

# Prevalence and Determinants of Influenza Immunization among Diabetic Patients Attending Al-Eskan Primary Health Care Center in Makkah Al-Mokarramah, 2018

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**Abstract Background:** To decrease this risk of influenza infection in diabetic patients, annual influenza vaccination is recommended by WHO (World Health Organization), CDC (Centers for Disease Control and Prevention), and ADA (American Diabetic Association). **Objectives:** To estimate the prevalence and factor associated with success rate of influenza vaccination uptake among diabetic patients attending Al-Eskan Primary Health Care Center in Makkah Al-Mokarramah, 2018. **Material and methods:** A Cross-sectional analytical study was carried out in the city of Makkah Al-Mokarramah among diabetic patients attending Al-Eskan PHCC during the period of survey in 2018. Convenience sampling technique was adopted to select the patients. Self-administered validated questionnaire was used for data collection. It consists of three sections: Socio-demographics, attitude towards seasonal flu and influenza vaccine and reasons for accepting, or reasons for refusing flu vaccine. **Results:** The study included 181 diabetic patients. Their age ranged between 19 and 82 years with a mean of 53.5 years and standard deviation of 13.7 years. Overall, positive attitude towards seasonal influenza vaccination was observed among 107 patients representing 59.1% of the respondents. The prevalence of seasonal influenza vaccine uptake by adult diabetic patients was 55.2%. Among patients accepted seasonal influenza vaccine (n=100), the main reasons were being free of charge (56%) and doctor informed them that it is important (41%) whereas among patients who refused seasonal influenza vaccine (n=81), the main reasons were being not necessary because flu is just a minor illness (40.7%), forgetting (35.8%) and belief that the vaccine was not effective (35.4%). **Conclusion:** The positive attitude towards seasonal influenza vaccine and its uptake by diabetic patients is acceptable. However, efforts are needed to improve the situation more.

**Keywords:** prevalence, determinants, influenza, immunization, diabetic, patients, health care center

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## 1. Introduction

DM (Diabetes Mellitus) patients are considered a higher risk group to develop influenza infection, and this increases the risk of hospitalization. According to the American Diabetic Association (ADA), annual influenza vaccination for all individuals with diabetes recommended, because it is effective, safe, and mitigates influenza-related complications, hospitalizations, and deaths in these patients [1].

### 1.1. Background

Influenza is an infectious respiratory illness that caused by influenza viruses. These viruses can spread easily by direct contact with infected individuals, contact with contaminated objects and by inhalation of virus-laden aerosols [2]. It can cause mild to severe illness,

characterized by a sudden onset of fever, headache, cough (usually dry), muscle and joint pain, severe malaise, sore throat and a runny nose. A cough can be severe and can last at least two weeks. [3] Sinus infections and ear infections, Pneumonia, bronchitis, are examples of flu-related complications. Worldwide, these annual epidemics are estimated to result in about 3 to 5 million cases of severe illness and approximately 250 000 to 500 000 deaths [4]. In our country, seasonal outbreaks occur mainly during winter, while in tropical regions, influenza may occur throughout the year, causing outbreaks more irregularly.

However, to decrease this risk of influenza infection in DM patients, annual influenza vaccination of people with DM is recommended by WHO (World Health Organization), CDC (Centers for Disease Control and Prevention), and ADA. It is considered the most efficient method to prevent infection and severe outcomes caused by influenza viruses [1,4,5].

In Saudi Arabia, MOH (Ministry of Health) recommends that international pilgrims be vaccinated against seasonal

influenza with most recently available vaccines before arrival. Particularly those at increased risk of severe influenza disease including children aged over five years, pregnant women, the elderly, and individuals with pre-existing health conditions such as asthma, DM, chronic heart and lung diseases and HIV/AIDS infection [6].

There is no recent data investigation in Makkah estimating the prevalence of influenza vaccination among DM patients. So, this study is conducted to assess the prevalence of influenza vaccination among DM patients.

## 1.2. Rationale

Influenza is one of the most common respiratory illnesses affecting people of all age groups worldwide. Up to the researcher knowledge, there were no local studies of influenza vaccination among people with DM.

The researcher has a special interest because her mother had diabetes. Makkah Al-Mokarramah was chosen because pilgrims come to Makkah from all over the world every year to perform Hajj, which may lead to an increase in the prevalence of influenza.

## 1.3. Aim of the Study

This study aims to assess immunization status and increase the awareness of influenza vaccination in DM patients to decrease the risk of influenza infection and its complications.

## 1.4. Objectives

1- To estimate the prevalence of influenza vaccination among diabetic patients attending Al-Eskan Primary Health Care Center in Makkah Al-Mokarramah, 2018.

