

Assessment The Awareness Of The Elderly Patient's Knowledge And Attitudes Among Influenza Vaccination In Kingdom Of Saudi Arabia 2023

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ABSTRACT

Background

Although influenza vaccination is recommended for people aged 50 and above in Saudi Arabia, and the vaccine is provided free of charge, the elderly influenza vaccination rate is still low, also influenza vaccination reduces rates of pneumonia, hospitalization and mortality, influenza vaccination uptake remains low in older patients. Globally, influenza epidemics cause 3–5 million cases of severe illness and result in a quarter million deaths each year. Despite Saudi Arabia tropical climate, influenza and a significant number of hospitalization's . Influenza vaccination has been shown to reduce influenza-related hospitalizations and deaths. Patients with an influenza infection are at increased risk of severe illness and complications and have a higher mortality and morbidity rate. Despite the significant role of influenza vaccination in preventing and minimizing the serious complications of influenza infection in elderly patient's . **Aim of the study:** Assessment the awareness of the elderly patient's knowledge and attitudes among influenza vaccination in kingdom of Saudi Arabia 2023. **Methods:** This cross-sectional study was conducted among 300 participants from health care centers in Makkah Al-Mokarramah cit'y. A validated self-administered questionnaire was used. It includes questions on socio demographic variables, knowledge, attitude, and vaccine response, during the August to September 2023. **Results:** shows the majority of participant (47.0%) have average of the knowledge towards influenza vaccination followed by (35.0%) of participant high while Range(2-8) and Mean \pm SD(7.011 \pm 0.512), X^2 38.22 $P=0.001$ also the majority of participant (51.0%) have high of the attitudes towards influenza vaccination followed by (37.0%) of participant average while Range(10-18) and Mean \pm SD(15.521 \pm 1.755), X^2 70.26 $P=0.001$. **Conclusion:** The proportion of elderly people aged 50 and above who are willing to receive free influenza vaccine is high in Saudi Arabia . But the level of knowledge about influenza, vaccine and trust in society is low. The government should continue to improve the elderly's

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awareness and trust in society through medical staff, family members, television and radio media, and guide the elderly to actively vaccinate against influenza. Effective publicity should be carried out through the above channels to guide the elderly to actively vaccinate against influenza, and a significant number of hospitalization's

Keywords: Assessment, Knowledge, attitudes, Patients, PHC, seasonal influenza, Immunization, Saudi Arabia.

1.Introduction

Influenza is an acute respiratory infectious disease caused by the influenza virus. Influenza has a high incidence in the population and has caused many outbreaks around the world. Influenza patients have mild upper respiratory tract catarrhal symptoms, but severe systemic symptoms such as high fever, headache, and fatigue (1). Elderly people are more susceptible to influenza because of their weakened immune function and prevalence of chronic diseases (2). Elderly influenza patients often suffer from severe pulmonary infection, which aggravates organ disease and is one of the main causes of death (3)

Influenza is a highly contagious respiratory viral illness that occurs in certain seasons of the year. The 2 main types of human influenza viruses are influenza virus A and influenza virus B, both of which are easily spread between elderly patients, and are responsible for seasonal influenza epidemics each year, with a significant disease burden and significant morbidity and mortality.(4)

Studies have shown that population vaccination against influenza can reduce outbreaks of an influenza-like illness (5) and reduce hospital readmissions in older adults with cardiovascular or respiratory diseases (6). Antibodies produced after an influenza vaccination in frail older adults may disappear (7), but the vaccine can still reduce hospitalizations and deaths in these susceptible populations (8). Studies have also shown an inverse association between influenza vaccination coverage and SARS-CoV-2 seroprevalence, prevalence of hospitalized patients, prevalence of patients admitted to intensive care units, and deaths attributed to COVID-19 (9). Seasonal influenza vaccinations may have some influence on the incidence and severity of COVID-19 outbreaks (10). With or without additional protective benefits, an influenza vaccination is cost-effective compared with no vaccination (11). Influenza vaccinations for elderly 50 years of age or older are highly cost-effective (12) . At present, influenza vaccinations are still one

of the most effective measures to prevent the occurrence and epidemic of influenza (13). Both the WHO (14) and National Immunization Advisory Committee Technical Working Group (15) recommend influenza vaccinations and that the annual influenza vaccine should be allocated to the elderly and other high-risk groups as priority before the rest of the population.[16]Vaccination against influenza is the main way to reduce the substantial health burden that seasonal influenza causes, and is the primary tool to prevent influenza infection.(17) The Advisory Committee on Immunization Practices at the US Centers for Disease Control and Prevention (CDC) recommended that all people above age 50 years receive the influenza vaccination annually unless contraindicated.(18) There are marked differences in influenza vaccination rates between different countries, and between different times of the year.(19). The Ministry of Health in the Kingdom of Saudi Arabia launched a seasonal influenza vaccine to prevent influenza complications in high-risk groups, during influenza season.(20) This action was also based on the 2004 recommendation of The Advisory Committee on Immunization Practices in the United States.(21).

