

Prevalence of seasonal influenza vaccination among primary healthcare workers in Arar city, Saudi Arabia

Bashayer Reda Alenazi¹, Sabry Mohamed Hammad^{2,3}, Amal Elwan Mohamed^{4,5}

¹ M.B.B.S, Resident in Saudi Board of Family Medicine, Joint Program of Saudi Board of Family Medicine, Northern Borders Region, Arar City, Saudi Arabia

² MD., Professor of Public Health and Community Medicine, Faculty of Medicine, Mansoura University, Mansoura, Egypt

³ Consultant of Public Health & Community Medicine, Northern Borders General Health Affairs, Saudi Arabia

⁴ Consultant of Public Health, Saudi Board of Family Medicine, Northern Borders, Arar City, Saudi Arabia

⁵ MD., Lecturer of Public Health, Faculty of Medicine, Zagazig University, Zagazig, Egypt

Type of article: Original

Abstract

Background: Influenza outbreaks occur annually and have significant ramifications on the wellbeing of the population. Influenza is given high priority in Saudi Arabia where numerous reports of different types of influenza outbreaks have occurred in recent years.

Objective: The study aimed to determine the prevalence of influenza vaccination among healthcare providers.

Methods: The study employed a cross-sectional design, and data was collected using a predesigned questionnaire which was validated by a panel of experts and tested for reliability (Cronbach's alpha =0.8). All primary healthcare workers in Arar city (Saudi Arabia) were taken as a comprehensive sample between January and March 2018. The questionnaire used a Likert scale that assessed the reasons for embracing or rejecting the influenza vaccines. A p-value of ≤ 0.05 was considered statistically significant.

Results: In total, 204 health professionals (72 physicians, 102 nurses and 30 other staff members) filled the questionnaire. The mean age of the healthcare professionals was 31.9 ± 8.7 years. Self-report of seasonal influenza vaccination uptake was 55.9% (65.3% for physicians, 55.9% for nurses and 33.3% for other staff). Perceived risk of severity of influenza was 2.5 times more in the compliant group than that of the non-compliant group ($p < 0.001$, 95% CI: 1.4-4.4).

Conclusion: Utilization of influenza vaccine is 55% in both nurses and physicians despite 89% of them being aware of influenza vaccination guidelines and MOH recommendations. It is needed to ensure the intensive education of healthcare providers to understand the protective value of influenza vaccine.

Keywords: Influenza, Vaccination behavior, Healthcare workers

1. Introduction

Influenza vaccine is the essential tool for the prevention of influenza in healthcare settings. Despite it being highly recommended, compliance of healthcare workers remains low (1). Influenza constitutes one of the respiratory diseases that affect people across all age groups worldwide (2). Influenza outbreaks occur annually and have significant ramifications on the wellbeing of the population. On average, influenza outbreaks cause 200,000 people to be hospitalized annually, and 36,000 patients succumb to this acute disease in the US each year. (3, 4). The consequences of influenza can also be examined in terms of direct costs which fall within \$3 billion and \$10.4 billion annually (5, 6). In sub-Saharan Africa, influenza is responsible for 10% and 6.5% outpatient visits and hospital admissions, respectively in children suffering from acute respiratory illnesses (7). Underlying the burden of influenza is its high contagiousness that causes acute illness in individuals who lack a competent immune system.

Corresponding author:

Dr. Bashayer Reda Alenazi, Northern Borders General Health Affairs, Arar, Saudi Arabia.

Tel: +966.559509520, Email: bagori11@hotmail.com

Received: June 12, 2018, Accepted: July 08, 2018, Published: August 2018

iThenticate screening: June 25, 2018, English editing: July 11, 2018, Quality control: July 12, 2018

This article has been reviewed / commented by three experts

Ethics approval: 39/4 (Northern Borders General Health Affairs)

