

The Extent Of Health Practitioners' Knowledge (Attitudes, Practices) Regarding Adult Vaccination In Makkah, Saudi Arabia

Hamsah Ali AlAmri¹, Rabha Bakur Salah², Fatimah Abdulmutallab Mohammed Alsharif³, Kawthur Ebraheem Mohammad⁴, Afnan Adnan Bukhary⁵, Aeshah Zubayr Barnawi⁶, Esraa Hatim Dandormah⁷, Hanaa Mohammed Shaabain⁸

¹Nursing Specialist - Forensic Medical Services Center in Makkah

²Nursing technician - Infection control department Executive Administration of primary health care

³Employee Experience - Executive Management in Primary Healthcare

⁴Nursing Technician - Specialized Health Center in Makkah

⁵Midwife - Specialized Health Center in Makkah

⁶Nursing Specialist - Maternity and Children's Hospital in Makkah

⁷Nursing specialist- Maternity and Child Hospital in Makkah

⁸General Nursing- Forensic Medical Services Center in Makkah

Abstract:

Background: Adult vaccination plays a crucial role in preventing infectious diseases and reducing associated morbidity and mortality. However, there is limited research on the knowledge, attitudes, and practices of primary healthcare professionals regarding adult vaccination, particularly in the context of Makkah, Saudi Arabia.

Objective: The study aimed to assess the level of knowledge, attitudes, and practices among primary healthcare professionals in Makkah regarding adult vaccination.

Method: A cross-sectional study design was employed to assess the knowledge, attitudes, and practices of primary healthcare physicians, nurses, and health educators in Makkah, Saudi Arabia, regarding adult vaccination. Data was collected through self-administered questionnaires, which covered topics such as vaccine selection, vaccination schedules, contraindications, and attitudes towards adult vaccination. The collected data was analyzed using descriptive statistics and appropriate statistical tests to identify any significant differences among the healthcare professional groups.

Results: The study surveyed 193 participants, predominantly female (61.1%) nurses (73.1%). The majority of participants displayed good knowledge and positive attitudes towards adult vaccination. Nurses were more likely to provide information, address concerns, and actively recommend adult vaccination.

Conclusion: The study findings indicate that primary healthcare professionals in Makkah have a good understanding and positive attitudes towards adult vaccination, with nurses playing a significant role in promoting vaccination. These findings emphasize the importance of continuous education and support for healthcare professionals in promoting effective adult vaccination.

Introduction

Vaccination is a fundamental component of preventive healthcare, playing a crucial role in reducing the burden of infectious diseases and improving public health outcomes. Adult vaccination, in particular, has gained significant attention in recent years, as it offers protection against a range of illnesses that can have serious consequences for individuals, especially those with underlying health conditions or weakened immune systems. Primary healthcare professionals, including physicians, nurses, and health educators, are at the forefront of promoting and administering adult vaccination programs, making their knowledge,

attitude, and practice regarding this topic crucial for the success of vaccination initiatives.(Rappuoli,et al 2011)

Makkah, as a major religious and cultural hub, attracts a significant number of visitors and pilgrims each year. This diverse population brings with it a higher risk of infectious disease transmission. Vaccination among adults is essential for the prevention of diseases such as influenza, pneumococcal infections, hepatitis, and tetanus, among others. Primary healthcare professionals, including physicians, nurses, and health educators, serve as key stakeholders in promoting adult vaccination and disseminating accurate information. Understanding their knowledge, attitude, and practice regarding adult vaccination is crucial for designing effective interventions and improving vaccination rates in the community (Goronzy et al 2013). The growing number of people 65 and older in the world presents serious problems to healthcare systems. Elderly people are more vulnerable to a number of infectious diseases as they age, such as herpes zoster, influenza, meningitis, and *Streptococcus pneumoniae*. A major factor in preventing these illnesses and the problems they cause is vaccination. It is imperative to comprehend vaccination rates, associated variables, and the vaccine-related knowledge and attitudes of older persons in order to formulate efficacious public health initiatives.(Weinberger et al 2012).