1.2 Literature Review

Peng ZB et al,(2018) reported that The average annual vaccination rate for influenza vaccine in China is only 2–3%. In most areas, influenza vaccinations require paying for themselves. Only a few provinces and cities, such as Beijing, Shanghai, Karamay in

Xinjiang Province, Shenzhen in Guangdong province and Xinxiang in Henan province, have implemented free influenza vaccinations for the elderly or children (22)

A study carried out in Lebanon in 2015, the overall vaccination rate was 27.6% . In Arab countries, the vaccination rates are variable.(23)

while in Jordan, studies reported a low vaccination rate between 9.9 and 20% of elderly patient's .(24) Locally, a study carried out in Makkah, western Saudi Arabia, found a low seasonal flu vaccination rate, with only 18.5% of people receiving the vaccine.(25)

Rosano et al,(2019) found that Since 2020, Hangzhou has started to provide free influenza vaccines to individuals with a Zhejiang household registration who are 70years old and above. About 250,000 people are vaccinated each year. In addition, about 50,000 elderly people aged 50 and above receive influenza vaccines at their own expense each year in Hangzhou, and the influenza vaccine coverage rate for this age group is about 15%. In Hangzhou and other parts of China (26), influenza vaccination rates among the elderly are still low .

Another study of military personnel in central Saudi Arabia revealed an influenza vaccine coverage rate of 17.8%.¹² A person's decision to receive the seasonal influenza vaccine depends on several factors, including beliefs and attitudes about influenza and the influenza vaccine.(27) In Slovenia, unvaccinated people cited 2 main reasons for not getting the seasonal influenza vaccine: the perception that they were in good health and therefore did not need the vaccine, and a fear of side effects. Many of those who did get the vaccine said they felt it was important to be vaccinated by their family physicians since they had confidence in them.(28) In a German study in 2010, 'fear of side effects' and the opinion that 'vaccination was not necessary' were the major reasons cited for receiving a pandemic vaccination.(25)

Studies involving the willingness of the elderly to be vaccinated, have shown that multi-component interventions, such as reminders and persuasion to vaccinate at a community level, can help increase the vaccination rate and reduce the incidence of influenza in the elderly (29)

1.2Rational.

Knowledge gaps and misperceptions regarding elderly patient's influenza vaccine contribute to the poor uptake rates. Conversely, elderly patient's education improves vaccination uptake and patient education could be provided using printed materials such as pamphlets and posters. A local study of influenza vaccination uptake in persons with diabetes mellitus found that encouragement from healthcare providers and family members, better information about vaccines, and lower cost encouraged vaccine uptake. In elderly patient's previously undecided about influenza vaccination, brief face-to-face patient education improved vaccine uptake, both arms of elderly patient's education increased uptake of influenza vaccination. Individualized counseling was not superior to pamphlets alone in improving uptake. Performing vaccination at the initial point of contact improves actual uptake rates.

2. Aim of the study

Assessment the awareness of the elderly patient's knowledge and attitudes among influenza vaccination in kingdom of Saudi Arabia 2023 .

3. Methodology

3.1 Study Design

A Cross-sectional descriptive study

3.2 Study area

The study was carried out in Saudi Arabia which is located at the center of the Western Region of Saudi Arabi. It has a holy value for all Muslims worldwide who travel to it

annually to perform Hajj and to visit the Holy Masjid and Kaaba towards which Muslims turn in prayers. The city has seven sectors of PHC. Each sector consists of a group of Primary Health Care Centers. The researcher is concerned with one of the inner PHC .

3.3 Study Population

The study was conducted among elderly patient's attending PHC in Saudi Arabia during the period of study in 2023 .

Selection criteria:

3.4 A- Inclusion criteria:

- All elderly patient's.
- Both males and females.
- All nationalities.

