



# A cross sectional survey to evaluate knowledge, attitudes and practices regarding seasonal influenza and influenza vaccination among diabetics in Pretoria, South Africa



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## ABSTRACT

**Background:** In South Africa, influenza vaccination is recommended to all diabetics. However, vaccination coverage among diabetics remains low. Therefore, this study aimed to explore the knowledge, attitudes, and practices among people with diabetes in Pretoria regarding seasonal influenza and influenza vaccination. **Method:** A cross-sectional survey was conducted among type 1 and 2 diabetes mellitus patients who attended diabetic clinics in two major tertiary hospitals in Pretoria, South Africa from October to December 2015. The pilot-tested questionnaire consists of 32 quantitative questions that covered seasonal influenza and influenza vaccination in terms of the patient's demographics, medical history and knowledge, attitudes and practices.

**Results:** A total of 292 completed questionnaires were received with a response rate of 70.0%. Of these, 162 participants (55.5%) believed that influenza is the same as common cold. While 96 (32.9%) participants were aware that they were at higher risk of complications of influenza, only 86 (29.5%) participants considered vaccination as an effective means in preventing serious influenza-related complication. Even though 167 (57.2%) participants had heard of the vaccine to prevent influenza, only 84 (28.8%) participants were previously vaccinated. Multivariate analysis shows that participants with good attitude score for influenza vaccination were 18.4 times more likely to be vaccinated compared with those with poor attitude score (OR =18.4, 95%CI. 5.28–64.10,  $p = .001$ ). Among those previously vaccinated, advice from their doctors (82/84, 97.6%) was the main factor encouraging vaccination. Top reasons given by participants who had never been vaccinated before (208/292, 71.2%) include use of alternative protection (107/208, 51.4%) and that vaccination is not necessary because flu is just a minor illness (93/208, 44.7%).

**Conclusion:** Uptake of seasonal vaccination among diabetics in Pretoria is low. Level of knowledge and perception are the main barriers to vaccination. Health care provider's advice may be an important key predictor of previous influenza vaccination and they should continue to educate and encourage all diabetics to get vaccinated for influenza at least once yearly.

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## 1. Introduction

Influenza, a mild to severe respiratory infection, is one of the most common vaccine-preventable diseases affecting people of all age groups worldwide. Annually it is estimated that it attacks 5–10% of adults and 20–30% of children globally and causes significant levels of illness, hospitalisation and death [1]. Worldwide, these annual influenza epidemics are estimated to result in about 3–5 million cases of severe illness, and about 250,000–500,000

deaths [2]. Severe morbidity and mortality during typical influenza seasons occurs among persons aged  $\geq 65$  years and those who have chronic medical conditions like diabetes mellitus [3]. Diabetes mellitus (DM) is one of the leading causes of death worldwide, accounting for an estimate of 1.5 million deaths worldwide in 2015 [4]. DM is the 3rd leading cause of death in South Africa with a prevalence of 7% among the adult population (20–79 yrs) in 2014 and about 2.28 million cases of diabetes were reported in 2015 [5,6]. Studies have shown that people with diabetes are 3–6 times more likely to be hospitalised with influenza complications than people without diabetes and death rates among diabetics increase 5–15 percent during influenza epidemics [7,8].

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In South Africa, the influenza season occurs within the four months of winter (May to August), sometimes continuing for a short period into September [9]. Seasonal influenza commonly known as flu is associated with considerable economic burden and still a challenging field for the public health system [10,11]. During influenza season it is estimated that influenza-like illness is responsible for 45% of workdays lost and for 49% of low productivity days among working adults aged 50–64 years in the United States [12]. It is estimated that between 6734 and 11619 individuals die of seasonal influenza-associated illness in South Africa each year [13,14].

Vaccination has been found to be the most effective way to prevent infection and severe outcomes caused by influenza viruses. [15]. Although patients with diabetes may have abnormalities in immune function [16], they have appropriate humoral immune responses to vaccination [17,18] and immunization against influenza has been associated with substantial health and economic benefits with previous studies showing reduction of hospital admission by 79% during influenza epidemics among diabetics [19,20].