One of the main causes of meningitis, bacteremia, and pneumonia in the elderly is *streptococcus pneumoniae*. It has been demonstrated that the pneumococcal conjugate vaccination (PCV13) is useful in preventing pneumococcal infections (Moberley, et al 2013). Another important factor contributing to morbidity and mortality in older individuals is influenza. To lessen the burden of influenza-related consequences, yearly influenza vaccination is advised. Immunization against particular etiological agents helps prevent meningitis, which is caused by a variety of diseases. Furthermore, the herpes zoster vaccine is advised to lower the incidence and severity of the disease since shingles, also known as herpes zoster, is a frequent viral infection in older persons.(Moberley et al 2013) It is essential for the primary healthcare professionals to stay updated on the latest recommendations and guidelines from authoritative health organizations, as the landscape of adult vaccination is constantly evolving. A deep knowledge base allows healthcare professionals to make informed decisions, provide accurate information to patients, and address any concerns or misconceptions that may arise. Furthermore, a strong grasp of the epidemiological data and the burden of vaccine-preventable diseases among the adult population can further strengthen the professionals' ability to advocate for and promote adult vaccination effectively.(Al Musa, et al 2018)

The attitude of primary healthcare professionals towards adult vaccination can significantly influence the uptake and success of vaccination programs. A positive and proactive attitude, characterized by a firm belief in the importance of adult vaccination, can foster an environment that encourages patients to participate in vaccination initiatives. Healthcare professionals who understand the benefits of adult vaccination, both for individual and public health, and who are committed to addressing barriers and concerns, are more likely to actively recommend and administer vaccines to their patients. (Redondo Margüello et al 2022) The practice of adult vaccination among primary healthcare professionals encompasses a range of activities, including the assessment of vaccination needs, the administration of vaccines, the documentation of vaccination records, and the follow-up with patients. Professionals who consistently and effectively integrate these practices into their routine care can ensure high vaccination coverage and optimal protection for their adult patients. This may involve implementing robust screening and reminder systems to identify eligible individuals, establishing efficient vaccine procurement and storage protocols, and fostering a culture of vaccination within the healthcare setting.

In the context of Makkah, Saudi Arabia, the importance of adult vaccination is further underscored by the region's strategic significance as the birthplace of Islam and a hub for religious pilgrimage. The influx of millions of visitors from around the world each year, combined with the presence of a diverse adult population, highlights the need for robust adult vaccination coverage to mitigate the risk of infectious disease outbreaks and protect the overall public health.

Objective of Study

The primary aim of this study was to assess the knowledge, attitudes, and practices of primary healthcare physicians, nurses, and health educators in Makkah, Saudi Arabia, regarding adult vaccination.

Review of Literature

Preventive healthcare is based on adult vaccination, however, in many parts of the world, including low- and middle-income countries, its adoption is still not optimal. WHO focuses on the role of health care providers in adult immunization and particularly the high-risk population, including the elderly, persons with chronic illnesses, and health care workers themselves. Within the Saudi Arabian context, a number of studies have examined knowledge, attitudes, and practices (KAP) of healthcare professionals on adult vaccination but hardly any have been undertaken in Makkah Al-Mukarramah. In Abha City, a cross-sectional study demonstrated that, although in general the attitudes of the primary care physicians were positive towards adult immunization, their understanding of specific vaccine indications, including pneumococcal and herpes zoster, was low, and their practice regarding the actual vaccine was inconsistent (Alshammari et al., 2020). On the same note studies carried out in Riyadh and Jeddah established that nurses and health educators were not adequately trained in the principles of adult immunization, with the result that nurses and health educators missed the chance to educate patients and immunize them. Timeliness, unavailability of updated guidelines, and insufficient patient awareness or need were usually mentioned among barriers (Alqahtani et al., 2021; Alzahrani et al., 2019).

The nursing workforce in Qatar needs to be skilled and competent to address rapid changes in primary healthcare services, aligning with the National Vision of Qatar. A study assessed the knowledge, attitude, and practice of Primary Health Care nurses before and after an immunization education program in Qatar. Results showed specific knowledge gaps among participants, but the program significantly improved their knowledge in areas like vaccine safety, efficiency, and contraindications. (Abdulla,et al 2020).