3.5 Exclusion criteria:

- Age <50

3.6 Sampling technique:

The researcher used Multi-stage random sampling technique, giving each sector code number from PHC After that, by using random number generator, the minimum number was one, and the maximum was seven, the generation number. Then simple random sampling technique was applied to select the PHC. Also, convenience sampling technique was utilized to select the participants in the study.

.37 Data collection tool:

A self-administered validated questionnaire was used. The questionnaire was translated to Arabic by forward-backward technique and then was piloted among 20 participants. after permission was taken through email from the researcher, with some modification and preamble letter was issued to explain the aim of the study, request to participate, and appreciation for a response. Then, the questionnaire was validated by three consultants. After that, the first part included questions on socio demographic characteristics such as age, sex, marital status, educational level and history of chronic disease. The second part included questions on influenza vaccination knowledge, attitudes and questions about vaccination status.

Reliability:

The researcher tested the reliability by retesting 10% of participants to compare the answers. An average coefficient of correlation of 0.89 has been achieved which is accepted.

3.9 Data collection technique:

After the arrival of the patient to the PHCC, they should go to the reception first to register and ensure the presence of the center's card. Then, the receptionist gives a number to every patient who waits until called by the nurse to detect the vital signs. During that period of waiting the researcher will select patient conveniently until the target number achieves and gives the questionnaire for answering after taking the consent.

3.10 Data entry and analysis:

The Statistical Package for Social Sciences (SPSS) software version 24.0 was used for data entry and analysis. Descriptive statistics (e.g., number, percentage) and analytic statistics using Chi-Square tests (χ^2) to test for the association and the difference between two categorical variables were applied. A p-value ≤ 0.05 was considered statistically significant.

3.11 Pilot study:

Was piloted among 20 participants, after permission was taken through from the researcher, with some modification and preamble letter was issued to explain the aim of the study, request to participate, and appreciation for a response. Then, the questionnaire was validated by three consultants. A pilot study was conducted in one PHC in the same sector due to the similarity to the target group using the same questionnaire to test the methodology of the study. As a feedback, the questionnaire was clear and no defect was detected in the methodology.

3.12 Ethical considerations:

The ethical approval for this study was obtained from the ethical committee for health research in Makah (2023). The objectives of the study were explained to the participants and confidentiality was assured. Participation was voluntary. A written consent was obtained from the participants. Permission from the Makah joint program of family medicine was obtained; permission from the Directorate of Health Affairs of the Holy Capital Primary Health Care was obtained.

3.13 Budget: Self-funded

4. Result

Table 1: Distribution of socio-demographic characteristics of patients in primary health care center, Makkah Al-Mokarramah(n-300)

	N	%
Age		
50-60	165	55
60-70	96	32
>80	39	13
Gender		
Male	198	66
Female	102	34
Marital status		
Single	63	21
Married	147	49
Divorced	51	17
Widow	39	13
Level of education		
Primary school degree or below	126	42
Secondary school	36	12
High school	63	21
Associate degree	75	25
Occupation		
Working	186	62

Not working	114	38
Influenza vaccination		
Vaccinated	147	49
Non vaccinated	153	51
Chronic medical conditions		
Cardiovascular and Cerebrovascular diseases	162	54
Tumor	45	15
Chronic respiratory disease	105	35
Diabetes	216	72
Other chronic diseases	96	32
Nothing	30	10

The study included 300 patients, table 1 show the remaining socio-demographic characteristics of the patients, regarding age most of participants 50-60 were (55.0%) followed by 60-70 years were (32.0%) , regarding the gender majority of participants were(66.0%) were male while female were (34.0%). Regarding the marital status the most of participant were (49.0%) married, regarding the level of education the most of participant Primary school degree or below were (42.0%) while associate degree were (25.0%), regarding the level of education the most of participant Primary school degree or below were (42.0%) while associate degree were (25.0%), regarding Occupation most of participant working were (62.0%) while not working were (38.0%), regarding the Influenza vaccination most of participant Non vaccinated were (51.0%) while Vaccinated were (49.0%), regarding Chronic medical conditions most of participant diabetes were (72.0%) while Cardiovascular were (54.0%).