2- To determine factors associated with the success rate of influenza vaccination among diabetic patients attending the same center.

3- Assessment of the attitude of diabetic patients towards seasonal influenza vaccine.

## 2. Literature Review

Olatunbosun OD et al. conducted a cross-sectional survey published by Elsevier journal, 14 October 2017 about (knowledge, attitudes, and practices regarding seasonal influenza and influenza vaccination among people with diabetes in Pretoria, South Africa). The survey conducted among type 1 and 2 diabetic patients who attended diabetic clinics in two major tertiary hospitals in Pretoria from October to December 2015. A total of 292 diabetic patients completed questionnaires. From these participants, 162 (55.5%) believed that flu is the same as common cold. While 96 participants (32.9%) aware that they were at higher risk for complications of influenza, only 86 (29.5%) considered vaccination as an effective means of preventing severe influenza-related complication. Even though 167 (57.2%) had heard of the vaccine to prevent influenza, only 84 (28.8%) were previously vaccinated. The top reason for diabetics who had never

been vaccinated in the previous year (208/292, 71.2%) include use of other different protection (107/208, 51.4%).

However, Influenza vaccination coverage remains low in South African, and this may be attributed mainly to the low vaccine supply and inadequate knowledge of influenza vaccine and its benefits [7].

A systematic review and meta-analysis published in BioMedCentral (BMC) on 17 March 2015 in Germany. Conducted by Cornelius Remschmidt et al. which reviewed (Vaccines for the prevention of seasonal influenza in patients with diabetes) by searching in Medline, Embase, Cochrane Central Register of Controlled Trials, and Clinical Trials from inception until November 2014. They collected all types of studies reporting on influenza vaccination in patients with type 1 and typed 2 all ages. Following the review of 1,444 articles, 11 observational studies with a total of 170,924 participants included. In diabetic patients age (18–64 years), influenza vaccination prevented all-cause hospitalization with VE (vaccine effectiveness) of 58% (95% CI, 6–81%), and hospitalization admission due to influenza VE 43% (95% CI, 28-54%). However, no effects on all-cause mortality and influenza-like illness (ILE). For that, the available evidence is insufficient to determine the magnitude of benefit of vaccination. Adequately powered randomized controlled trials or quasi-experimental studies using laboratory-confirmed influenza-specific outcomes are urgently needed [8]. In Taiwan, a retrospective cohort study published by Vaccine journal in 2013, conducted by I-Kuan Wang, et al. about (benefits of influenza vaccination in elderly diabetic patients), they used data from 2001 to 2009 to identify annual elderly patients with diabetes with influenza vaccination= 4454 and without vaccination= 4571. After following them for years, vaccinated patients had lower incidences of pneumonia or influenza and respiratory failure compared with the non-vaccinated patients. More importantly, the vaccinated patients had a hospitalization rate that was 11% less than the non-vaccinated patients. [9] A descriptive cross-sectional study published in Human Vaccines and Immuno-therapeutics journal at 2013. Jimenez-Trujillo, et al. conducted a study about (Influenza vaccination coverage rates among diabetes  $\geq$  50 years from 2003 to 2010 in Spain). They assess influenza vaccination status by a question (yes or no). The Influenza vaccination coverage among adults with diabetes in 2010 was 65.0% (95% CI: 62.1-67.7) compared with 41.2% (95% CI 40.0–42.4) for those without diabetes [10]. Another study carried on Spain, E. Alvarez et al. conducted a cross-sectional study in 2016, about (vaccination practices in patients with diabetes) involving 279 patients with diabetes attending a Primary Care Center. The prevalence of patients vaccinated for seasonal influenza was 40%. Regarding believes and attitudes for vaccination, a total of 67 (24%) of the patients did not believe in the effectiveness of the vaccination or feared side effects. However, there were only 4 (1%) patients who experienced mild adverse reactions to influenza vaccination.

In this study, vaccine coverage rate against influenza vaccination still very low in patients with type 2 diabetes [11].

### 3. Materials and Methods

#### 3.1. Study Design

A Cross-sectional analytical study.

#### 3.2. Study Area

The study was carried out in the city of Makkah Al-Mokarramah (the Holy capital of Saudi Arabia) which is located at the center of the Western Region of Saudi Arabia, contains a population around 1.578 million [12]. 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 divided into three inners and four outers (Al-Zahir, Al-Adel, Al-Kakyeea, Al-Sharaee, Al-Jamom, Al-Kamel, and Kolese). Each sector consists of a group of Primary Health Care Centers. The researcher is concerned with one of the inner PHC of Al-kakyeea sector called "AL-Eskan PHCC".