Another study examined attitudes and knowledge towards immunization practices among Italian general practitioners (GPs) aged over 65 years for seasonal influenza, pneumococcus, and Herpes zoster. A questionnaire was sent to 274 GPs in Parma, Italy. Knowledge gaps were identified on targeted vaccination rates, formulation of vaccines, and simultaneous immunization. Despite a generally favorable attitude towards vaccines, GPs exhibited knowledge gaps that require intervention. The lack of association between knowledge status to vaccinate highlights the complex interplay between attitudes and personal behaviors. (Vezzosi,et al 2019) Another study evaluated knowledge, attitudes, and habits of at-risk populations about the varicella-zoster virus and its vaccination revealed that 83% of participants had heard of herpes zoster (HZ). However, 74% did not recognize the link between varicella and HZ. The majority of respondents had heard of the HZ vaccine, but 94.6% had not taken it. The study recommends national campaigns targeting at-risk populations to increase awareness and increase the rate of HZ immunization. (Alhothali,et al 2023)

Research Methodology

Research Questions

1. What is the level of knowledge among primary healthcare professionals in Makkah regarding adult vaccination, including recommended schedules, vaccine efficacy and safety, and specific indications and contraindications?
2. What are the attitudes of primary healthcare professionals in Makkah towards the importance and value of adult vaccination programs?

Design of the study

A cross sectional descriptive design study was conducted on primary health care physicians in primary health care in Makkah

Setting and Population

Primary health care center in primary health care in Makkah. Primary Health Care Physicians, nurses and health educators in primary health care in Makkah was enrolled.

Sample Size

A total number 168 was calculated using Epicalc program version 1.02 assuming a power of 95 % and $\alpha=0.05$. The sample size is based on; (Primary health care physicians' attitude regarding if he think that his knowledge about Adult Vaccination to be insufficient); the percentage of who agree & who are neutral; was (25.2%) & (43.7%); respectively. (Al-Musa HMA et al,)

Inclusion and Exclusion Criteria

Inclusion criteria

1. Primary Health Care Physicians with experience more than 3 years working in primary health care in Makkah
2. Agree to participate in the study.

Exclusion criteria

1. Experience of primary health care physicians, nurses and health educators less than 3 years
2. Refusal to participate in the study.

Sampling technique

Self-administered questionnaire in English Language, that was previously used in a similar study and proved to be valid and reliable , it was paraphrased (Baykan, Z., et al 2011).To establish which vaccines they would suggest, they were asked to write the vaccines in some given situations. The 2009 report from the Centers of Disease Control and Prevention (CDC) was taken into account in the preparation of the questions regarding risk factors and the age at which the vaccinations should be applied. (Kim, D. K.,2019)

Data collection method

The questionnaires sheets was collected on the same day.

Data Management and Analysis:

The collected data was revised, coded, tabulated and introduced to a PC using Statistical package for Social Science (SPSS 15.0 for windows; SPSS Inc, Chicago, IL, 2001). Data was presented and suitable analysis was done according to the type of data obtained for each parameter.

i. Descriptive statistics:

- o Frequency and percentage of non-numerical data.

ii. Analytical statistics:

Chi-Square test was used to examine the relationship between two qualitative variables.

Fisher's exact Chi-Square test is computed when a table that does not result from missing rows or columns in a larger table has a cell with an expected frequency of less than 5. Considered level of significance- $P \leq 0.05$: Significant (S)

Ethical consideration and study approval

Ethical approval was obtained from the Research Ethics Committee at the University of Hail to ensure that the study is conducted in an ethically sound manner. Additionally, approval was obtained from the local committee for research ethics in Makkah Al-Mukarramah Health, as they are responsible for overseeing research conducted in the specific region. Ethical considerations was addressed by ensuring

participant confidentiality and anonymity. Informed consent was obtained from all participants, clearly explaining the purpose and procedures of the study, as well as their rights to withdraw at any time without repercussions. Measures were taken to protect the privacy and confidentiality of participants' personal information and data.

Data Analysis and Interpretation

Table 1: Demographic data of participants in this survey

Demographic Data		Frequency(n=193)	Percent
Age	<30 years	19	9.8%
	30-40 years	118	61.1%
	> 40 years	56	29.0%
Gender	Male	43	22.3%
	Female	150	77.7%
Specialization type	A physician	22	11.4%
	Nurse	141	73.1%
	Healthy educator	30	15.5%
Marital status	married	131	67.9%
	unmarried	62	32.1%
Experience in PHC practice	<5 years	33	17.1%
	5-10 years	36	18.7%
	>10 years	124	64.2%

There 193(100%) participants in this survey. The most prevalent age group was (30-40) 118 (61.1%).Female more prevalent, than male 150(77.7%). Nurse was the most prevalent specialization 141(73.1%).Married more prevalent than unmarried 131(67.9%).Experience in PHC practice >10 years was the most prevalent experience 124(64.2%).