Table 2: Distribution of Knowledge among the elderly patient's about the influenza vaccination patients

Knowledge of influenza vaccination	No		Yes		Chi-square	
	N	%	N	%	X ²	P-value
Influenza vaccine is safe	102	34	198	66	30.720	0.000
Influenza vaccine prevents flu	126	42	174	58	7.680	0.006
Influenza vaccine has side effects	81	27	219	73	63.480	0.000
Influenza vaccine can protect for only one flu season	69	23	231	77	87.480	0.000
Influenza vaccine can prevent serious complications among chronic diseases	132	44	168	56	4.320	0.038
Influenza vaccine is important for diabetics and should be take yearly	36	12	264	88	173.280	0.000
Disagrees that influenza vaccine has serious side effects and should not be taken	84	28	216	72	58.080	0.000
Would take influenza vaccine to prevent if effective	147	49	153	51	0.120	0.729

Would recommend influenza vaccine to all diabetic patients	105	35	195	65	27.000	0.000
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The results shown in table (2) represent the knowledge towards elderly patients. The results showed that there was a significant relation in the responses of the vaccinated regarding the safety of the influenza vaccine, increased in the yes answers were(66.0%) X^2 30.720 and $P=0.000$, regarding the Influenza vaccine prevents flu there was a significant relation and the most of participant answer Yes were (58.0%) while No were (42.0%) and X^2 7.680 and $P=0.006$, regarding Influenza vaccine has side effects, protection for only one flu season, Influenza vaccine can prevent serious complications among chronic diseases, Influenza vaccine is important for diabetics and should be take yearly, disagrees that influenza vaccine has serious side effects and should not be taken and would recommend influenza vaccine to all diabetic patients. The results presented in tables 2 results showed that there was a significant difference in the responses of the vaccinated regarding all items, increased in the yes answers were respectively X^2 63.480, 87.480, 4.320, 173.280,58.080, 0.120,27.000 and $P=0.001$, the most of participant answer Yes were respectively (73.0%,77.0%,56.0%,88.0%,72.0%,51.0%,56.0%)

Table 3: Distribution of the Knowledge about the influenza vaccination elderly patient's

knowledge			Chi-square	
	N	%	X^2	P-value
Weak	54	18	38.22	<0.001*
Average	141	47		
High	105	35		
Total	300	100		
Score	Range	2-8.		
	Mean+SD	7.011±0.512		

This table shows the majority of participant (47.0%) have average of the knowledge towards influenza vaccination followed by (35.0%) of participant high while Range(2-8) and Mean ±SD(7.011±0.512), X^2 38.22 $P=0.001$

Figure (1): Distribution of the Knowledge about the influenza vaccination elderly patients

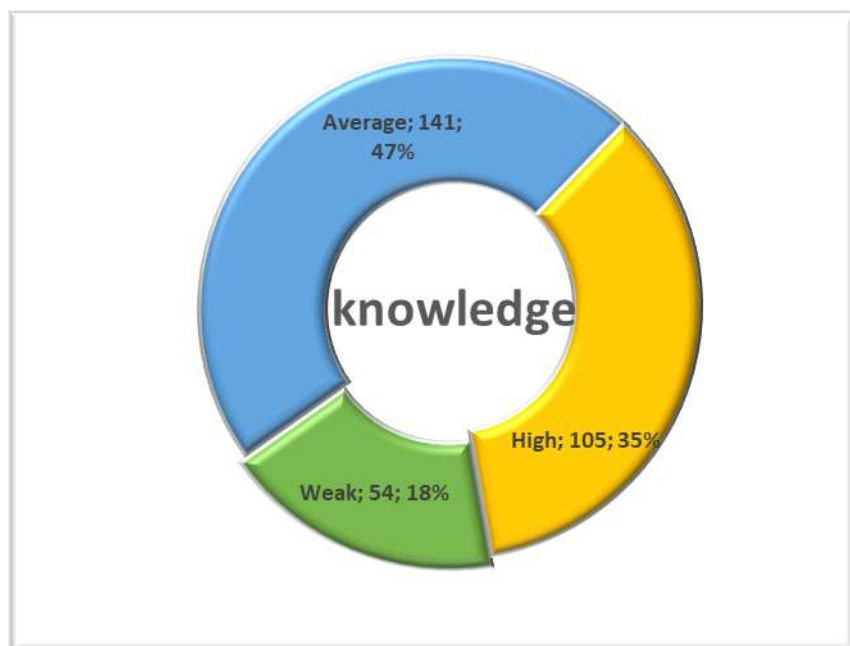


Table 4: Distribution of the attitudes of the study participants towards **elderly patients Influenza** vaccination