#### 3.3. Study Population

The study was conducted among DM patients attending Al-Eskan PHCC in Makkah Al-Mokarramah, during the period of survey in 2018.

#### 3.4. Selection Criteria

A- Inclusion criteria:

- All adult DM patients.
- Both males and females.
- All nationalities.

Exclusion criteria:

- Age < 18
- DM with impaired cognitive functions.

#### 3.5. Sample Size

The estimated total number of DM patients in AL-Eskan PHCC is 310 during the last 3 weeks. Assuming that, the prevalence of influenza vaccination among DM patients is on average 50%. By Setting the confidence interval of 95% and sample error of 5%, using the Raosoft sample size calculator program, the sample size calculated was 172 patients [13] and adding 10 more to decrease margin of error.

#### 3.6. Sampling Technique

The researcher used Multi-stage random sampling technique, giving each sector code number from one to seven (1- Al-zahir, 2- Al-adel, 3- Al-kakyeea, 4- Al-sharaee, 5- Al-jamom, 6- Al-kamel, 7- Al- Kolese). After that, by using random number generator, [14] the minimum number was one, and the maximum was seven, the generation number was three which is Al-kakyeea sector. Then simple random sampling technique was applied to select the PHCC from Al-Kakyeea sector (1- Al-Kakyeea, 2- Al-Khaldya, 3- Al-Hejra, 4- Al-Eskan, 5- Al-Masflah, 6-Al-Nakash, 7-Alhilal Alahmer, 8-Al-Heglah, 9- Al-Hndaweeah, 10- Um-Alrakah, 11- Al-Khadhra) the

given number was 4 "Al-Eskan PHCC". Also, convenience sampling technique was utilized to select the participants in the study.

#### 3.7. Data Collection Tool

Self-administered questionnaire was used for data collection, validated from the previous study published in Pretoria [6], after permission was taken through email from the researcher, Then, the questionnaire was validated by three consultants. After that, it was translated to Arabic language and validated again by three consultants. The questionnaire consists of three sections: Section A: Socio-demographics.

Section B: Attitude towards seasonal flu and influenza vaccine.

Section C: Reasons for accepting or reasons for refusing flu vaccine .

Responses to attitude questions were scored in the way that, the highest the score, the more positive the attitude towards seasonal influenza vaccination and vice versa. Then, the total score for each participant was computed and its median value was identified (it was 8). Patients scored at median or above were regarded as having "positive attitude" whereas those scored below the median were regard as having "negative attitude".

#### 3.8. 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. Study Variables

**a. Dependent variable:**

Influenza immunization status

**b-Independent variables:**

Age, gender, marital status, educational level, occupation, home/living, reasons for accepting flu vaccination, or reasons for refusing.

#### 3.11. Data entry and Analysis

The Statistical Package for Social Sciences (SPSS) software version 22.0 was used for data entry and analysis. Descriptive statistics (e.g., number, percentage) and analytic statistics using Chi-Square tests ( $\chi^2$ ) to test for the association and the difference between two categorical variables were applied. A p-value  $\leq 0.05$  was considered statistically significant.

### 3.12. Pilot Study

A pilot study was conducted in one PHCC 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.

### 3.13. Ethical Considerations

- Permission from the Makkah joint program of family medicine was obtained.
- Permission from the Directorate of Health Affairs
- Verbal consents from all participants
- All information was kept confidential

### 3.14. Relevance

- This study was carried out to assess the prevalence of influenza immunization among DM patients in Al-Eskan PHCC.

- At the end of this study we are able to identify some factors associated with the success rate of influenza vaccination among DM patients in Al-Eskan PHCC.

## 4. Results

### 4.1. Socio-demographic Characteristics of the Participants

The study included 181 diabetic patients. Their age ranged between 19 and 82 years with a mean of 53.5 years and standard deviation of 13.7 years. [Table 1](#) summarizes the remaining socio-demographic characteristics of the diabetic patients. More than half of them (98; 54.1%) were females. About two-thirds were married (112; 61.9%). More than one-third of the participants were either secondary school (75; 41.5%) or below than secondary school educated (69; 38.1) whereas only 10 (5.5%) were postgraduate. Almost two-thirds of them (115; 63.6%) live with spouse and children whereas 37 (20.4%) live alone. Approximately half of them (89; 49.2%) were working.