Table 2: Association between Primary healthcare professionals and Demographic data

Demographic Data		A physician	Nurse	Healthy educator	X ²	P Value
Age	<30 years	0	6(31.6%)	13(68.4%)	33.1	<0.001 HS
	30-40 years	16(13.6%)	88(74.6%)	14(11.9%)		
	> 40 years	6(10.7%)	47(83.9%)	3(5.4%)		
Gender	Male	10(23.3%)	22(51.2%)	11(25.6%)	14.0	0.001 HS
	Female	12(8.0%)	119(79.3%)	19(12.7%)		
Marital status	married	16(12.2%)	101(77.1%)	14(10.7%)	7.3	0.025 S
	unmarried	6(9.7%)	40(64.5%)	16(25.8%)		
Experience in PHC practice	<5 years	6(18.2%)	20(60.6%)	7(21.2%)	9.5	0.045 S
	5-10 years	7(19.4%)	22(61.1%)	7(19.4%)		
	>10 years	9(7.3%)	99(79.8%)	16(12.9%)		

Fisher's Exact Chi-Square test, P>0.05=NS, P<0.05= S, P<0.01=HS.

The percentage of age group (<30) for Healthy educator 13(68.4%); was higher than those for A physician & Nurse. The percentage of age group (30-40) for Nurse 88(74.6%); was higher than those for A physician & Healthy educator. The percentage of age group (>40) for Nurse 47(83.9%); was higher than those for A physician & Healthy educator. Those differences; were statistically highly significant. The percentage of female for Nurse 119(79.3%); was higher than those for A physician & Healthy educator. Those differences; were statistically highly significant. The percentage of married for Nurse 101 (77.1%); was higher than those for A physician & Healthy educator. Those differences; were statistically

significant. The percentage of Experience in PHC practice (<5 years), (5-10 years) & (>10 years) for Nurse; were higher than those for A physician & Healthy educator by 20(60.6%), 22(61.1%) & 99(79.8%), respectively. Those differences; were statistically significant.

Table 3: Association between Primary healthcare professionals and Assessment of Knowledge

Knowledge assessment		A physician	Nurse	Healthy educator	X ²	P Value
1-select the vaccines recommended for adults according to the Saudi Ministry of Health guidelines	None of the above	0	1(50%)	1(50%)	32.1	0.076 NS
	Meningococcal	0	1(33.3%)	2(66.7%)		
	Hepatitis B	0	2(50%)	2(50%)		
	Pneumococcal	1(50%)	1(50%)	0		
	Influenza	7(8.9%)	61(77.2%)	11(13.9%)		
	Influenza & Meningococcal	1(12.5%)	6(75.0%)	1(12.5%)		
	Influenza & Hepatitis B	0	10(66.7%)	5(33.3%)		
	Influenza & Hepatitis B & Meningococcal	2(12.5%)	11(68.8%)	3(18.8%)		
	Influenza & Pneumococcal	2(40.0%)	3(60.0%)	0		
	Influenza & Pneumococcal & Hepatitis B	0	8(80.0%)	2(20.0%)		
	Influenza & Pneumococcal & Hepatitis B & Meningococcal	4(23.5%)	12(70.6%)	1(5.9%)		
	Influenza & Pneumococcal & Meningococcal	5(15.6%)	25(78.1%)	2(6.3%)		
2-What are the recommended vaccination schedules for adults in Makkah?	Every 5 years	0	22(78.6%)	6(21.4%)	15.2	0.034 S
	Every 10 years	0	1(50%)	1(50%)		
	Annually	18(15.8%)	84(73.7%)	12(10.5%)		
	No specific schedule	3(8.3%)	27(75.0%)	6(16.7%)		
	Not sure	1(7.7%)	7(53.8%)	5(38.5%)		
3-Can adults receive multiple vaccines during the same visit?	Yes, without any limitations	4(10.8%)	28(75.7%)	5(13.5%)	4.4	0.616 NS
	Yes, but with specific guidelines	16(13.8%)	83(71.6%)	17(14.7%)		
	No, it is not recommended	0	17(77.3%)	5(22.7%)		
	Not sure	2(11.1%)	13(72.2%)	3(16.7%)		
4-Which vaccines are recommended for pregnant women in Makkah?	Influenza vaccine	13(19.7%)	47(71.2%)	6(9.1%)	20.5	0.004 HS
	Tdap vaccine	8(10.4%)	61(79.2%)	8(10.4%)		
	Hepatitis B vaccine	0	1(33.3%)	2(66.7%)		
	None of the above	0	10(76.9%)	3(23.1%)		
	Not sure	1(2.9%)	22(64.7%)	11(32.4%)		
5-What are the common contraindications to adult vaccination?	Not sure	0	12(85.7%)	2(14.3%)	44.4	
	Pregnancy	2(9.1%)	17(77.3%)	3(13.6%)		
	History of Guillain-Barre syndrome	0	1(33.3%)	2(66.7%)		
	History of Guillain-Barre	1(100%)	0	0		