© 2018 The Authors. This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

They include the young, the elderly and those grappling with chronic diseases (8). In addition to a high infection rate, these groups suffer greater mortality than other population groups. In an effort to control influenza outbreaks, an annual flu vaccine is considered an effective intervention with effectiveness of 36% according to CDC, 2018 (8). Maximizing vaccination against influenza is essential as it contributes to herd immunity which limits further spread of the disease in the community. Of significant interest are the healthcare workers (HCWs) who engage directly with patients ailing from flu. They are at risk of transferring influenza from the community to the patient and also becoming a channel of transmission from the hospital to family members and the community at large (7). The role of HCWs in controlling influenza outbreaks goes beyond vaccinating the patients to encompass their own vaccination for the wellbeing of the population (9). The Centre for Disease Control and Prevention (CDC) emphasizes the need for healthcare providers including medical students to adhere to annual vaccination guidelines (10).

In a systematic review consisting of 10 studies, Burls et al studied the reasons underlying rejection or acceptance of influenza vaccination by healthcare workers (HCWs) (11). According to the review, 82%-83% of the HWCs indicated that they receive vaccination for personal protection, and 32-37% reported embracing vaccination as a way of protecting patients. In contrast, 21-45% of HWCs rejected the influenza vaccine due to the fear of contracting a vaccine-related influenza, and 8-51% of the HWCs were wary of the adverse side effects associated with vaccines. Additionally, 3-53% of the HWCs were unaware of the availability of the influenza vaccine, while 5-27% of the HWCs feared the mode of vaccine administration, which is injection. Other reasons given by 5-29% and 5-60% of the HWCs were low risk of disease and time constraints, respectively (11). Abu-Gharbieh et al. conducted a study in the UAE, Kuwait and Oman where they sampled 993 HWCs and measured the vaccination rates (12). In the UAE, the vaccination rate was 24.7% while Oman registered 46.4% and Kuwait reported 67.2% vaccination rate. The desire for vaccination was primarily based on the need to protect oneself from influenza (59%). In contrast, the HWCs were unable to take the influenza vaccine due to time constraints (31.8%) occasioned by busy schedules in the workplace. Additionally, 29.4%, 25.4% and 24.9% failed to take a vaccine due to limited knowledge on the availability of the vaccine, vaccine being unavailable and being skeptical about the effectiveness of the vaccine, respectively. Moreover, 20.1% of the HWCs were oblivious of the value of a vaccine in disease protection while 17.3% worried about the adverse effects of the vaccine (12). Another study was done in Saudi Arabia by Alshammari et al. where they investigated the cause of low adoption of the influenza vaccine (13). It was realized that most of the HWCs (75%) were unaware of the vaccination guidelines developed by the Advisory Committee on Immunization Practices and Centre for Disease Control. Some HWCs declined influenza vaccines due to a misplaced opinion that they had low risk of influenza infection (13%) while others harbored the fear of getting a vaccine-related influenza infection (16%). Additionally, 13% of the HWCs indicated that the vaccine was not readily available. Similarly, the non-availability of the influenza vaccine was reported by 43% of the respondents and was associated with the failure to administer the vaccine to the patients. Notably, 33% of the HWCs feared the adverse effects of the influenza vaccine (13). There is no study done in the Northern Borders Region in the Kingdom of Saudi Arabia reviewing influenza vaccination awareness. This study aimed to determine the influenza vaccination rates in primary HWCs and to understand their attitudes and behaviors toward vaccination.

2. Material and Methods

2.1. Research design and participants

This cross-sectional study was done using a self-report questionnaire, and was conducted between January and March 2018. The study population consisted of all primary healthcare workers in Arar city (Saudi Arabia) who agreed to participate and provide information, and they were physicians, nurses, premedical and administrative staff. The study sample was all HCPs of whom there were 204 health professionals (72 of them were physicians, 102 nurses, and 30 others).