### 4.2. Attitude towards Influenza Vaccination

[Table 2](#) shows that more than half of the diabetic patients (103; 56.9%) agreed that Influenza vaccination is important among diabetics and should be taken yearly whereas 78 patients (43.1%) agreed that Influenza vaccine prevent serious complication among diabetics. More than one-third of the participants (72; 39.8%) agreed that all diabetics should receive influenza vaccine while 99 patients (54.7%) agreed that if there is an effective vaccine to prevent flu, they will take it. On the other hand, 83 patients (45.9%) disagreed that Influenza vaccine has serious side effect and therefore should not be taken, 72 patients (39.8%) disagreed that Flu is a mild illness and therefore vaccination is not necessary and 75 patients (41.4%) disagreed that they don't need the flu vaccine because they have life immunity against flu. From [Table 3](#), female patients were more likely to have positive

attitude towards seasonal influenza vaccination compared to male patients as 66 female patients (67.3%) compared to 41 male patients (49.4%) expressed positive attitude towards influenza vaccination,  $p=0.014$ . The age of patients who had positive attitude towards influenza vaccination was significantly lower than that of those who had negative attitude ( $50.6\pm 14$  versus  $57.6\pm 12.1$  years),  $p<0.001$ . Other factors (marital status, level of education, living status and occupation) were not significantly associated with attitude of diabetic patients towards seasonal influenza vaccination. The highest rate of positive attitude towards seasonal influenza vaccination was reported among diabetic patients with duration of disease ranged between 11 and 15 years (23; 82.1%) whereas the lowest rate was reported among those with a duration exceeded 15 years (14; 46.7%). The difference was statistically significant,  $p=0.035$ . ([Table 4](#))

**Table 1. Socio-demographic characteristics of diabetic patients, Al-Eskan PHCC, Makkah Al-Mokarramah**

	Number	Percent
Gender		
Male	83	45.9
Female	98	54.1
Marital status		
Single	20	11.0
Married	112	61.9
Divorced	25	13.8
Widow	24	13.3
Level of education		
Less than secondary	69	38.1
Secondary	75	41.5
University	27	14.9
Postgraduate	10	5.5
Home/living		
Alone	37	20.4
With spouse and children	115	63.6
With parents	29	16.0
Occupation		
Working	89	49.2
Not working	92	50.8

**Table 2. Attitude of diabetic patients towards influenza vaccination .**

	Agree N (%)	Disagree N (%)	Don't know N (%)
Influenza vaccination is important among diabetics and should be taken yearly	103 (56.9)	41 (22.7)	37 (20.4)
Influenza vaccine prevent serious complication among diabetics	78 (43.1)	65 (35.9)	38 (21.0)
Influenza vaccine has serious side effect and therefore should not be taken	48 (26.5)	83 (45.9)	50 (27.6)
All diabetics should receive influenza vaccine	72 (39.8)	60 (33.1)	49 (27.1)
Flu is a mild illness and therefore vaccination is not necessary	65 (35.9)	72 (39.8)	44 (24.3)
I don't need the flu vaccine because I have life immunity against flu	48 (26.5)	75 (41.4)	58 (32.0)
If there is an effective vaccine to prevent flu, I will take it	99 (54.7)	32 (17.7)	50 (27.6)

**Table 3. Socio-demographic factors associated with attitude of diabetic patients towards seasonal influenza vaccination.**

	Attitude towards flu vaccination		p-value
	Negative N=74 n (%)	Positive N=107 n (%)	
Gender			
Male (n=83)	42 (50.6)	41 (49.4)	0.014*
Female (n=98)	32 (32.7)	66 (67.3)	
Age			
Mean±SD	57.6±12.1	50.6±14.0	0.001**
Marital status			
Single (n=20)	5 (25.0)	15 (75.0)	0.406*
Married (n=112)	48 (42.9)	64 (57.1)	
Divorced (n=25)	12 (48.0)	13 (52.0)	
Widow (n=24)	9 (37.5)	15 (62.5)	
Level of education			
Less than secondary (n=69)	34 (49.3)	35 (50.7)	0.103*
Secondary (n=75)	25 (33.3)	50 (66.7)	
University (n=27)	13 (48.1)	14 (51.9)	
Postgraduate (n=10)	2 (20.0)	8 (80.0)	
Home/living			
Alone (n=37)	18 (48.6)	19 (51.4)	0.214*
With spouse and children (n=115)	48 (41.7)	67 (58.3)	
With parents (n=29)	8 (27.6)	21 (72.4)	
Occupation			
Working (n=89)	41 (46.1)	48 (53.9)	0.163*
Not working (n=92)	33 (35.9)	59 (64.1)	

\* Chi-square test, \*\*Student's t-test.