	syndrome & Pregnancy					
	Allergies to vaccine component	12(11.4%)	75(71.4%)	18(17.1%)		
	Allergies to vaccine component & Not sure	1(33.3%)	2(66.7%)	0		
	Allergies to vaccine component& Pregnancy	0	14(93.3%)	1(6.7%)		
	Allergies to vaccine component& History of Guillain-Barre syndrome	2(40%)	2(40%)	1(20%)		
	Allergies to vaccine component& History of Guillain-Barre syndrome & Pregnancy	2(66.7%)	1(33.3%)	0		
	Mild illness	0	7(100%)	0		
	Mild illness & Allergies to vaccine component	2(33.3%)	3(50%)	1(16.7%)		
	Mild illness & Allergies to vaccine component & Pregnancy	0	3(60.0%)	2(40%)		
	Mild illness & Allergies to vaccine component& History of Guillain-Barre syndrome	0	1(100%)	0		
	Mild illness & Allergies to vaccine component& History of Guillain-Barre syndrome & Pregnancy	0	3(100%)	0		
					0.014 S	

Fisher's Exact Chi-Square test, $P > 0.05 = \text{NS}$, $P < 0.05 = \text{S}$, $P < 0.01 = \text{HS}$.

There were no statistically significant between Primary healthcare professionals regards Q1-Selection of Vaccines recommended for adults. Also there were no statistically significant between Primary healthcare professionals regards question.

For the question of {Q2-What are the recommended vaccination schedules for adults in Makkah?}, the percentage of answer (Every 5 years), (Annually), (No specific schedule) for nurse was; higher than those for A Physician and Healthy educator, 22(78.6%), 84(73.7%), 27(75%); respectively. Those differences were statistically significant.

For the question of {Q4-Which vaccines are recommended for pregnant women in Makkah?},The percentage of answer (Influenza vaccine),(Tdap vaccine) was higher than those for A Physician and Healthy educator,47(71.2%)&61(79.2%); respectively. While the percentage of answer (Hepatitis B vaccine) for Healthy educator was higher than those for A Physician and Nurse, 2(66.7%).Those differences were statistically highly significant.

For the question of {Q5-What are the common contraindications to adult vaccination}.The percentage of nurse was higher than those for A Physician and Healthy educator in answer (Pregnancy),(Allergies to vaccine component),(Allergies to vaccine component& Pregnancy),(Mild illness),(Mild illness & Allergies to vaccine component),(Mild illness & Allergies to vaccine component & Pregnancy),(Mild illness & Allergies to vaccine component& History of Guillain-Barre syndrome),(Mild illness &

Allergies to vaccine component& History of Guillain-Barre syndrome & Pregnancy) were 17(77.3%), 75(71.4%),14(93.3%),7(100%),3(50%),3(60.0%),1(100%),3(100%); respectively.

Table 4: Association between Primary healthcare professionals and Assessment of Attitude