Therefore, the United States Advisory Committee on Immunization Practices (ACIP) and the International Diabetes Federation (IDF), in view of the efficacy of influenza vaccination, recommend influenza vaccination of all diabetics across all ages [21,22]. Influenza vaccine coverage continues to vary across different geographical locations, and vaccine supply still remains low in Africa. Generally, the rate of influenza vaccination is universally low [23,24] and with an estimated coverage rate of about 9% in South Africa in 2005 among adult (17–64 years) and elderly ( $\geq 65$  years) age group in the urban setting [25]. Even though South Africa is one of the six countries in Africa recommending the use of influenza vaccination in their national immunization schedule, the influenza vaccination uptake is low [23,26,27]. Despite the yearly influenza vaccination campaign initiated in 2010 by the South African National Department of Health in collaboration with National Institute for Communicable Diseases (NICD) to increase vaccination awareness among high risk groups which include diabetics [28,29], there is no recent published study in South Africa assessing the knowledge, attitudes, and practices (KAPs) of diabetics regarding seasonal influenza and influenza vaccination; and evaluating vaccine uptake among this high risk group.

The aim of this study was therefore to assess the knowledge, attitudes and practices among diabetic patients in Pretoria regarding seasonal influenza and influenza vaccination. It also aimed to assess the uptake of seasonal influenza vaccine among diabetics and identify factors influencing such practices.

## 2. Methods

The study is a cross sectional survey that took place at two government tertiary hospitals (Dr. George Mukhari and Steve Biko hospitals) in Pretoria, South Africa. These hospitals have been purposively selected because they serve as referral centres for most hospitals in Pretoria and have a large base of patients in the endocrine clinics where the diabetic patients are seen. All type 1 and type 2 DM patients above 18 years irrespective of gender and race were eligible for the study with the exclusion of diabetic patients on admission and at the emergency department of the hospital. Also patients attending clinic more than once during the period of the study were not allowed to participate more than once in the study.

The study was approved by the Research Ethics Committee of Stellenbosch University, and from the appropriate research ethics body of both hospitals prior to study initiation. The survey was conducted at the end of the influenza season among all eligible diabetes mellitus patients who attended the weekly endocrine or diabetic clinic of both hospitals between October and December 2015;

following pilot interviews conducted in September 2015. Primary data were collected using interviewer administered structured questionnaire (Appendix A) after obtaining written informed consent from all participants. Informed consent was witnessed in situations where participants were illiterate. All eligible patients who attended the clinics during the proposed study period were selected and approached to participate in the study. The questionnaires were administered by the study physician and assisted by a trained nurse with background experience in diabetic care during normal routine consultation at the clinics with prior explanation and information given to all participants. However, no further clarification was provided in order to standardise the procedure of filling out the questionnaire. Both the study physician and the nurse are not regular health care giver of these patients and have not previously encountered any of these patients.

A minimum sample size of at least 97 diabetics was calculated based on an estimated 50% uptake rate of the influenza vaccination, with allowable error of 10% (total width of the confidence interval) and 95% level of confidence. We enrolled 292 participants in order to increase the precision of our estimates and allow for missing data.

The cutoff scores for knowledge and attitude questions were established a priori. Knowledge was scored and graded as good (score  $\geq 65\%$ , from the questions on knowledge) or poor (score  $< 65\%$ ) based on the number of knowledge questions answered correctly. This scoring system is applicable to knowledge score for seasonal influenza ( $\geq 14$  correct answers out of 22), influenza vaccine ( $\geq 13$  correct answers out of 20) and combined knowledge score for both seasonal influenza and vaccination ( $\geq 27$  correct answers out of 42). Also, attitude was categorised as positive ( $\geq 4$  positive responses out of 7 questions) or negative ( $\leq 3$  negative responses out of 7) based on the responses from the attitude questions.