**Table 4. Association between duration of diabetes and attitude of diabetic patients towards seasonal influenza vaccination**

Duration of diabetes mellitus (years)	Attitude towards flu vaccination		p-value
	Negative N=74 n (%)	Positive N=107 n (%)	
≤5 (n=66)	27 (40.9)	39 (59.1)	0.035*
6-10 (n=57)	26 (45.6)	31 (59.4)	
11-15 (n=28)	5 (17.9)	23 (82.1)	
>15 (n=30)	16 (53.3)	14 (46.7)	

\* Chi-square test.

### 4.3. Prevalence of Influenza Vaccination among Diabetic Patients

The prevalence of seasonal influenza vaccine uptake by adult diabetic patients was 55.2% as displayed in Table 3.

Among patients accepted seasonal influenza vaccine (n=100), the main reasons were being free of charge (56%) and doctor informed them that it is important (41%). (Table 5)

Among patients who refused seasonal influenza vaccine (n=81), the main reasons were being not necessary because flu is just a minor illness (40.7%), forgetting (35.8%) and belief that the vaccine was not effective (35.4%). (Table 6)

**Table 5. Reasons for accepting flu vaccination among adult diabetic patients (n=100)**

	Frequency	Percentage
Doctor told me it's important	41	41.0
It was free of charge	56	56.0
Patient/friend told me it's effective	32	32.0
Information from mass media	32	32.0
Health awareness within the health center	35	35.0

**Table 6. Reasons for refusing flu vaccination among adult diabetic patients (n=81)**

	Frequency	Percentage
It is not necessary because flu is just a minor illness	33	40.7
Concern about vaccine's side effects	26	32.1
Belief that the vaccine was not effective	28	35.4
Fear of needles and injection	15	18.5
Forgetting	29	35.8

### 4.4. Factors Associated with Receiving Seasonal Influenza Vaccine

#### - Socio-demographic factors

Female adult diabetic patients were more likely to receive seasonal influenza vaccine compared to males (61.2% versus 48.2%). However, the difference was not statistically significant. The age of diabetic patients who received the seasonal influenza vaccine was significantly lower than of those who refused it (50.1±14.5 versus 57.6±11.4 years), p<0.001. Most of postgraduate patients (80%) compared to 46.4% of those of less than secondary school educational level received seasonal influenza vaccine. The association between educational level of diabetic patients and receiving of seasonal influenza vaccine was statistically significant, p=0.034. Most of patients who live with parents (72.4%) compared to 40.5% of those living alone received seasonal influenza vaccine, p=0.035. Patients' marital status, and occupation were not significantly associated with receiving seasonal influenza vaccine.

### 4.5. Duration of Diabetes

The highest rate of receiving seasonal influenza vaccine was observed among diabetic patients with duration of five years of the disease or less (68.2%) whereas the lowest rate was reported among those with duration of diabetes ranged between 6 and 10 years (35.1). the association between duration of diabetes and receiving seasonal influenza vaccine by diabetic patients was statistically significant, p=0.002.

### 4.6. Patients' Attitude towards Seasonal Influenza Vaccine

From Table 9, it is realized that 62.6% of diabetic patients who expressed positive attitude towards seasonal influenza vaccine have received it compared to 44.6% of those who expressed negative attitude towards the vaccine, p=0.017.

**Table 7. Socio-demographic factors associated with receiving of seasonal influenza vaccine.**

	Receiving flu vaccination		p-value
	No N=81 n (%)	Yes N=100 n (%)	
Gender			
Male (n=83)	43 (51.8)	40 (48.2)	0.079*
Female (n=98)	38 (38.8)	60 (61.2)	
Age			
Mean±SD	57.6±11.4	50.1±14.5	<0.001**
Marital status			
Single (n=20)	5 (25.0)	15 (75.0)	0.195*
Married (n=112)	50 (44.6)	62 (55.4)	
Divorced (n=25)	14 (56.0)	11 (44.0)	
Widow (n=24)	12 (50.0)	12 (50.0)	
Level of education			
Less than secondary (n=69)	37 (53.6)	32 (46.4)	0.034*
Secondary (n=75)	35 (46.7)	40 (53.3)	
University (n=27)	7 (25.9)	20 (74.1)	
Postgraduate (n=10)	2 (20.0)	8 (80.0)	
Home/living			
Alone (n=37)	22 (59.5)	15 (40.5)	0.035*
With spouse and children (n=115)	51 (44.3)	64 (55.7)	
With parents (n=29)	8 (27.6)	21 (72.4)	
Occupation			
Working (n=89)	44 (49.4)	45 (50.6)	0.212*
Not working (n=92)	37 (40.2)	55 (59.8)	

\* Chi-square test, \*\*Student's t-test.