Items	Attitudes			% of agreement	Chi-square		
	Agree	Don't know	Disagree		X ²	P-value	
Influenza vaccination is important and should be taken yearly	N	144	84	72	74.67	29.760	<0.001*
	%	48	28	24			
Influenza vaccine prevent serious complication	N	117	144	39	75.33	59.460	<0.001*
	%	39	48	13			
Influenza vaccine has serious side effect and therefore should not be taken	N	30	96	174	50.67	103.920	<0.001*
	%	10	32	58			
Chronic diseases should receive influenza vaccine	N	147	93	60	76.33	38.580	<0.001*
	%	49	31	20			
don't need the flu vaccine because I have life immunity against flu	N	111	126	63	72.00	21.660	<0.001*
	%	37	42	21			

If there is an effective vaccine to prevent flu, I will take it	N	237	30	33	89.33	281.580	<0.001*
	%	79	10	11			

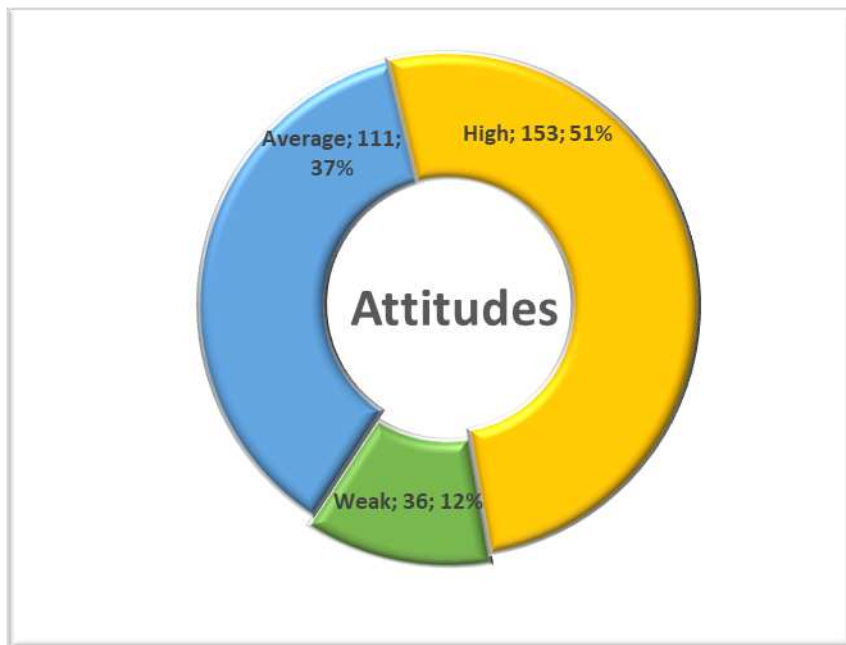
The results presented in table (4) showed that was a significant difference in the majority of items were $P=0.001$ and X^2 29.760 while % of agreement were 74.67 also showed that (48.0%) of the patients agree that influenza vaccination is important and should be taken yearly, whereas only 48.0% don't know that influenza vaccine prevent serious complications among diabetic patients, while a significant difference in the majority of items were $P=0.001$ and X^2 59.460 while % of agreement were 75.33 and only 58.0% disagree that influenza vaccine has serious side effects and therefore must not be taken while a significant difference were $P=0.001$ and X^2 103.920 while % of agreement were 50.67. Moreover, about 49.0% of the study participants agree that Chronic diseases should receive influenza vaccine, while a significant difference were $P=0.001$ and X^2 38.580 while % of agreement were 76.33, regarding the don't need the flu vaccine because I have life immunity against flu the most of participant agree were (37.0%) while a significant difference were $P=0.001$ and X^2 21.660 while % of agreement were 72.00, regarding the If there is an effective vaccine to prevent flu, I will take it the most of participant agree were (79.0%) while a significant difference were $P=0.001$ and X^2 281.580 while % of agreement were 89.33

Table 5: Distribution of the Attitudes about the influenza vaccination elderly patients

Attitudes			Chi-square	
	N	%	X²	P-value
Weak	36	12	70.26	<0.001*
Average	111	37		
High	153	51		
Total	300	100		
Score	Range	10-18.		
	Mean±SD	15.521±1.755		

This table shows the majority of participant (51.0%) have high of the attitudes towards influenza vaccination followed by (37.0%) of participant average while Range(10-18) and Mean ±SD(15.521±1.755), X^2 70.26 $P=0.001$