For the descriptive analysis, Chi-square and Fisher's exact tests were used to compare the categorical outcomes. Logistic regression models were used to explore the factors associated with previous vaccination. Univariate analysis was performed using all relevant independent variables as covariates one at a time. For the multivariate analysis, forward stepwise modelling was used. Independent variables were selected starting from the most significant variable identified in the univariate analysis and the likelihood ratio test was used to determine whether the inclusion of a covariate significantly improved the model's fit. All statistical analyses were performed using STATA version 12.0 (StataCorp. Texas) and all tests were conducted at the 5% level of significance.

## 3. Results

A total number of 292 patients participated in the study with a response rate of 70.0% (292/415). The mean age of participants was 49 years (SD = 14.25) and most of the participants (182/292, 61.6%) were above 45 years with majority (241/292, 82.5%) being blacks (Table 1).

When asked about of flu, majority believed flu is a preventable illness (231/292, (79.1%) and caused by virus (235/292, 80.5%) while 162 participants (55.5%) still believed that it is the same as common cold.

Regarding the major symptoms of influenza, the most frequent choices were running nose (288/292, 98.6%), sneezing (285/292, 97.6%), headache (267/292, 91.4%), sore throat (265/292, 90.8%) and cough (264/292, 90.4) (Table 2). Flu was not seen to be more serious among diabetics by majority of the participants (180/292, 61.6%) as only 96 participants (32.9%) believed that flu can cause serious complications among diabetics (Table 2).

Only 24% (70/292) of patients had previously been admitted in the hospital for flu related illness.

**Table 1**  
Demographic characteristics of participants (n = 292).

Characteristics	Number	Percentage
<b>Gender</b>		
Male	141	48.29
Female	151	51.71
<b>Age category</b>		
>15–25	19	6.50
>25–35	41	14.04
>35–45	52	17.81
>45–55	68	23.29
>55–65	81	27.74
>65–75	24	8.22
>75–85	7	2.40
<b>Marital status</b>		
Single	102	34.93
Married	132	45.21
Separated	5	1.71
Divorced	25	8.56
Widow	28	9.59
<b>Level of education</b>		
Primary	107	36.64
Secondary	156	53.42
Tertiary	29	9.93
<b>Race</b>		
Black	241	82.53
White	18	6.16
Coloured	22	7.53
Indian	11	3.77
<b>Duration of being diabetic</b>		
0–5 yrs	60	20.55
6–M 10 yrs	100	34.25
11–15 yrs	69	23.63
More than 15 yrs	63	21.58

**Table 2**  
Perception of seasonal influenza, common symptoms and complications associated with influenza among participants (n = 292).

	Participants Number (%)
<b>Seasonal influenza</b>	
Flu is caused by a virus	235 (80.5)
Flu can spread from one person to the other	250 (85.6)
Flu can be prevented	231 (79.1)
Flu is the same as common cold	129 (44.2)
Flu occurs at certain period of the year	232 (79.5)
Flu symptoms are worse among diabetics	112 (38.4)
Flu causes serious complication among diabetics	96 (32.9)
<b>Symptoms</b>	
Running Nose	288 (98.6)
Sneezing	285 (97.6)
Headache	267 (91.4)
Sore throat	265 (90.8)
Cough	264 (90.4)
Vomiting	131 (44.8)
Fatigue	100 (34.6)
Muscle ache	97 (33.2)
Fever	67 (23.0)
Diarrhoea	60 (20.6)
Abdominal pain	42 (14.4)
<b>Complications</b>	
Poor blood sugar control	73 (25.0)
High risk of hospitalisation	61 (20.0)
Pneumonia	26 (8.9)
Hypertension	2 (0.7)
Gangrene	2 (0.7)
Chest pain	1 (0.3)
Tuberculosis	1 (0.3)

Out of the 57.2% (167/292) of participants who had heard of the vaccine to prevent flu, only 50.3% (84/167) of participants had ever been vaccinated in the past for flu. Majority (147/167, 88%) indicated that the vaccine is safe, and 83.8% (140/167) believed it works to prevent flu, although 38.3% (64/167) of participants

who believed in the efficacy of the vaccine indicated that one can still develop flu despite being vaccinated. Few participants (34/167, 20.1%) reported knowing side effects of the vaccine, among which headache (100%), nausea (85.3%), soreness/swelling at injection site (64.7%), and muscle ache (52.9%), were the most frequently reported.

