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Research Article

Assessment of knowledge about seasonal influenza and practice of influenza vaccination in a sample of Iraqi diabetic patients

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Abstract

Administering influenza vaccines can prevent seasonal influenza and prevent or reduce the severity of influenza-related serious complications in diabetic patients. We aimed to assess the knowledge about seasonal influenza and its vaccines and the practice of influenza vaccination in a sample of Iraqi diabetic patients.A cross-sectional study was conducted on adult diabetic Iraqi patients. The data was collected by a well-trained community pharmacist using a paper-based, structured questionnaire. Most participants understood influenza well and answered the knowledge part of the questionnaire effectively. Over 50% of the participants had heard or knew about the influenza vaccine, and 43.2% agreed that seasonal influenza is a mild condition and does not require the administration of any vaccine. The vast majority of participants (75.7%) agreed with the statement that they would take a vaccine if it were a good vaccine for preventing influenza. Less than one-third of participants (32.4%) previously received the influenza vaccine. The recommendation of a friend or family member, followed by physician instruction, significantly influenced most vaccine participants (47.2% and 44.4%, respectively). On the other hand, the most frequent cause of avoiding vaccination was the perception of seasonal influenza as a mild illness (57.3%). In conclusion, most participants had good knowledge about seasonal influenza and its vaccines. The highest percentage of participants, less than that in the knowledge part, revealed positive attitudes towards seasonal influenza and its vaccines. Unfortunately, about two-thirds of participants had not taken influenza vaccines previously because most considered seasonal influenza a mild illness.

Keywords

seasonal influenza, Iraq, diabetes, attitude, practice, patients, vaccination

Introduction

The International Diabetes Federation reported that more than 570 million patients throughout the world were diagnosed with diabetes mellitus (DM) (IDF 2021), with a significant economic impact of direct health costs estimated to be over 760 billion USD in 2019 (Williams et al. 2020). Antioxidant impairment (Fadhel et al. 2024), reduced neutrophil function, and humoral immunity dysfunction can be induced by chronic hyperglycemia, potentially increasing the risk of various infections, including viral infections (Casqueiro et al. 2012; Akash et al. 2020).

Seasonal influenza is an acute upper respiratory tract infection, a highly contagious viral infection that can in-

fect all age groups. The peak incidence of seasonal influenza is in the late fall and winter months (Saod and Alkhudhairi 2016; Tuohetamu et al. 2017). The patients vary widely in the clinical presentation of this viral infection, from mild and self-limited symptoms of sneezing, rhinorrhea, and headache (Paules and Subbarao 2017) to severe complications like pneumonia, respiratory distress, and even death (Taubenberger and Morens 2008; Tuohetamu et al. 2017; Ibraheem Ali et al. 2019). Many studies showed greater risks of serious complications and higher rates of hospitalizations and mortality among diabetic patients who developed seasonal influenza compared to the general population (Basevi et al. 2011; Hulme et al. 2017).

Preventing seasonal influenza and avoiding or reducing the severity of serious influenza-related complications can be achieved in diabetic patients with great success by administering influenza vaccines (Goeijenbier et al. 2017; Dos Santos et al. 2018). Because various influenza viruses change their characteristics each year, the vaccines are effective and provide the required protection for only one year (WHO 2006). Therefore, many health institutions worldwide recommend annual influenza vaccine administration for all diabetic patients aged 6 months and older (ADA 2019; Grohskopf et al. 2020). Despite all the facts and frequent recommendations of different health institutions about the core importance of the annual administration of influenza vaccines, the vaccination rates continue to be lower than the target point for diabetic patients (Clancy et al. 2012; Moreno-Fernández et al. 2020).

The extent of information and level of knowledge were documented as major factors determining the level of willingness and practice of influenza vaccination among diabetic patients (Olatunbosun et al. 2017; Alnaheelah et al. 2018; Salih et al. 2022; Mohammed and Fawzi 2024). In Iraq, the targets of the control plan for seasonal influenza involve healthcare workers, pilgrims, and patients with chronic diseases, including those with DM (Abubakar et al. 2019). In Iraq, the vaccination program largely depends on governmental support from the Ministry of Health; however, due to recent reductions in expenditure, not all vaccinations are covered by the government at all times; one of these vaccines is influenza; as such, many of the patients seeking to get vaccinated for influenza seek the vaccine themselves and buy it from their pocket, and this vaccine cost is relatively high compared to their average monthly income.

To the best of the author's knowledge, the previous studies in Iraq for evaluating knowledge, attitudes, or practices towards seasonal influenza or influenza vaccines were conducted among the general population (Hameed and Jubair 2021), medical (Saod and Alkhudhairi 2016), or paramedical staff (Adil and Al-Sarray 2018), but no study has been performed to target diabetic patients. The current study aims to assess the knowledge about seasonal influenza and its vaccines and the practice of influenza vaccination in a sample of Iraqi diabetic patients.