Figure (2): Distribution of the Attitudes about the influenza vaccination elderly patients



5. Discussion

The study shows that a high proportion of people over 50 years old in Saudi Arabia are willing to the influenza vaccine. The proportion of elderly people willing to take an influenza vaccine in Saudi Arabia is relatively high, which is similar to the study results from the Jiaojiang District of Taizhou City (25) and Chongqing City (28), revealing that elderly people are subjectively willing to take an influenza vaccine. The most of elderly population with primary school degree or below, which was contrary to the results of (23) show age most of participants < 60 were (55.0%), the gender majority of participants were(66.0%) male, the marital status the most of participant were (49.0%) married, level of education the most of participant Primary school degree or below were (42.0%) Occupation working were (62.0%), the Influenza vaccination most of participant Non vaccinated were (51.0%) while Vaccinated were (49.0%), also news media reports of a small number of severe have heightened concerns about vaccination among the highly educated .(30)

Moreover, the outcome of this research showed that the great majority of the participating patients were not able to identify the symptoms and complications of flu , such as poor control and increased risk of hospitalization chronic diseases . These results are consistent with the findings of (31) who found that South African chronic diseases patients were able to identify the symptoms and complications of flu. Investigating the participants' perceptions towards seasonal flu vaccination showed significant differences between vaccinated and non-vaccinated diabetic patients' perceptions regarding the safety, effectiveness and side effects of the seasonal flu vaccine. Previously vaccinated diabetic patients had more positive perceptions towards seasonal flu vaccination compared to non-vaccinated vaccines. The results of the present study are similar to the findings of Ahmed et al., (2023) who found that Jordanian elderly patients have a good level of knowledge and attitudes about seasonal flu and vaccination. However, the context of the two studies is different as our study focused on elderly patients (32)

On the other hand, those who were not vaccinated justified that by having alternative protection or considering flu as a mild illness or considering that the vaccine is not effective and not safe. This results highlights that there is still a need to increase the public awareness and knowledge about flu. In addition, this result might be attributed to the absence of national tracking strategy to the seasonal flu vaccination process among the patients.

Moreover, it was found that both attitudes and knowledge are significantly associated with increased likelihood of taking the seasonal vaccine, which could be referred to patients' realizing of the benefits of the seasonal flu vaccine and its effect in reducing the complications that might happen among patients. A major strength of this study is the scarcity of the local studies in Saudi Arabia that examine the knowledge, attitudes and practices towards seasonal flu and vaccination among elderly patients (33).

6. CONCLUSION

The proportion of elderly people aged 50 and above who are willing to receive free influenza vaccine is higher in Saudi Arabia. But the level of knowledge about influenza, vaccine and trust in society is not high. Lack of knowledge about influenza and influenza vaccine is the most important reason for people aged 60 and above to refuse vaccination. The government should continue to improve the elderly's awareness and trust in society through medical staff, family members, television and radio media, and guide the elderly to actively vaccinate against influenza. Effective publicity should be carried out through the above channels to guide the elderly to actively vaccinate against influenza.