When previously ever vaccinated patients were asked how long the vaccine can protect against having flu, majority (152/167, 91.6%) indicated that it can only protect for one flu season and that the most appropriate time to take the vaccine is before the flu season starts (155/167, 92.8%). 51.5% (86/167) of participants believe that the vaccine can prevent serious complications among diabetics, and previously vaccinated participants have significant better perception of influenza vaccine preventing serious complication among diabetics (54/84, 64.3%) (Table 3). Majority of participants have positive attitude (200/292, 68.5%) towards seasonal flu vaccination, even though only 37.7% (110/292) and 11.3% (33/292) has good knowledge about seasonal flu and vaccine respectively (Tables 4–6).

Regarding the general attitude of entire participants to influenza vaccination, most participants agreed that annual influenza vaccination is important among diabetics (189/292, 64.7%) and 65.4% (191/292) would recommend it for all diabetics. Recommendation for vaccination of all diabetics was more observed among participants with better perception that flu can be prevented. Majority (237/292, 81.2%) also indicated that if there was an effective vaccine to prevent flu, they would take it (Table 7). When asked about their previous influenza vaccination practice, 28.8% (84/292) had previously been vaccinated at one point in time of their life. Majority of them (68/84, 81%) received the vaccine yearly, 11% (9/84) have it every 2 years, and only 5% (4/84) have had the vaccination once. Factors that influenced decision for vaccination included advice from the doctor that it is important (82/84, 97.6%), being told by fellow patients that it is effective (46/84, 54.7%) and the vaccine made available free of charge (33/84, 39.3%) (Table 8).

Majority of participants had never received influenza vaccination before (208/292, 71.2%) and the main reasons given by them included use of alternative protection (51.4%), vaccination is not necessary because flu is just a minor illness (44.7%), and vaccine is expensive (31.3%) (Table 9).

From the multiple logistic regression analysis, age, duration of diabetes of 6–10 years, attitude score and combined knowledge of seasonal influenza and influenza vaccination score were significantly and independently associated with previous influenza vaccination after adjusting for the other variables in the model (Table 9). Participants with diabetes duration of 6–10 years were 4.3 times more likely to be vaccinated compared to participants with diabetes of 5 years or less duration (OR = 4.3, 95%CI. 1.70–10.98 p = .002). Participants with good attitude score for influenza vaccination were 18.4 times more likely to be vaccinated compared with those with poor attitude score (OR = 18.4, 95%CI. 5.28–64.10, p = .001), while participants with good combined knowledge of seasonal influenza and influenza vaccination score were 3.8 times more likely to be vaccinated compared with those with poor combined knowledge score (OR = 3.78, 95%CI. 1.81–7.87, p < .001).

When compared to the age group of <25 years, participants in the >35–55 years age group were 84% less likely to be vaccinated (OR = .16, 95%CI. 0.04–0.65, p < .011), while those >55 years were 96% less like to get vaccinated (OR = .08, 95%CI. 0.02–0.36, p = .001) (Table 10).

#### 4. Discussion

From this study, the knowledge of vaccine is extremely low as only 11% of participants who have heard of the influenza vaccine

**Table 3**  
Knowledge and attitudes pertaining to influenza vaccination based on previous influenza vaccination history.

	No. (%)			p-value <sup>a</sup>
	Total (n = 292)	Vaccinated	Not vaccinated	
Believes influenza vaccine is safe	147(50.3)	78(53.06)	69(46.94)	0.10
Believes influenza vaccine work to prevent flu	140(47.9)	74(52.86)	66(47.14)	0.09
Believes influenza vaccine has side effect	34(11.6)	21(61.76)	13(38.24)	0.30
Believes influenza vaccine can protect for only One flu season	152(52.1)	77(50.66)	75(49.34)	0.55
Believes Influenza vaccine can prevent serious complication among diabetics	86(29.5)	54(62.69)	32(37.21)	0.005
Believes Influenza vaccination is important among diabetics and should be taken yearly	189(64.7)	77(40.74)	112(59.26)	0.00
Disagrees that influenza vaccine has serious side effect and therefore should not be taken	141(48.3)	53(37.54)	88(62.41)	0.001
Would take influenza vaccine to prevent if effective	237(81.2)	83(35.02)	154(64.98)	0.00
Would recommend influenza vaccine to all diabetics	191(65.4)	77(40.31)	114(59.69)	0.00

<sup>a</sup> Comparing participants who had been previously vaccinated with those who had never been vaccinated.

