.22	0.09	0.008*

Notes: OR = Odds Ratio, SE = Standard Error, PHE = Periodic Health Examination.

* $P < 0.05$.

Saudi adults in public locations in communities of the Al-Jouf Region. As such, the findings may not be representative of the general Saudi population. Nevertheless, the results presented here are consistent with vaccination rates reported in similar studies conducted in other parts of Saudi Arabia (Alhazmi et al., 2019; Aljamili, 2020; Barry et al., 2020; Fayed et al., 2021; Sales et al., 2021; Minshawi et al., 2022).

5. Conclusion

Seasonal influenza is a serious condition warranting appropriate prevention measures, including vaccination. However, this study confirmed low rates of seasonal influenza vaccination in the Al-Jouf Region of Saudi Arabia. Interventions to boost vaccination uptake, in particular among unemployed individuals, those not working in the healthcare sector, and those with lower PHE knowledge Scores, is therefore recommended.

Ethical approval

The ethical approval was obtained from the Research Ethics Committee at Qurayyat Health Affairs, Ministry of Health (Approval number: H-13-S-017) date (24/11/2020). Also, the survey questionnaire was self-administered by the participants after they had received an explanation of the study purpose and the voluntary nature of the study, and they provided their written informed consent.

Authors contributions

AA & HF contributed to the study conceptualization, data cleaning and analysis, results interpretation, and manuscript preparation. NA led the design of the study, the development and validation of the questionnaire, data collection, and communications with participants. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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