Methods

Study design and settings

A cross-sectional, questionnaire-based study was conducted in Al-Nasiriya City, the center of Dhi Qar governorate in south Iraq, from 15 November 2019 until 20 February 2020. The researcher trained four pharmacists who worked in four community pharmacies in different districts of Al-Nasiriya City. These community pharmacists were responsible for interviewing participants and collecting the data required for this study.

Eligibility criteria

Diabetic patients, both male and female patients, were asked to participate in this study if they were adults (age 18 years or older) and willing to participate after explaining the aim of the study and obtaining their written consent.

Data collection

Well-trained community pharmacists collected the data of interest from the participants using a paper-based, structured questionnaire. The questionnaire was selected from a previous study (Olatunbosun et al. 2017; Al-Tukmagi et al. 2021). The questionnaire was generally composed of four parts; the first one (Section A) was designed to specify the suitable patients for recruitment to the study and to obtain their sociodemographic data such as age, sex, educational level, occupation status, and duration of DM since diagnosis. The second part (Section B) included questions to evaluate the level of knowledge of participants about seasonal influenza (Questions 7–9) and about the influenza vaccine (Questions 11–17).The third part of the questionnaire (Section C) involved five questions (18–22) to assess the attitudes of the participating diabetic patients regarding seasonal influenza and influenza vaccination. The participants answered the attitude questions using a 3-point Likert scale (Agree, Disagree, Neutral). The last part (Section D) asked the participants about their practice of administering seasonal influenza vaccine (Questions 23–26). Details of the questionnaire are illustrated in Suppl. material 1.

The score of seasonal influenza knowledge was measured by summing the correct answers to questions 7–9, while the score of influenza vaccination knowledge was measured by summing the correct answers to questions 11–17. After that, the total knowledge score of seasonal influenza and vaccination was measured by combining the two scores.

Attitude score was calculated as follows: three scores for (Agree), one score for(Disagree), and two scores for (Neutral) responses for questions 19 and 20, whereas reverse scoring was used for questions 18, 21, and 22 in which one score for (Agree), three scores for (Disagree) and two scores for (Neutral) responses.

Ethical considerations

The study was approved by the Research Ethics Committee of the College of Pharmacy, University of Baghdad, approval number (RECOL0202013H), approval date (13 January 2019). Written informed consent was obtained from all the participants, and the study was carried out per the Declaration of Helsinki and its later amendments.

Sample size calculations

In the current study, the sample size calculations were derived from a finite population, in which in Iraq in 2018, there were approximately 1,400,000 adults living with diabetes in Iraq, according to the World Health Organization report (WHO 2018; Abusaib et al. 2020), assuming a margin of error of 9.5%, and using the following equation (Sharma et al. 2020):

$$\text{Sample required}(n) = \frac{N}{1 + Nxd^2}$$

N = Total population, d = Margin of error.

We arrived at a sample size of 111.

Statistical analysis

Data was analyzed using the Statistical Package for the Social Sciences (SPSS) software, version 25. Continuous variables were expressed as means ± standard deviation (SD), whereas categorical variables were expressed as frequencies and percentages. The Pearson correlation test was applied to measure the relationships between the continuous variables (age with each of the total knowledge scores and the attitude score). A one-way ANOVA test with a *post hoc* Tukey test was used to compare the differences in the means of continuous parameters (total knowledge score and attitude score) among five levels of participants' education (illiterate, primary, secondary, college, and post-college levels). The P-value of less than 0.05 was considered statistically significant.

Results

Sociodemographic characteristics of participants

The total number of diabetic patients who participated in the study was 111, with a mean age of 52.34 ± 13.8 years, nearly equal distribution between male and female participants. Participants with secondary education represented the largest part (30.6%), while non-workers accounted for 36% of participants. The duration of diabetes for less than 5 years was reported by 39.6% of participants, as shown in Table 1.

Table 1. Sociodemographic characteristics of participants.

Variables	Value
Number of participants	111
Age (years), mean ± SD	52.34 ± 13.8
Sex, n (%)	
Male	54 (49.5%)
Female	56 (50.5%)
Marital status, n (%)	
Married	97 (87.4%)
Unmarried	14 (12.6%)
Education level, n (%)	
Illiterate	22 (19.8%)
Primary	21 (18.9%)
Secondary	34 (30.6%)
College	30 (27.0%)
Post college	4 (3.6%)
Occupation, n (%)	
Student	9 (8.2%)
Government employee	22 (19.8%)
Privet sector	24 (21.6%)
Non-workers	40 (36.0%)
Retired	16 (14.4%)
Duration of diabetes mellitus, n (%)	
0–5 years	44 (39%)
6–10 years	32 (28.7%)
11–15 years	20 (18%)
16–20 years	15 (13.5%)

Knowledge of participants about seasonal influenza

Most participants understood influenza well and answered the knowledge part of the questionnaire effectively. However, their responses were poor regarding the serious complications of seasonal influenza among diabetic patients, as demonstrated in Table 2.