2.2. Instrument

The study tool was a self-administered questionnaire in Arabic languages. The questionnaire was pre-designed and evaluated by a panel of bilingual experts to assure that the validity and pilot study was done on twenty HCPs. No modifications on the questionnaire were done. It was tested for reliability (0.8). The questionnaire consisted of two sections that the participant had been subjected to. The first section concerned demographic data such as age, sex, occupation, and work experience (in years). The next question was about whether the participants had received influenza vaccine during the 2017-2018 influenza season, and was followed by the questions regarding the reasons why or why they did not get the vaccine. The second section concentrated on the vaccination of influenza virus, estimated by five-point Likert-type questions of a total of 24 questions. The answers were expressed as 1) "Strongly

disagree," 2) "Disagree," 3) "Neutral," 4) "Agree," and 5) "Strongly agree" (8). This section incorporates the reasons whether or not the participant will accept the vaccine, the barriers and the motivation factors of receiving the vaccine, and the risks and the benefits of influenza vaccine. The health beliefs model has been applied in this study to explain behavior of participants (14).

2.3. Ethical considerations

Before interviewing the study participants, we gave them a brief introduction on the aim of the study and instructions on how to complete the questionnaire. Then, informed consent was taken from all study participants and we assured them that confidentiality of their data would be maintained during and after the study. Research clearance and approval were obtained from the research ethics committee of Northern Borders General Health Affairs (Ref: 39/4). Also, the approvals were taken from the administrator of each primary healthcare center.

2.4. Data Analysis

Data entry and analysis was performed using IBM© SPSS© Statistics version 20 (IBM© Corp., Armonk, NY, USA). Chi square test was used to assess statistical significance. A p-value of ≤ 0.05 was used to indicate statistical significance. Odds ratio was calculated for each variable.

3. Results

Table 1 shows that there were 204 health professionals including 72 (35.3%) physicians, 102 (50%) nurses and 30 (14.75%) other cadres who responded to the questionnaire. The participants' mean age was 31.9 ± 8.7 years. The rate of self-reported influenza vaccination was 55.9% (65.3% for physicians, 55.9% for nurses and 33.3% for others.). Increasing age, longer work duration in health services, being male and being a physician, are significantly increased in vaccination compliance ($p=0.02$, $p=0.07$, $p=0.01$, $p=0.01$) respectively. Table 2 indicates the perceived risk and benefit of influenza vaccination among health professionals. Perceived risk was 2.5 times more in the compliant group than that of the non-compliant group ($p<0.001$) (95% CI: 1.4-4.4). Table 2 also shows the univariate analysis of barriers and motivating factors of influenza vaccination among health professionals. Perception of barriers (finding injection every year is uncomfortable) was significantly higher in the vaccine non-compliant group (50% vs. 24.5%) than in the compliant group ($p=0.001$). The perceived risk of influenza and benefit of influenza vaccination among participants, and the barriers and motivating factors of influenza vaccination are shown on Tables 3 and 4 respectively. Participants who would be vaccinated provided that the vaccine is available was 77.2% in the compliant group versus 58.9% in the noncompliant group, and the difference was statistically significant ($p=0.005$) (Table 5).

Table 1. Influenza vaccination rates among the participants according to their demographic characteristics.

Characteristics	Total; n (%)	Vaccination %	OR (95% CI) *	p-value	
Age (31.9 ± 8.7)	20-30	86 (42.2)	45.3	1.70 (0.92-3.13)	0.021 #
	31-40	82 (40.2)	58.5	3.09 (1.17-8.18)	
	41-50	25 (12.3)	72.0	5.42 (1.10-26.59)	
	51+	11 (5.4)	81.8	1 **	
Gender	Male	68 (33.3)	69.1	1 **	0.007 #
	Female	13 (66.7)	49.3	2.30 (1.24-4.26)	
Profession	Physician	72 (35.3)	65.3	3.76 (1.52- 9.25)	0.012 #
	Nurse	10 (50)	55.9	2.53 (1.07-5.95)	
	Other	30 (14.7)	33.3	1 **	
Work experience (years)	≤ 10	120 (58.8)	48.3	2.13 (1.2-3.81)	0.01 #
	> 10	84 (56)	66.7		

* OR: Odds ratio, CI: Confidence interval; # Significant; ** Reference group

Table 2. Relationship between perceived benefits and barriers of influenza vaccination among primary HCWs.