**Table 4**  
Seasonal flu knowledge scores of participants (n = 292).

Seasonal flu knowledge score	Participants (%)
Good seasonal flu knowledge	110 (37.7)
Poor seasonal flu knowledge	182 (62.3)

**Table 5**  
Vaccine knowledge scores of participants (n = 292).

Flu vaccine knowledge score	Participants (%)
Good vaccine knowledge	33 (11.3)
Poor vaccine knowledge	259 (88.7)

**Table 6**  
Attitude scores of participants (n = 292).

Attitude score	Participants (%)
Positive attitude	200 (68.5)
Negative attitude	92 (31.5)

**Table 8**  
Factors influencing previous influenza vaccination among participants (n = 84).

Factors	Participants (%)
Advice from the doctor that it is important	82 (97.6)
Being told by fellow patients that it is effective	46 (54.7)
Vaccine made available free of charge	33 (39.3)
Advice from the pharmacist	1 (1.2)

**Table 9**  
Reasons given by the participants for not receiving influenza vaccination previously (n = 208).

Reason	Participants (%)
I have alternative protection	107 (51.4)
It is not necessary because flu is just a minor illness	93 (44.7)
It is expensive	65 (31.3)
People who had the vaccine still eventually had the flu	30 (14.4)
Fear of needles and injection	27 (13.0)
The vaccine is not effective	21 (10.1)
It has serious side effect	12 (5.8)

have good knowledge score. Although majority of patients who have heard about the influenza vaccine before believe in its effectiveness and safety, only half of them has ever been vaccinated before. Participants are well aware of the common symptoms of seasonal influenza as majority believed that running nose, sneezing, headache, sore throat and cough are associated with influenza related illness [30]. People with diabetes (type 1 and 2), even when well-managed, are at high risk of serious flu complications like pneumonia, bronchitis, sinus infections, ear infections and poor sugar control [7,30]. In this study however, flu is not seen to be worse among diabetics and complications of influenza aren't perceived as any different among them.

The perception of risk appears to be a significant factor for previous vaccination as participants who were previously vaccinated had better perception of influenza vaccine preventing serious complication among them (54/84, 64.3%,  $p = .005$ ). This is a similar finding in previous studies that has shown that risk perception plays a significant role in influenza vaccination [31,32]. Recom-

mendation for vaccination for all diabetics is also more among those with better perception that flu can be prevented (161/191, 84.3%,  $p = .000$ ), and majority of participants (81.2%) indicated their willingness for flu vaccination if there is an effective vaccine. Therefore there is need to develop awareness of the peculiarities of presentation of influenza in diabetics and the importance of influenza vaccination in order to reduce morbidity and mortality in this high risk group. Vaccination among this high risk group has been found to reduce outpatient visits, hospitalisation from pneumonia and even death [7,20]. Its effectiveness however depends on characteristics of those being vaccinated (age and health), whether there is a good match between the circulating viruses and the viruses contained in the vaccine, and on influenza types and subtypes [28,33]. The influenza season of 2015 in South Africa was predominately influenza A (H1N1) pdm09 with additional co-circulation of influenza A (H3N2) and influenza B [28,34]. According to the National Institute for Communicable Diseases (NICD) in collaboration with the South African National Department of