Knowledge of participants about influenza vaccination

Over 50% of the participants heard or knew about the influenza vaccine. The prevailing consensus among participants was that the vaccination is safe and can effectively thwart seasonal influenza. However, two-thirds of participants held the knowledge that vaccines could potentially cause side effects. Most participants reported a precise understanding of the technique and timing of taking influenza vaccines, as shown in Table 2.

Attitudes of participants regarding seasonal influenza and influenza vaccination

As seen in Fig. 1, the largest part of participants (43.2%) agreed that seasonal influenza is a mild condition and does not require the administration of any vaccine. A slightly larger percentage of participants (47.7%) agreed that the influenza vaccine is important for diabetic patients and should be administered yearly. Interestingly, the vast majority of participants (75.7%) agreed with the statement that they would take a vaccine if it were a good vaccine for preventing influenza. Only 17.1% of participants believed the influenza vaccine causes serious complications

Table 2. Knowledge of participants about seasonal influenza and influenza vaccination.

Knowledge of participants about seasonal influenza		Knowledge of participants about influenza vaccination	
Statement	**N (%) [#] of correct responses**	**Statement**	**N (%) [#] of correct responses**
What do you know about seasonal influenza? (N = 111)		Did you ever hear or know about the influenza vaccine before? (N = 111)	65 (58.6%)
It is the same as the common cold	79 (71.2%)	Is the influenza vaccine safe? (n = 65)	56 (86.2%)
Caused by a virus	36 (68.5%)	Is the vaccine effective in preventing seasonal influenza? (N = 65)	49 (75.4%)
Spread from one person to another	101 (91%)	**How is the vaccine administered? (N = 65)**	
Can be prevented	81 (73%)	Intramuscular/Subcutaneous injection	53 (81.5%)
It occurs during a certain season	80 (72.1%)	Oral drops	7 (10.8%)
What are the common symptoms of seasonal influenza? (N = 111)		Nasal spray	5 (7.7%)
Headache/fever	106 (95.5%)	**For how long can the vaccine protect? (N = 65)**	
Sore throat/cough	87 (78.4%)	One season	55 (84.6%)
Running nose/sneezing	93 (83.8%)	Two seasons	7 (10.8%)
Muscle pain/fatigue	91 (82.0%)	Three seasons	3 (4.6%)
Vomiting/diarrhea	16 (14.4%)	Does this vaccine cause side effects? (N = 65)	43 (66.2%)
Serious complications of seasonal influenza among diabetic patients include: (N = 49)		**What are the possible side effects? (N = 43)**	
Poor control of blood sugar	33 (67.3%)	Headache/fever	38 (88.4%)
High risk of hospitalization	14 (28.5%)	Pain/swelling at the injection site	26 (60.5%)
Pneumonia	16 (32.6%)	Muscle pain/fatigue	24 (55.8%)
Others	17 (43.7%)	Others	8 (18.6%)

[#] Sum of percentages may exceed 100% because each participant could select more than one choice.