Attitude assessment		A physician	Nurse	Healthy educator	X ²	P Value
1-How confident do you feel in discussing the importance of adult vaccination with your patients?	Very confident	14(12.4%)	88(77.9%)	11(9.7%)	8.6	0.136 NS
	Somewhat confident	8(11.3%)	47(66.2%)	16(22.5%)		
	Not confident	0	4(66.7%)	2(33.3%)		
	Not applicable	0	2(66.7%)	1(33.3%)		
2-Do you believe that adult vaccination is an effective preventive measure against infectious diseases?	Strongly agree	18(14.6%)	89(72.4%)	16(13.0%)	9.0	0.253 NS
	Agree	4(7.3%)	42(76.4%)	9(16.4%)		
	Neutral	0	6(60.0%)	4(40.0%)		
	Disagree	0	1(50%)	1(50%)		
	Strongly disagree	0	3(100%)	0		
3-Are you aware of any misconceptions or concerns among your patients regarding adult vaccination?	No	6(6.7%)	68(76.4%)	15(16.9%)	3.6	0.181 NS
	Yes	16(15.4%)	73(70.2%)	15(14.4%)		
4-How comfortable are you in addressing and clarifying misconceptions or concerns about adult vaccination?	Very comfortable	11(12.6%)	65(74.7%)	11(12.6%)	5.6	0.378 NS
	Somewhat comfortable	9(9.3%)	71(73.2%)	17(17.5%)		
	Not comfortable	2(33.3%)	3(50%)	1(16.7%)		
	Not applicable	0	2(66.7%)	1(33.3%)		
5-Do you actively recommended adult vaccination to your patients during routine visits?	Yes, always	13(11.5%)	88(77.9%)	12(10.6%)	16.1	0.006 HS
	Yes, sometimes	7(10.8%)	47(72.3%)	11(16.9%)		
	No, rarely	1(8.3%)	4(33.3%)	7(58.3%)		
	No, never	1(33.3%)	2(66.7%)	0		

Fisher's Exact Chi-Square test, P>0.05=NS, P<0.05= S, P<0.01=HS.

There were Statistically significant between primary health care professionals & assessment of Attitude regarding {Q1-How confident do you feel in discussing the importance of adult vaccination with your patients?}, {Q2-Do you believe that adult vaccination is an effective preventive measure against infectious diseases?}, {Q3-Are you aware of any misconceptions or concerns among your patients regarding adult vaccination?}, {Q4-How comfortable are you in addressing and clarifying misconceptions or concerns about adult vaccination?}. While; there were statistically highly significant between primary health care professionals & assessment of Attitude regarding {Q5-Do you actively recommended adult vaccination to your patients during routine visits?}. The percentage of Nurse for {Yes, always} & {Yes, sometimes} were higher than {No, rarely & No, Never} by 88(77.9) & 47(72.3%); respectively. Those differences, were statistically highly significant.

Results

This survey surveyed 193 participants, with the majority being female (61.1%) and nurses (73.1%). The most prevalent specialization was nursing, with 67.9% being married. The most prevalent experience was in PHC practice over 10 years. Over 193 participants answered questions about the selection of vaccines, vaccination schedules, and common contraindications. They also expressed confidence in discussing the importance of adult vaccination with patients, strongly agreeing with the effectiveness of vaccination, and being aware of misconceptions or concerns. The study found that the percentage of female nurses (79.3%) and married nurses (77.1%) were higher than those of physicians and health educators (60.6%, 61.1%, and 79.8%, respectively). The experience in primary healthcare practice (<5 years), (5-10 years), and (>10 years) was also higher for nurses. However, there were no significant differences between primary healthcare professionals regarding vaccine selection or multiple vaccinations during the same visit. Nurses were more likely to answer questions about vaccination schedules, contraindications, and attitudes towards adult vaccination. They were more confident in discussing the importance of adult vaccination with patients and were more comfortable in addressing misconceptions or concerns.

Conclusion

In conclusion, this cross-sectional study assessed the knowledge, attitudes, and practices of primary healthcare physicians, nurses, and health educators in Makkah, Saudi Arabia, regarding adult vaccination. The findings revealed that while there were some differences between primary healthcare professionals in terms of demographics and roles, overall, the majority of participants displayed good knowledge and positive attitudes towards adult vaccination. Nurses played a significant role in providing information, addressing concerns, and actively recommending adult vaccination during routine visits. However, improvements can be made in terms of training, access to up-to-date information, and documentation practices. These findings highlight the importance of continued education and support for healthcare professionals in promoting and implementing effective adult vaccination programs.

Further Scope of Research: Future research should explore the barriers and facilitators to adult vaccination in different healthcare settings and regions. Longitudinal studies are recommended to assess changes in knowledge, attitudes, and practices over time and evaluate the effectiveness of interventions aimed at improving adult vaccination rates. By addressing these limitations and implementing the recommended strategies, healthcare systems can strengthen adult vaccination programs and improve the overall vaccination rates among the target population.