**Table 7**  
Attitudes of participants regarding seasonal influenza vaccination (n = 292).

	Number (%)		
	Agree	Disagree	Don't Know
Influenza vaccination is important among diabetics and should be taken yearly	189(64.7)	20(6.9)	83(28.4)
Influenza vaccine prevent serious complication among diabetics	98(33.6)	92(31.5)	100(34.6)
Influenza vaccine has serious side effect and therefore should not be taken	24(7.9)	141(48.3)	128(43.8)
All diabetics should receive influenza vaccine	191(65.4)	28(9.6)	73(25)
Flu is a mild illness and therefore vaccination is not necessary	20(6.9)	184(63.0)	88(30.1)
I don't need the flu vaccine because I have life immunity against flu	13(4.5)	183(62.7)	96(32.9)
If there is an effective vaccine to prevent flu, I will take it	237(81.2)	6(2.1)	49(16.8)

**Table 10**  
Factors potentially influencing previous vaccination among people with diabetes.

	Previously ever vaccinated		
	Adjusted OR	95%CI	p-value
Age group (<25 years)			
>25–35 years	0.43	(0.011–1.61)	0.209
>35–45 years	0.16	(0.04–0.65)	0.011
>45–55 years	0.16	(0.04–0.65)	0.010
>55 years	0.08	(0.02–0.36)	0.001
Duration of diabetes (<6 years)			
6–10 years	4.32	(1.70–10.98)	0.002
11–15 years	2.03	(0.63–6.57)	0.236
>15 years	2.50	(0.71–8.82)	0.155
Attitude score (good versus poor)	18.40	(5.28–64.10)	0.001
Combined flu and vaccine knowledge score (good versus poor)	3.78	(1.81–7.87)	<0.001

Relevant independent variables included in the logistic regression includes age group categories, duration of diabetes, attitude score, and combined flu and vaccine knowledge.

Health in 2015, diabetic patients amongst other high risk group are targeted to receive the influenza vaccine yearly [28,35]. Influenza vaccine is recommended to be given sufficiently early before winter to provide protection for the winter season because protective antibody response generally takes about 2 weeks to develop following vaccination [28,33].

In this study, influenza vaccine uptake among diabetics is low as only 28.8% of participants have previously been ever vaccinated against influenza. This is similar to the findings in a study done in 2007 at Singapore where the vaccine uptake among diabetics was 30.6% [36]. Influenza vaccination coverage still remains low in African and South Asian countries, and this may be largely attributed to the low vaccine supply and availability in these regions [37]. Influenza vaccination is included in the South African national immunization guideline and made available in the country through the public and private sector [23,27,28]. Unlike South Africa, influenza vaccine is not included in the Singapore national immunization policy and largely made available through the private sector [38]. However, the uptake of influenza vaccine among diabetics in Singapore has been largely attributed to increased public awareness of the vaccine following the SARS epidemic in 2003, indicating that it might have induced the public to seek vaccination against influenza [39].

Uptake is higher among participants with better perception of the vaccine being able to prevent complication among diabetics and its yearly importance. Therefore, better knowledge of both the vaccine and flu influence decision to get vaccinated. There is no recent published study in South Africa to evaluate the influenza vaccine uptake rate among diabetics. However a study done in 2004 shows the vaccination rate among the high risk group to be 16.9% [24]. An uptake rate of 28.8% in this study could be a reflection of the impact of the increasing awareness about seasonal flu in South Africa.

Major predictors of vaccination in this study include combined knowledge of vaccine and flu, good attitude towards vaccination, being told by doctors and fellow patients who have been previously vaccinated and availability of the vaccine free of charge. Advice from doctors about the importance of vaccination has strongly influenced decision to get vaccinated as 97.6% of those who were previously vaccinated were encouraged to do so by their doctors. Therefore health care provider's recommendation is a cost-effective immunization implementation strategy and a strong source of information to educate the patients regarding the benefits of influenza vaccination. Vaccination promotion strategies need to focus on encouraging health-care providers to discuss vaccination with their high risk clients and in providing them with

accurate and unbiased information about the risks of influenza infection and the benefits of vaccination [40,41].

Health system processes and continuous quality improvement can support the provider and patient in this and other effective implementation strategies [42]. Although data collection and tracking appears essential in effective implementation strategies, targeting at-risk groups in subspecialty clinics and during hospitalizations can greatly simplify this process and translate into significant cost savings and the prevention of disease.