**Table 8. Association between duration of diabetes and receiving seasonal influenza vaccination among adult diabetic patients**

Duration of diabetes mellitus (years)	Receiving flu vaccination		p-value*
	No N=81 n (%)	Yes N=100 n (%)	
≤5 (n=66)	21 (31.8)	45 (68.2)	0.002
6-10 (n=57)	37 (64.9)	20 (35.1)	
11-15 (n=28)	10 (35.7)	18 (64.3)	
>15 (n=30)	13 (43.3)	17 (56.7)	

\* Chi-square test.

**Table 9. Association between diabetic patients' attitude towards seasonal influenza vaccine and receiving it**

Attitude towards flu vaccination	Receiving flu vaccination		p-value
	No N=81 n (%)	Yes N=100 n (%)	
Negative (n=74)	41 (55.4)	33 (44.6)	0.017*
Positive (n=107)	40 (37.4)	67 (62.6)	

\* Chi-square test.

#### 4.7. Multivariate Logistic Regression Analysis

Results of multivariate logistic regression analysis revealed that younger patients were more likely to accept seasonal influenza vaccine as with increase in the age of patient by one year there was reduction in the uptake of the vaccine by 4% (AOR=0.96, 95%CI=0.93-0.99, p=0.003). Compared to patients with duration of diabetes of 5 years or less, those with duration ranged between 11 and 15 years were 70% less likely to receive seasonal influenza vaccine (AOR=0.30, 95% CI=0.11-0.80, p=0.016). Patient's educational level, living status and attitude

towards seasonal influenza vaccine were not significantly associated with receiving seasonal influenza vaccine. (Table 10).

**Table 10. Determinants of receiving seasonal influenza vaccine among diabetic patients: Results of multivariate logistic regression analysis**

	B	SE	AOR	95% CI	p-value
Age (years)	-0.042	0.014	0.96	0.93-0.99	0.003
Duration of diabetes					
≤5 (n=66) <sup>(a)</sup>			1.0	---	---
6-10 (n=57)	-0.104	0.520	0.90	0.33-2.50	0.841
11-15 (n=28)	-1.210	0.501	0.30	0.11-0.80	0.016
>15 (n=30)	-0.138	0.588	0.87	0.28-2.76	0.814

(a): Reference category, B: Slope, SE: Standard error. AOR: Adjusted odds ratio, CI: Confidence interval.

## 5. Discussion

It has been reported that diabetic patients, even well controlled are 3 to 6 times more likely to be hospitalized as a result of influenza complications, particularly pneumonia than others and death rates among them increase between 5 and 15% during epidemics of influenza [15,16]. In a retrospective cohort study carried out in Taiwan (2013), the vaccinated elderly diabetic patients had lower incidences of pneumonia and respiratory failure compared with the non-vaccinated patients. Additionally, they had a 11% lower hospitalization rate than the non-vaccinated patients. Moreover, they were less likely to be admitted to the intensive care unit (ICU) [9]. The objective of this study is to estimate the prevalence and determine the predictors of receiving influenza vaccine among diabetic patients attending Al-Eskan Primary Health Care Center in Makah Al-Mokarramah, KSA, 2018.

More than half of diabetic patients in the present study perceived Influenza vaccination as an important tool for diabetics and should be taken yearly. This positive attitude was associated with higher uptake of the vaccine. Similarly, in South Africa [7], uptake of influenza vaccine was higher among diabetic patients who had better perception that influenza can be prevented and believe that it is an effective vaccine. Therefore, it is recommended to improve awareness of diabetics regarding the importance of influenza vaccination to reduce morbidity and mortality in this vulnerable group [15].

The effectiveness of the seasonal influenza vaccine depends mostly on characteristics of patients, whether there is matching between the circulating viruses and the viruses contained in the vaccine, and finally on the types and subtypes of influenza virus [17,18].

In a systematic review carried out in 2015, influenza vaccination prevented all-cause hospitalization with vaccine effectiveness of 58% and hospitalization admission due to influenza with vaccine effectiveness of 43% [8]. It is recommended to have seasonal influenza vaccine before winter season as antibody response generally needs about two weeks to be developed [17,18].

In this study, more than half of diabetic patients (54.7%) reported that if there is an effective vaccine to prevent flu, they will take it and 43.1% believe in effectiveness of

influenza vaccine in preventing serious influenza complications, however, 26.5% of them fear from serious side effects of the vaccine. In a study carried out in Spain, 24% of diabetic patients did not believe in the effectiveness of the vaccination or feared side effects. However, only 4 (1%) of patients experienced mild adverse reactions to influenza vaccination [11]. In South Africa, only 29.5% of diabetic patients considered vaccination as an effective means of preventing severe influenza-related complication [7].