Variable	p-value	
	Accepting vaccination *	Rejecting vaccination #
Age	0.149	0.667
Gender	0.278	0.760
Profession	0.001	1.000
Work experience (years)	0.267	0.267

* Causes of accepting vaccination were at least one of the following: 1) Protect myself from illness, 2) Protect my patients from illness, 3) Protect family and friends. # Causes of rejecting vaccination were: 1) fear of adverse reaction, 2) fear of getting Influenza by vaccine itself.

Table 3. The perceived risk of influenza and benefit of influenza vaccination among participants.

Participant opinions		Vaccine compliant, total: 114, n (%)	Vaccine non-compliant, total: 90, n (%)	OR (95% CI) *	p-value
Perceived risk of influenza	I have high risk for influenza	55 (48.2)	45 (50)	0.9 (0.53-1.62)	0.8
	Health professionals are under the highest risk in case of an epidemic	90 (60.9)	70 (77.7)	1.07 (.54-2.09)	0.8
	Influenza is dangerous for me	76 (66.6)	40 (44.4)	2.50 (1.41-4.41)	0.001 #
	Influenza is dangerous for my patients and my family	92 (80.7)	75 (83.3)	0.83 (0.40-1.72)	0.6
Perceived benefit of influenza vaccination	Vaccination reduces my personal risk	94 (82.4)	68 (75.5)	1.52 (0.76-3.00)	0.2
	Vaccination reduces the risk of spreading the disease to my patients	94 (82.4)	68 (75.5)	1.52 (0.76-3.00)	0.2

* OR: Odds ratio, CI: Confidence interval; # Significant

Table 4. The barriers and motivating factors of influenza vaccination among health professionals.

Participant opinions		Vaccine compliant, total: 114, n (%)	Vaccine non-compliant, total: 90, n (%)	OR (95% CI) *	p-value
Perceived barriers of influenza vaccination	I don't expect a side effect after vaccination	65 (57.1)	40 (44.4)	1.6 (0.9-2.8)	0.07
	Need for vaccination every year negatively affects my regular vaccination	43 (37.7)	31 (34.4)	1.1 (0.6-2.05)	0.6
	I had side effects from my previous influenza vaccinations	23 (20.1)	28 (31.1)	0.5 (0.2-1.06)	0.07
	The influenza vaccine itself does not cause influenza	52 (45.6)	49 (54.4)	0.7 (0.4-1.2)	0.2
	I find injection every year uncomfortable	28 (24.5)	45 (50)	0.3 (0.1-0.5)	0.001 #
	Vaccination does not improve my immunity	35 (46.5)	50 (55.6)	0.6 (0.3-1.2)	0.1
Motivating factors	I know the Ministry of Health recommendations regarding influenza vaccination	38 (72.8)	70 (77.8)	0.7 (0.4-1.4)	0.4
	I know the Ministry of Health recommendations regarding the age groups and chronic diseases which require influenza vaccination	89 (78.1)	67 (74.4)	1.2 (0.6-2.3)	0.5
	I have sufficient knowledge about influenza	79 (69.3)	68 (75.6)	0.7 (0.3-1.3)	0.1

* OR: Odds ratio, CI: Confidence interval; # Significant

Table 5. Univariate analysis of attitudes of health professionals toward influenza vaccination.

Participant opinions	Vaccine compliant, total: 114, n (%)	Vaccine non-compliant, total: 90, n (%)	OR (95% CI) *	p-value
I feel that health professionals' not spreading the disease to their patients is important	53(46.5)	48(53.3)	0.7(0.4-1.3)	0.3
I believe that health professionals should be vaccinated for the continuity of health services	85(74.6)	62(88.9)	1.3(0.7-2.4)	0.3
Influenza vaccine should be mandatory for health professionals	78(68.4)	44(48.9)	2.2(1.2-4)	0.005 #
My colleagues believe that my vaccination is important	72(63.2)	48(53.3)	1.5(0.8-2.6)	0.1
I would be vaccinated every year if I have enough time	84(73.7)	47(52.2)	2.5(1.4-4.6)	0.001 #
I would be vaccinated every year if the vaccine was provided in my institute	88(77.2)	53(58.9)	2.3(1.2-4.3)	0.005 #