7. References

1. Dee, K., Schultz, V., Haney, J., Bissett, L. A., Magill, C., & Murcia, P. R. (2023). Influenza A and respiratory syncytial virus trigger a cellular response that blocks severe acute respiratory syndrome virus 2 infection in the respiratory tract. *The Journal of infectious diseases*, 227(12), 1396-1406.
2. Li, L., & Ren, H. (2019). *Infectious Diseases*. Version 9.
3. Yi, S., Zhang, W. X., Zhou, Y. G., Wang, X. R., Du, J., Hu, X. W., & Lu, Q. B. (2023). Epidemiological change of influenza virus in hospitalized children with acute respiratory tract infection during 2014– 2022 in Hubei Province, China. *Virology Journal*, 20(1), 1-10.
4. Gordon, A., & Reingold, A. (2018). The burden of influenza: a complex problem. *Current epidemiology reports*, 5(1), 1-9.
5. Committee on Infectious Diseases. (2022). Recommendations for prevention and control of influenza in children, 2022–2023. *Pediatrics*, 150(4), e2022059275.
6. Pang, Y., Wang, Q., Lv, M., Yu, M., Lu, M., Huang, Y., ... & Xie, Z. (2021). Influenza vaccination and hospitalization outcomes among older patients with cardiovascular or respiratory diseases. *The Journal of Infectious Diseases*, 223(7), 1196-1204.
7. Zhuang, Y., Wang, M., Liang, L., Mao, Y., Wang, K., Yang, S., ... & Ye, S. (2023). First Known Human Death After Infection With the Avian Influenza A/H3N8 Virus: Guangdong Province, China, March 2023. *Clinical Infectious Diseases*, ciad462.
8. Jin, S., Jiang, C., Xia, T., Gu, Z., Yu, H., Li, J., ... & Wang, C. (2022). Age-dependent and sex-dependent differences in mortality from influenza-associated cardiovascular diseases among older adults in Shanghai, China: a population-based study. *BMJ open*, 12(9), e061068.
9. Amato, M., Werba, J. P., Frigerio, B., Coggi, D., Sansaro, D., Ravani, A., ... & Baldassarre, D. (2020). Relationship between influenza vaccination coverage rate and COVID-19 outbreak: An Italian ecological study. *Vaccines*, 8(3), 535.
10. Cocco, P., Meloni, F., Coratza, A., Schirru, D., Campagna, M., & De Matteis, S. (2021). Vaccination against seasonal influenza and socio-economic and environmental factors as determinants of the geographic variation of COVID-19 incidence and mortality in the Italian elderly. *Preventive Medicine*, 143, 106351.
11. Dilokthornsakul, P., Lan, L. M., Thakkinian, A., Hutubessy, R., Lambach, P., & Chaiyakunapruk, N. (2022). Economic evaluation of seasonal influenza vaccination in elderly and health workers: A systematic review and meta-analysis. *EClinicalMedicine*, 47.
12. Torres, A. R., Gómez, V., Kislaya, I., Rodrigues, A. P., Fernandes Tavares, M., Pereira, A. C., ... & Machado, A. (2022). Monitoring COVID-19 and Influenza: The Added Value of a Severe Acute Respiratory Infection Surveillance System in Portugal. *Canadian Journal of Infectious Diseases and Medical Microbiology*, 2023.
13. Boehm, A. B., Hughes, B., Duong, D., Chan-Herur, V., Buchman, A., Wolfe, M. K., & White, B. J. (2023). Wastewater concentrations of human influenza, metapneumovirus, parainfluenza, respiratory syncytial virus, rhinovirus, and seasonal coronavirus nucleic-