References

1. Abdulla, E., Johnson, J., Munir, S., & O'Dwyer, R. (2020). Assessing primary health care nurses' knowledge toward immunizations: A quantitative study. *Journal of public health research*, 9(4), jphr-2020.
2. Ajzen, I. (2020). The theory of planned behavior: Frequently asked questions. *Human behavior and emerging technologies*, 2(4), 314-324.
3. Alhothali, O. S., Alhothali, A. S., Hanif, A. A., Bondagji, M. F., Aljabri, H. M., Goweda, R., ... & Bondagji Sr, M. (2023). A cross-sectional study of the knowledge, practice, and attitude towards

herpes zoster vaccination among the General Population in the Western Region of Saudi Arabia. *Cureus*, 15(1).

4. Al Musa, H. M. A., Al Ghanem, T. A., Awad, S. A., Al Saleem, M. A. S., Bharti, R. K., Al Saleem, S. A. S., ... & Al, A. A. M. A. S. (2018). Knowledge, attitude and practice of primary care physicians toward adult vaccination in Abha City. *Bangladesh Journal of Medical Science*, 17(3), 369.
5. Baykan, Z., Naçar, M., Özdemir, S. B., Poyrazoğlu, S., & Çetinkaya, F. (2011). Knowledge and attitude of family physicians regarding adult vaccination. *World Journal of Vaccines*, 1(3), 92-97.
6. Bhattacharya, L. K., Gerbie, M. V., & Tan, T. Q. (2013). Knowledge and utilization of recommended preventative vaccines among young adults. *J. Vaccines Vaccin*, 4, 1000179.
7. Dearing, J. W., & Cox, J. G. (2018). Diffusion of innovations theory, principles, and practice. *Health affairs*, 37(2), 183-190.
8. Demİr, İ., Kaya, S., Demİrcİ, M., & Cİcİğlu-ArİdoğAn, B. (2006). Investigation of seropositivity of hepatitis B virus in healthcare workers in Isparta, Türkiye.
9. El Khoury, G., & Salameh, P. (2015). Influenza vaccination: a cross-sectional survey of knowledge, attitude and practices among the Lebanese adult population. *International journal of environmental research and public health*, 12(12), 15486-15497.
10. Goronzy, J. J., & Weyand, C. M. (2013). Understanding immunosenescence to improve responses to vaccines. *Nature immunology*, 14(5), 428-436.
11. Jackson, M. L., Chung, J. R., Jackson, L. A., Phillips, C. H., Benoit, J., Monto, A. S., ... & Flannery, B. (2017). Influenza vaccine effectiveness in the United States during the 2015–2016 season. *New England Journal of Medicine*, 377(6), 534-543.
12. Kwol, V. S., Eluwole, K. K., Avci, T., & Lasisi, T. T. (2020). Another look into the Knowledge Attitude Practice (KAP) model for food control: An investigation of the mediating role of food handlers' attitudes. *Food control*, 110, 107025.
13. MacDougall, D. M., Halperin, B. A., MacKinnon-Cameron, D., Li, L., McNeil, S. A., Langley, J. M., & Halperin, S. A. (2015). The challenge of vaccinating adults: attitudes and beliefs of the Canadian public and healthcare providers. *BMJ open*, 5(9), e009062.
14. Tarkang, E. E., & Zotor, F. B. (2015). Application of the health belief model (HBM) in HIV prevention: a literature review. *Central African Journal of Public Health*, 1(1), 1-8.
15. Redondo Margüello, E., Trilla, A., Munguira, I. L., López-Herce, A. J., & Cotarelo Suárez, M. (2022). Knowledge, attitudes, beliefs and barriers of healthcare professionals and adults ≥ 65 years about vaccine-preventable diseases in Spain: the ADult Vaccination drIverS and barriErs (ADVISE) study. *Human Vaccines & Immunotherapeutics*, 18(1), 2025007.
16. Swanson, K. A., Schmitt, H. J., Jansen, K. U., & Anderson, A. S. (2015). Adult vaccination: current recommendations and future prospects. *Human Vaccines & Immunotherapeutics*, 11(1), 150-155.
17. Vezzosi, L., Riccò, M., Agozzino, E., Odone, A., & Signorelli, C. (2019). Knowledge, attitudes, and practices of general practitioners from the Province of Parma (Northern Italy) towards vaccinations in adults ≥ 65 year-old. *Acta Bio Medica: Atenei Parmensis*, 90(Suppl 9), 71.