Other strategies to improve vaccination that can be employed include client reminder and recall system [43], community based immunization programme for high risk [44], public awareness of places where vaccines are available and easy access to influenza vaccine at a subsidised cost [25]. Studies have also shown that some of the other predictors of influenza vaccination include awareness of vaccination recommendations, history of previous vaccination, perceived susceptibility to influenza infection, and perceived benefits of influenza vaccination [45,46].

A major strength of this study is the lack of previous similar local studies, as this to the best of our knowledge is the first of its kind in South Africa to investigate seasonal influenza vaccine attitude, perception and knowledge among diabetics.

The limitations of this study include low response rate (70%), and therefore a possibility of inclusion bias as included individuals may differ from those not included. Also, there were some limitations with respect to our study being a cross-sectional survey observing a small snapshot of the population. The population may not entirely be representative, being a hospital-based sample. This may limit the generalization of the results. Also our questionnaire did not enquire about the availability of influenza vaccine in the respective hospitals, alternative access to vaccine in private sector and cost implications with respect to their income.

This study was done after the influenza season in 2015 and there is a possibility that some of the participants included in the analysis of “ever vaccinated” were recently diagnosed with diabetes and would not have had the opportunity to have received influenza vaccination previously. This might also introduce some bias into the study. The outcome of this study was ever vaccinated, whereas vaccination in the previous year might have been a much more robust outcome, less subject to recall bias and substantially less likely to be biased by the number of years a person has had diabetes.

Therefore there is need for further studies among diabetics, other high risk group and the general population especially in the area of vaccine uptake, availability and ease of access. This will help health-care providers and policy makers to make key decision that will influence seasonal influenza vaccination and prevent future outbreak.

## 5. Conclusion

The uptake of seasonal vaccination among diabetics in Pretoria is low. This is largely attributed to the poor knowledge of influenza vaccine and its benefits. Diabetics are at high risk of developing serious complications of influenza, hence the need to educate them about this peculiarity. Despite the possibility of having flu even with vaccination, diabetics are more likely to benefit if they get vaccinated every autumn. Health care provider's advice may be an important predictor of previous influenza vaccination and they should continue to educate and encourage all diabetics to get vaccinated for influenza at least once yearly.

## Conflict of interest

There is no conflict of interest to declare.

**Acknowledgements**

Our profound appreciation to all participants of this study that provided important information.

**Appendix A**

Dear respondent, the information in this questionnaire is for education and research purpose only and responses will be treated with all confidentiality. Please answer sincerely by ticking where appropriate or giving information as the case may be. Thank you.

**Questionnaire**

**QUESTIONNAIRE ON KNOWLEDGE, ATTITUDE AND PRACTICES REGARDING SEASONAL INFLUENZA (FLU)  
AND INFLUENZA VACCINATION AMONG DIABETICS IN PRETORIA.**

Dear respondent, the information in this questionnaire is for education and research purpose only and responses will be treated with all confidentiality. Please answer sincerely by ticking where appropriate or giving information as the case may be. Thank you.

**SECTION A: Socio demographics**

1. Name \_\_\_\_\_

2. Age \_\_\_\_\_

3. Sex; Male ( ) Female ( )

4. Marital Status: Single ( ) Married ( ) Separated ( ) Divorced ( ) Widow ( )

5. Occupation \_\_\_\_\_

6. Level of education

Primary ( ) Secondary ( ) Tertiary ( )

7. Race: Black ( ) White ( ) Coloured ( ) Indian ( ) Others \_\_\_\_\_

8. For how long have you known that you are diabetic?

0 – 5 yrs ( ) 6- 10 yrs ( ) 11-15 yrs ( ) more than 15 yrs ( )