- acids during the COVID-19 pandemic: a surveillance study. *The Lancet Microbe*, 4(5), e340-e348.
14. mondiale de la Santé, O., & World Health Organization. (2022). Vaccines against influenza: WHO position paper—May 2022—Vaccins antigrippaux: note de synthèse de l’OMS—mai 2022. *Weekly Epidemiological Record= Relevé épidémiologique hebdomadaire*, 97(19), 185-208.
 15. Rogers, J. H., Casto, A. M., Nwanne, G., Link, A. C., Martinez, M. A., Nackviseth, C., ... & Chu, H. Y. (2023). Results from a test-and-treat study for influenza among residents of homeless shelters in King County, WA: a stepped-wedge cluster-randomized trial. *Influenza and Other Respiratory Viruses*, 17(1), e13092.
 16. Hirose, R., Ikegaya, H., Naito, Y., Watanabe, N., Yoshida, T., Bandou, R., ... & Nakaya, T. (2021). Survival of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and influenza virus on human skin: importance of hand hygiene in coronavirus disease 2019 (COVID-19). *Clinical Infectious Diseases*, 73(11), e4329-e4335.
 17. Zeitouni, M. O., Al Barrak, A. M., Al-Moamary, M. S., Alharbi, N. S., Idrees, M. M., Al Shimemeri, A. A., & Al-Hajjaj, M. S. (2015). The Saudi Thoracic Society guidelines for influenza vaccinations. *Annals of thoracic medicine*, 10(4), 223.
 18. Hwang, J. H., You, Y. S., Yeom, S. W., Lee, M. G., Lee, J. H., Kim, M. G., & Kim, J. S. (2023). Influenza viral infection is a risk factor for severe illness in COVID-19 patients: a nationwide population-based cohort study. *Emerging Microbes & Infections*, 12(1), 2164215.
 19. Roberts, E. T., & Mellor, J. M. (2022). Differences In Care Between Special Needs Plans And Other Medicare Coverage For Dual Eligibles: Study examines difference in care between Special Needs Plans and other Medicare coverage for dual eligibles. *Health Affairs*, 41(9), 1238-1247.
 20. Baral, R., Li, X., Willem, L., Antillon, M., Vilajeliu, A., Jit, M., ... & Pecenka, C. (2020). The impact of maternal RSV vaccine to protect infants in Gavi-supported countries: Estimates from two models. *Vaccine*, 38(33), 5139-5147.
 21. Kobayashi, M. (2023). Pneumococcal vaccine for adults aged ≥ 19 years: recommendations of the Advisory Committee on Immunization Practices, United States, 2023. *MMWR. Recommendations and Reports*, 72.
 22. Peng, Z. B., Wang, D. Y., Yang, J., Yang, P., Zhang, Y. Y., Chen, J., ... & Feng, L. Z. (2018). Current situation and related policies on the implementation and promotion of influenza vaccination, in China. *Zhonghua liu Xing Bing xue za zhi= Zhonghua Liuxingbingxue Zazhi*, 39(8), 1045-1050.
 23. Ding, H., Black, C. L., Ball, S., Fink, R. V., Williams, W. W., Fiebelkorn, A. P., ... & Greby, S. M. (2017). Influenza vaccination coverage among pregnant women—United States, 2016–17 influenza season. *MMWR. Morbidity and mortality weekly report*, 66(38), 1016.
 24. Sprenger, R., Häckl, D., Kossack, N., Schiffner-Rohe, J., Wohlleben, J., & von Eiff, C. (2022). Pneumococcal vaccination rates in immunocompromised patients in Germany: A retrospective cohort study to assess sequential vaccination rates and changes over time. *Plos one*, 17(3), e0265433.
 25. Hariri, N. H. (2022). Seasonal influenza and its vaccine: Knowledge and attitudes of the general population in Makkah city, Saudi Arabia.
 26. Rosano, A., Bella, A., Gesualdo, F., Acampora, A., Pezzotti, P., Marchetti, S., ... & Rizzo, C. (2019). Investigating the impact of influenza on excess mortality in all ages in Italy during recent seasons (2013/14–2016/17 seasons). *International Journal of Infectious Diseases*, 88, 127-134.
 27. Alotaibi, F. Y., Alhethel, A. F., Alluhaymid, Y. M., Alshibani, M. G., Almuhaydili, A. O., Alhuqayl, T. A., ... & Almasabi, A. A. (2019). Influenza vaccine coverage, awareness, and beliefs regarding seasonal influenza vaccination among people aged 65 years and older in Central Saudi Arabia. *Saudi medical journal*, 40(10), 1013.
 28. Pavlič, D. R., Maksuti, A., Podnar, B., & Kokot, M. K. (2020). Reasons for the low influenza vaccination rate among nurses in Slovenia. *Primary health care research & development*, 21, e38.
 29. TWG, I. V., National Immunization Advisory Committee, & Technical Working Group. (2020). Technical guidelines for seasonal influenza vaccination in China (2020-

- 2021). *Zhonghua liu xing bing xue za zhi= Zhonghua liuxingbingxue zazhi*, 41(10), 1555-1576.
30. Yang, X., Tang, W., Mao, D., Shu, Q., Yin, H., Tang, C., ... & Ding, X. (2021). Prevalence and risk factors associated with osteoporosis among residents aged above 20 years old in Chongqing, China. *Archives of Osteoporosis*, 16, 1-11.
 31. Li, Q., Zhang, M., Chen, H., Wu, F., Xian, J., Zheng, L., ... & Chen, Q. (2021). Influenza vaccination coverage among older adults with hypertension in Shenzhen, China: a cross-sectional survey during the COVID-19 pandemic. *Vaccines*, 9(10), 1105.
 32. Ahmed, W. S., Abu Farha, R., Halboup, A. M., Alshargabi, A., Al-Mohamadi, A., Abu-Rish, E. Y., ... & Al-Jamei, S. (2023). Knowledge, attitudes, perceptions, and practice toward seasonal influenza and its vaccine: A cross-sectional study from a country of conflict. *Frontiers in public health*, 11, 1030391.
 33. Olatunbosun, O. D., Esterhuizen, T. M., & Wiysonge, C. S. (2017). A cross sectional survey to evaluate knowledge, attitudes and practices regarding seasonal influenza and influenza vaccination among diabetics in Pretoria, South Africa. *Vaccine*, 35(47), 6375-6386.