* OR: Odds ratio, CI: Confidence interval; # Significant

4. Discussion

This study aimed to determine the prevalence of seasonal influenza vaccine uptake among primary HCWs in Arar city and to investigate the attitudes, barriers, and knowledge of HCWs regarding influenza vaccination. This study has shown that 55.9% of participants have been vaccinated against influenza, which indicates positive attitudes toward vaccination. In particular, the physicians registered the highest vaccination score at 65.3% while nurses had a vaccination rate of 55.9%. It is an indication that most physicians and nurses had embraced vaccination. The other healthcare cadres including the administrative officers had lower vaccination scores at 33.3%. The majority of the healthcare providers, particularly, physicians and nurses considered vaccination as an intervention for protection

against influenza. They believed that the vaccine would protect them from illness. The study results are in tandem with the findings of Mytton et al. (15) who found that the desire to protect the healthcare providers from disease was the greatest motivator of influenza vaccination. Such a trend could be due to two reasons according to the authors. The first is that the healthcare providers could be privy to research which has shown that adoption of vaccination protects health workers from the diseases (15, 16). Notably, the healthcare workers interact with the patients suffering from influenza, and they would not wish to contract the illness (12). The second factor that would compel the healthcare providers to be vaccinated is having personal experience with the dreadful symptoms of influenza (15).

As found in this study, the healthcare providers understand that they are a high-risk group of contracting influenza due to their interaction with sick patients. If they contract the illness, their families will also be affected. The hospitals remain a source of disease (17), and the healthcare providers should be pro-active in preventing the spread of influenza to the community (18). Notably, the need to protect the patients and family members had a lower effect on compliance to vaccination than their individual preference to protect themselves from the disease. The professional guidelines for healthcare providers recommend that the need to protect others from disease should supersede the urge by healthcare professionals to seek protection against the illness (8). Such a trend is against the professional duty of care since the healthcare providers are interested in vaccination when at high risk of influenza than when the patients have a high risk of the disease (8).

Another significant factor in influencing penetration of vaccination among the healthcare workers is the age of the personnel. As indicated in the results, the vaccination rates improved with age of the healthcare personnel with those aged 20-30 years having a vaccination score of 45.3% while those aged above 51 years having a vaccination score of 81.8%. Similarly, the healthcare providers who had served in the healthcare industry for a long duration registered high vaccination rates. The study results are similar to the findings of Asma et al. who also discovered a positive relationship between the rising age of healthcare providers and the likelihood of embracing vaccination (9). The relationship between vaccination rates and age of the healthcare provider indicates that the older personnel have a better understanding of the benefits of the vaccine (19, 20). They are aware of the high incidence of influenza before the introduction of a vaccine and the reduced incidence of the disease following vaccine development. Moreover, the study indicates that healthcare providers may fail to comply with vaccination guidelines for fear of adverse reactions or vaccine-related influenza. These results are emphasized by Pless et al. who are categorical that nurses require their autonomy to be respected with regard to protecting themselves from the potential harm caused by vaccines (21). Interestingly, the healthcare providers note that they have a right to become ill and this autonomy should not be overlooked (21). Some of the nurses are wary of mischievous intentions by scientists and pharmaceutical companies who might manufacture vaccines that possess adverse effects (21-23). Accepting the influenza vaccine would encourage the authorities to introduce new vaccines for healthcare providers (21). These are misconceptions that were highly related to the level of knowledge about the significance of vaccination. There is a debate on whether vaccination against influenza should be made mandatory to enhance compliance. In this study, most of the healthcare providers who were vaccinated support an initiative to make it compulsory for all personnel to get a vaccine. Dini et al. (20) reported that mandatory vaccination can cause a tremendous rise in vaccination rates as it is considered part of occupational safety (24) and every healthcare provider would be expected to abide by the rules. However, mandatory vaccination would elicit resistance since it goes against the autonomy of a person.

5. Strengths and limitations

This cross-sectional study was done only on primary healthcare workers. Seasonal influenza uptake for those in secondary and tertiary care is not addressed in this study. However, this study is the first study done in Arar city addressing influenza vaccine uptake and the roots of this healthy behavior.