In the current survey, the prevalence of seasonal influenza vaccine uptake by adult diabetic patients was 55.2%. Lower figures have been reported from other countries. In South Africa [7], 28.8% of diabetic patients have ever been vaccinated. Also, in Singapore (2007), 30.6% of diabetic patients have taken influenza vaccine [19]. In Spain, the prevalence of patients vaccinated for seasonal influenza was 40% [11]. However, in another study carried out in Spain among diabetics aged 50 years or older, the vaccine uptake was 61.4% in 2003, 63.8% in 2006 and 65% in 2010 [10]. The relatively higher uptake observed in the present study could be attributed to the increasing awareness about seasonal flu in KSA in general, and Makkah in particular due to having a lot of people come for Hajj and Omrah. However, tracking of patients is an effective measure, targeting high risk group patients, particularly those with diabetes in subspecialty clinics and during hospitalizations as this strategy simplifies the process of vaccination and translate it into significant cost savings procedure [7].

After controlling for confounders in the present study, younger patients were more likely to accept seasonal influenza vaccine as compared to older patients and patients with moderate duration of diabetes (11-15 years) were less likely to receive seasonal influenza vaccine compared to those with shorter or longer duration.

In the present study, the main reasons for accepting seasonal influenza vaccine among diabetics were being the vaccine free of charge and patients being informed by doctor that the vaccine is important. Therefore, physicians' recommendation is very important in educating patients regarding the benefits of influenza vaccination utilizing accurate information and encourage them to uptake it to prevent adverse outcomes of influenza [20,21]. In a similar study conducted in South Africa [7], better knowledge of vaccine and influenza, positive attitude towards vaccination, being informed by doctors and fellow patients who have been previously vaccinated and availability of the vaccine free of charge were the main contributors for having the vaccine. Other studies reported that awareness of seasonal influenza vaccination recommendations, previous history of influenza vaccination, perception of the harmful effects of influenza infection, particularly for diabetics, and perceived advantages of being vaccinated against influenza were predictors for up taking the vaccine [22,23]. In the current survey, the main reasons to refuse seasonal influenza vaccine by diabetic patients were being not necessary because flu is just a minor illness (40.7%), forgetting (35.8%) and belief that the vaccine was not effective (35.4%). In a similar study carried out in South Africa, the main reason was use of other different protection (51.4%) [7].

## 6. Study Strengths and Limitations

The main strength of the present study is the fact that, up to our knowledge, it is the first one of its kind in our region exploring uptake rate and reasons for accepting and refusing influenza vaccine among diabetic patients. However, the same has some potential limitations. First, the cross-sectional design which proves only association and not causality between dependent and independent variables. The possibility of selection bias as we recruited patients from only one PHC center in Makkah, therefore generalizability of results is questionable.

## 7. Conclusion

Almost half of diabetic patients in Makkah had positive attitude towards seasonal influenza vaccine and have been vaccinated. Positive attitude was associated with higher uptake of the vaccine. Additionally, higher uptake of the seasonal influenza vaccine was associated with younger diabetic patients and those with less than 5 years or more than 15 years of diabetes. The main reasons for up taking seasonal influenza vaccine were being free of charge and doctor informed the patients that it is important.

## 8. Recommendations

1. Organizing and implementing health education program at the primary care setting and waiting areas of outpatient clinics regarding the adverse consequences of influenza infection for diabetics and importance of seasonal vaccination with stressing on its efficacy.
2. Health care workers, particularly primary care physicians should play a more active role
3. Different strategies should be followed to improve influenza vaccination
4. Establishment of a community-based vaccination program for vulnerable group of people, including diabetics is recommended.
5. Ensure availability and efficacy of the influenza vaccine at primary care settings. Further study is recommended including diabetic patients from other PHC centers.

## References

- [1] American Diabetes Association® How many people need your help today? [Internet]. [cited 2017 Nov 6]. Available from: <http://www.diabetes.org>.
- [2] Mubareka S, Lowen AC, Steel J, Coates AL, García - Sastre A, Palese P. Transmission of Influenza Virus via Aerosols and Fomites in the Guinea Pig Model. *J Infect Dis* [Internet]. 2009 Mar 15 [cited 2017 Nov 6]; 199(6): 858-65.
- [3] WHO | Influenza (Seasonal). WHO [Internet]. 2017 [cited 2017 Nov 14]; Available from: <http://www.who.int/mediacentre/factsheets/fs211/en/>.
- [4] About Flu | Seasonal Influenza (Flu) | CDC [Internet]. [cited 2017 Nov 6]. Available from: <https://www.cdc.gov/flu/about/index.html>.
- [5] WHO | Vaccines. WHO [Internet]. 2017 [cited 2017 Nov 6]; Available from: <http://www.who.int/influenza/vaccines/en/>.