**SECTION B; Knowledge on Seasonal Influenza and Influenza Vaccination**

9. What do you know about seasonal Flu?

- a) It is caused by a virus **(YES / NO)**
- b) It can spread from one person to the other **(YES / NO)**
- c) It can be prevented **(YES / NO)**
- d) It is the same as common cold **(YES / NO)**
- e) It occur at certain period of the year **(YES / NO)**
- f) Flu symptoms are worse among diabetics **(YES / NO)**
- g) Causes serious complication among diabetics **(YES / NO)**

10. What are the common symptoms of flu that you know?

- a) Headache **(YES / NO)**
- b) Vomiting **(YES / NO)**
- c) Sore throat **(YES / NO)**
- d) Muscle ache **(YES / NO)**
- e) Fever **(YES / NO)**
- f) Fatigue **(YES / NO)**
- (g) Running Nose **(YES / NO)**
- (h) Sneezing **(YES / NO)**
- (i) Cough **(YES / NO)**
- (j) Abdominal pain **(YES / NO)**
- (k) Diarrhoea **(YES / NO)**

11. Have you ever been admitted to the hospital for flu infection before **(YES / NO)**

12. Flu can cause serious complications among diabetics **(YES / NO)**

If yes, common flu complication among diabetics includes

- i) Poor blood sugar control **(YES / NO)**                      (ii) High risk of hospitalisation **(YES / NO)**
- iii) Pneumonia **(YES / NO)**                                      (iv) others -----

13. Have you ever heard of vaccine to prevent flu before **(YES / NO)**

(If yes to question 13, answer question 14 to 21 )

14. Is the flu vaccine safe **(YES / NO)**

15. Does the vaccine work to prevent flu **(YES / NO)**

16. How is the vaccine given?

Injection **(YES / NO)**

Nose Spray **(YES / NO)**

Mouth drop **(YES / NO)**

17. Does the vaccine has side effect **(YES / NO)**

If yes, what the side effect of the flu vaccine

i) Headache **(YES / NO)**                      (ii) Soreness/swelling at injection site **(YES / NO)**

iii) Fever **(YES / NO)**                      (iv) Nausea **(YES / NO)**

v) Muscle ache **(YES / NO)**                      (vi) others-----

18. For how long can the vaccine protect?

One flu season **(YES / NO)**



Two flu season (YES / NO)

3 or more flu season (YES / NO)

19. Influenza vaccine can prevent serious complication among diabetics (YES / NO)

20. When is the appropriate time to take influenza vaccine?

i) Before flu season starts (YES / NO)

ii) During the flu season (YES / NO)

iii) Immediately after flu season (YES / NO)

21. You can never have flu as long as you are vaccinated during the seasonal flu (YES / NO)

**SECTION C; Attitudes of Diabetics regarding Seasonal Influenza and Influenza Vaccine**

Please tick as appropriate

		Agree	Disagree	Don't know
22	Influenza vaccination is important among diabetics and should be taken yearly			
23	Influenza vaccine prevent serious complication among diabetics			
24	Influenza vaccine has serious side effect and therefore should not be taken			

25	All diabetics should receive influenza vaccine			
26	Flu is a mild illness and therefore vaccination is not necessary			
27	I don't need the flu vaccine because I have life immunity against flu			
28	If there is an effective vaccine to prevent flu ,I will take it			

29. Have you received influenza vaccine before (YES / NO)

(If yes to question 29, answer question 30 and 31. If NO to question 29, answer question 32)

30. How regularly do you take the vaccine?

Yearly ( ) every 2year ( ) every 3 years ( ) others -----

31. What influenced you to take the vaccine?

a) My doctor told me it's important (YES / NO)

b) Because it was free of charge (YES / NO)

c) A fellow patient told me it's effective (YES / NO)

d) Others-----

32) What is the reason(s) for not taking influenza vaccination?

- i) It is not necessary because flu is just a minor illness (YES / NO)
- ii) It is expensive (YES / NO)
- iii) It has serious side effect (YES / NO)
- iv) The vaccine is not effective (YES / NO)
- v) Fear of needles and injection (YES / NO)
- vi) I have alternative protection (YES / NO)
- vii) People who had the vaccine still eventually had the vaccine (YES / NO)
- viii) I reacted to it the first time I attempted it (YES / NO)

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