5. Conclusions

Utilization of influenza vaccine is above 50% in both nurses and physicians. Additionally, some healthcare providers have knowledge about the efficacy of the influenza vaccine, but others have misconceptions and consider vaccines as unsafe. Besides, the healthcare cadre influenced vaccination with nurses and physicians embracing the vaccine as they are in direct contact with the patients. The healthcare providers who had safety concerns regarding the influenza vaccine were reluctant to embrace the intervention. Further research to assess influenza vaccine uptake among secondary and tertiary healthcare workers is needed. The solution to the reluctance in vaccine adoption revolves around offering more education of healthcare workers to understand the value of the influenza vaccine.

They should realize that they are also at risk of influenza as their career involves direct contact with ailing patients and hence require protection. The goal is to change the attitude of healthcare providers towards vaccine compliance.

Acknowledgments:

The authors would like to acknowledge their sincere thanks to the Saudi Board of Family Medicine, joint program. This study was done for partial fulfillment of the Saudi Board of Family Medicine. The authors thank primary healthcare workers for their participation in the study. They also thank the Ministry of Health for their cooperation and facilitating data collection.

Conflict of Interest:

There is no conflict of interest to be declared.

Authors' contributions:

All authors contributed to this project and article equally. All authors read and approved the final manuscript.

References:

- 1) Alicino C, Iudici R, Barberis I, Paganino C, Cacciani R, Zacconi M, et al. Influenza vaccination among healthcare workers in Italy. *Human Vaccines & Immunotherapeutics*. 2014; 11(1): 95-100. doi: 10.4161/hv.34362. PMID: 25483521, PMCID: PMC4514208.
- 2) Fleming D, Elliot A. The impact of influenza on the health and health care utilisation of elderly people. *Vaccine*. 2005; 23: S1-9. doi: 10.1016/j.vaccine.2005.04.018. PMID: 15908058.
- 3) Thompson WW, Shay DK, Weintraub E, Brammer L, Cox N, Anderson LJ, et al. Mortality associated with influenza and respiratory syncytial virus in the United States. *JAMA*. 2003; 289: 179–86. doi: 10.1001/jama.289.2.179. PMID: 12517228.
- 4) Thompson WW, Shay DK, Weintraub E, Brammer L, Bridges CB, Cox NJ, et al. Influenza-associated hospitalizations in the United States. *JAMA*. 2004; 292: 1333–40. doi: 10.1001/jama.292.11.1333. PMID: 15367555.
- 5) Molinari NA, Ortega-Sanchez IR, Messonnier ML, Thompson WW, Wortley PM, Weintraub E, et al. The annual impact of seasonal influenza in the US: measuring disease burden and costs. *Vaccine*. 2007; 25: 5086–96. doi: 10.1016/j.vaccine.2007.03.046. PMID: 17544181.
- 6) Doebbeling BN, Edmond MB, Davis CS, Woodin JR, Zeitler RR. Influenza vaccination of health care workers: evaluation of factors that are important in acceptance. *Prev Med*. 1997; 26: 68–77. doi: 10.1006/pmed.1996.9991. PMID: 9010900.
- 7) World Health Organization. WHO: Weekly epidemiological record hebdomadaire. *World Heal Organ Geneva*. 2016; 21(83): 421–8.
- 8) CDC. Seasonal influenza vaccine effectiveness 2005-2018. 2018. Available from: <https://www.cdc.gov/flu/professionals/vaccinations>.
- 9) Asma S, Akan H, Uysal Y, Poçan AG, Sucaklı MH, Yengil E, et al. Factors effecting influenza vaccination uptake among health care workers: a multi-center cross-sectional study. *BMC Infect Dis*. 2016; 16: 192. doi: 10.1186/s12879-016-1528-9. PMID: 27142774, PMCID: PMC4855819.
- 10) Advisory Committee on Immunization Practices. Immunization of health-care personnel: recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR Recomm Rep*. 2011; 60(RR-7): 1-45. PMID: 22108587.
- 11) Wallace L. Acceptance and Uptake of Influenza Vaccination by Health Care Workers. Walden University. 2015.
- 12) Abu-Gharbieh E, Fahmy S, Rasool BA, Khan S. Influenza vaccination: healthcare workers attitude in three Middle East countries. *Int J Med Sci*. 2010; 7(5): 319–25. doi: 10.7150/ijms.7.319. PMID: 20922053, PMCID: PMC2948215.
- 13) Alshammari T, AlFehaid L, AlFraih J, Aljadhey H. Health care professionals' awareness of, knowledge about and attitude to influenza vaccination. *Vaccine*. 2014; 32(45): 5957-61. doi: 10.1016/j.vaccine.2014.08.061. PMID: 25218193.
- 14) Janz NK, Becker MH. The health belief model: A decade later. *Health Educ Q*. 1984; 11(1): 1-47. doi: 10.1177/109019818401100101. PMID: 6392204.
- 15) Mytton O, O'Moore E, Sparkes T, Baxi R, Abid M. Knowledge, attitudes and beliefs of health care workers towards influenza vaccination. *Occupational Medicine*. 2013; 63(3): 189-195. doi: 10.1093/occmed/kqt002. PMID: 23447033.