- [6] المملكة العربية السعودية - البوابة الإلكترونية لوزارة الصحة [Internet]. [cited 2017 Nov 6]. Available from: <https://www.moh.gov.sa/Pages/Default.aspx>
- [7] Olatunbosun OD, Esterhuizen TM, Wiysonge CS. A cross sectional survey to evaluate knowledge , attitudes and practices regarding seasonal influenza and influenza vaccination among diabetics in Pretoria , South Africa. *Vaccine* [Internet]. 2017; 35(47): 6375-86.
- [8] Remschmidt C, Wichmann O, Harder T. Vaccines for the prevention of seasonal influenza in patients with diabetes: systematic review and meta-analysis. *BMC Biol* [Internet]. 2013 [cited 2017 Nov 6]; 11: EE. Available from: [file:///C:/Users/technole/Desktop/proposal/systematic review.pdf](file:///C:/Users/technole/Desktop/proposal/systematic%20review.pdf).
- [9] Wang I-K, Lin C-L, Chang Y-C, Lin P-C, Liang C-C, Liu Y-L, et al. Effectiveness of influenza vaccination in elderly diabetic patients: A retrospective cohort study. *Vaccine* [Internet]. 2013 Jan [cited 2017 Nov 6]; 31(4): 718-24.
- [10] Jimenez-Trujillo I, López-De Andrés A, Hernández-Barrera V, Carrasco-Garrido P, Santos-Sancho JM, Jimenez-García R. Influenza vaccination coverage rates among diabetes sufferers, predictors of adherence and time trends from 2003 to 2010 in Spain. *Hum Vaccines Immunother*. 2013;9(6): 1326-32.
- [11] Alvarez CE, Clichici L, Patricia Guzmán-Libreros A, Navarro-Francés M, Ena J. Survey of vaccination practices in patients with diabetes: A report examining patient and provider perceptions and barriers. *J Clin Transl Endocrinol* [Internet]. 2017; 9: 15-7.
- [12] CDSI. Central Department Of Statistics & Information. 2015; Available from: <http://www.cdsi.gov.sa/english/>
- [13] Sample Size Calculator by Raosoft, Inc. [Internet]. [cited 2017 Nov 6]. Available from: <http://www.raosoft.com/samplesize.html>.
- [14] RANDOM.ORG - True Random Number Service [Internet]. [cited 2017 Nov 12]. Available from: <https://www.random.org/>.
- [15] Allard R, Leclerc P, Tremblay C, Tannenbaum TN. Diabetes and the severity of pandemic influenza A (H1N1) infection. *Diabetes Care* 2010; 33(7): 1491-3.
- [16] Center for Disease Control and Prevention. Flu and diabetes <<http://www.cdc.gov/flu/diabetes/>> [assessed 28 June 2016].
- [17] The National Institute for Communicable Diseases (NICD). Healthcare workers handbook on influenza. [http:// www. nicd. ac.za/assets/files/Healthcare Workers Handbook on influenza in SA\\_Final May 2016.pdf](http://www.nicd.ac.za/assets/files/Healthcare%20Workers%20Handbook%20on%20influenza%20SA_Final%20May%202016.pdf) (assessed 15 June 2016).
- [18] Center for Disease Control and Prevention. Key facts about seasonal flu vaccine. <[http://www.cdc.gov/flu/protect/ keyfacts.htm](http://www.cdc.gov/flu/protect/keyfacts.htm)> [assessed 28 June 2016].
- [19] Tan EK, Lim LH, Teoh YL, Ong G, Bock HL. Influenza and seasonal influenza vaccination among diabetics in Singapore: knowledge attitudes and practices. *Singapore Med J* 2010; 51(8): 623-30.
- [20] Burns VE, Ring C, Carroll D. Factors influencing vaccination uptake in an elderly, community-based sample. *Vaccine* 2005; 23: 3604-8.
- [21] Szucs DT, Muller D. Influenza vaccination coverage rates in 5 European countries: a population-based cross-sectional analysis of two consecutive influenza seasons. *Vaccine* 2005; 23: 5055-63.
- [22] Riphagen-Dalhuisen J, Gefenaite G, Hak E. Predictors of seasonal influenza vaccination among healthcare workers in hospitals: a descriptive metaanalysis. *Occup Environ Med* 2012; 69(4): 230-5.
- [23] Yuen CYS, Fong DYT, Lee ILY, Sing C, Siu ESM, Tarrant M. Prevalence and predictors of maternal seasonal influenza vaccination in Hong Kong. *Vaccine* 2013; 31: 5281-8.



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