- 16) Balkhy H, Al-Otaibi B, El-Saed A. Influenza vaccination among healthcare workers at a tertiary care hospital in Saudi Arabia: Facing challenges. *Annals of Thoracic Medicine*. 2010; 5(2): 120. doi: 10.4103/1817-1737.62480. PMID: 20582182, PMCID: PMC2883198.
- 17) Rehmani R, Memon J. Knowledge, attitudes, and beliefs regarding influenza vaccination among healthcare workers in a Saudi hospital. *Vaccine*. 2010; 28(26): 4283-7. doi: 10.1016/j.vaccine.2010.04.031. PMID: 20441803.
- 18) Aguilar-Díaz F, Jiménez-Corona M, Ponce-de-León-Rosales S. Influenza Vaccine and Healthcare Workers. *Archives of Medical Research*. 2011; 42(8): 652-7. doi: 10.1016/j.arcmed.2011.12.006. PMID: 22227045.
- 19) Bellia C, Setbon M, Zylberman P, Flahault A. Healthcare worker compliance with seasonal and pandemic influenza vaccination. *Influenza and Other Respiratory Viruses*. 2013; 7: 97-104. doi: 10.1111/irv.12088. PMID: 24034493, PMCID: PMC5909401.
- 20) Dini G, Toletone A, Sticchi L, Orsi A, Bragazzi N, Durando P. Influenza vaccination in healthcare workers: A comprehensive critical appraisal of the literature. *Human Vaccines & Immunotherapeutics*. 2017; 14(3): 772-89. doi: 10.1080/21645515.2017.1348442. PMID: 28787234, PMCID: PMC5861785.
- 21) Pless A, McLennan S, Nicca D, Shaw D, Elger B. Reasons why nurses decline influenza vaccination: a qualitative study. *BMC Nursing*. 2017; 16(1). doi: 10.1186/s12912-017-0215-5. PMID: 28465672, PMCID: PMC5410084.
- 22) Hulo S, Nuvoli A, Sobaszek A, Salembier-trichard A. Knowledge and attitudes towards influenza vaccination of health care workers in emergency services. *Vaccine*. 2017; 35(2): 205-7. doi: 10.1016/j.vaccine.2016.11.086. PMID: 27919630.
- 23) Qureshi A, Hughes N, Murphy E, Primrose W. Factors influencing uptake of influenza vaccination among hospital-based health care workers. *Occupational Medicine*. 2004; 54(3): 197-201. doi: 10.1093/occmed/kqg087. PMID: 15133144.
- 24) Kliner M, Keenan A, Sinclair D, Ghebrehewet S, Garner P. Influenza vaccination for healthcare workers in the UK: appraisal of systematic reviews and policy options. *BMJ Open*. 2016; 6(9): e012149. doi: 10.1136/bmjopen-2016-012149. PMID: 27625062, PMCID: PMC5030547.