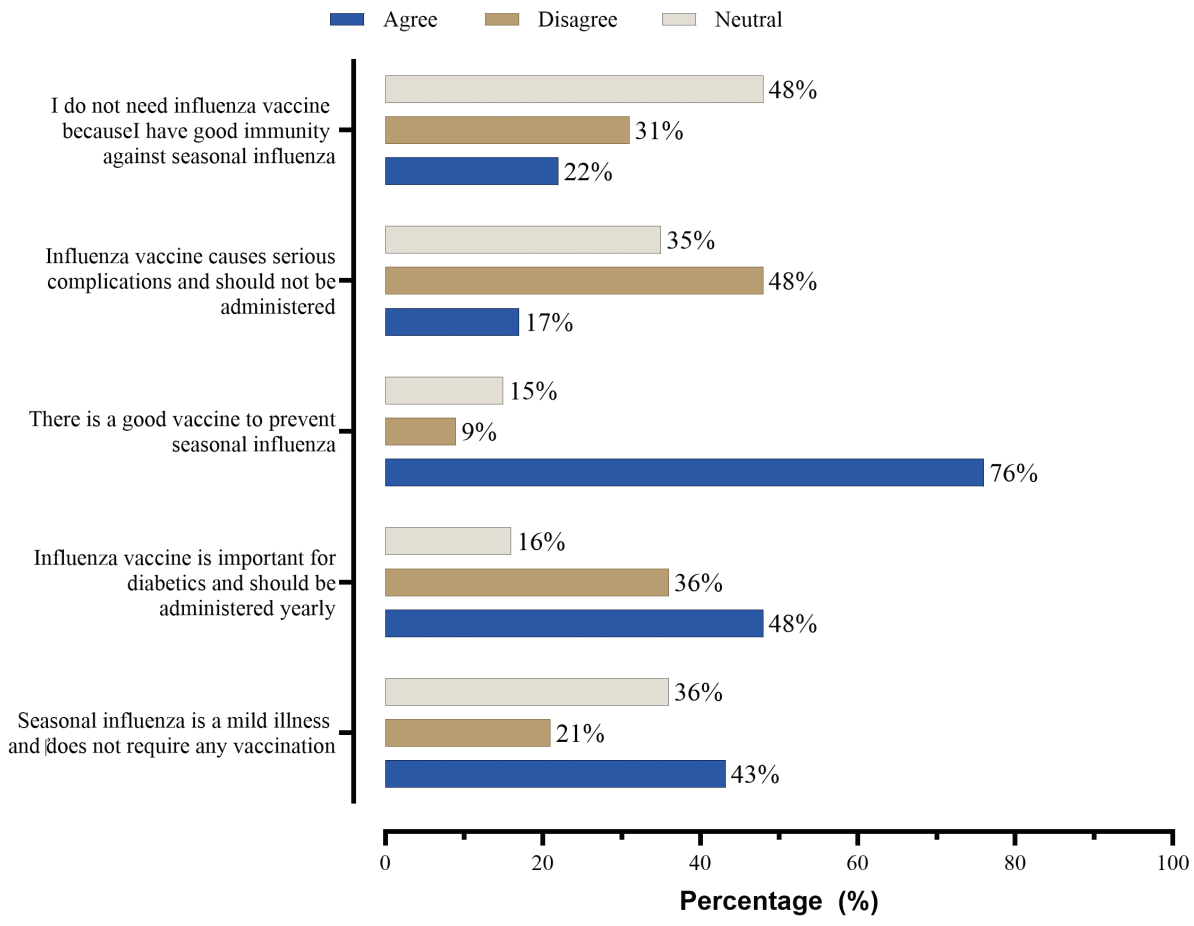

Figure 1. Attitudes of participants regarding seasonal influenza and influenza vaccination Practice of influenza vaccination.

and should not be administered. Nearly one-fifth of participants considered they had good immunity and did not require the vaccine.

According to Table 3, less than one-third of participants (32.4%) previously received the influenza vaccine, with 91.6% of them receiving it annually. The recommendation of a friend or family member, followed by physician instruction, significantly influenced most of the participants who took the vaccine (47.2% and 44.4%, respectively). The minority of participants who were vaccinated previously did so because the vaccine was free of charge (8.3%).

On the other hand, the most frequent reason for avoiding vaccination was the perception of seasonal influenza as a mild illness (57.3%), followed by fear of injection(28%), poor effectiveness in preventing influenza (17.3%), high cost (16 %), and possible side effects (13.3%).

Table 3. Practice of influenza vaccination.

Statement	N (%) of participants with a (Yes) response to the statement
Did you receive the influenza vaccine before? (N = 111)	36 (32.4%)
How regularly did you administer the vaccine? (N = 36)	
Yearly	33 (91.6%)
Every 2 years	2 (5.6%)
Every 3 years	1 (2.8%)
What influenced you to administer the vaccine? (N = 36) *	
My physician told me it is important	16 (44.4%)
My friend or a family member told me it is important	17 (47.2%)
Because it is free of charge	3 (8.3%)
Others	2 (5.6%)
What is (are) the reason(s) for not administering the vaccine? (N = 75)*	
It is not effective in preventing influenza	13 (17.3%)
It is not necessary because influenza is a minor illness	43 (57.3%)
It is expensive	12 (16%)
It may cause serious side effects	10 (13.3%)
Fear of injection	21 (28%)

*The sum of percentages may exceed 100% because each participant could select more than one choice.

Correlation between age and total scores of participants

There was a significant negative correlation between the age of participants and the attitude score of seasonal influenza and its vaccine. In contrast, a non-significant correlation was found with the total knowledge score of influenza and its vaccine, as shown in Table 4.

Effect of education level of participants on knowledge and attitude scores

As presented in Fig. 2, participants' education levels had a non-significant effect on the total knowledge score of seasonal influenza and its vaccine. In contrast, the attitude score increased significantly from illiterate participants and those with primary education to participants with secondary and academic levels.

Table 4. Correlation between age and total scores of participants (N = 111).

Parameter		Age (years)
Attitude score of seasonal influenza and its vaccine	Pearson correlation	-0.228
	P-value	0.016*
Total knowledge score of seasonal influenza and its vaccine	Pearson correlation	-0.148
	P-value	0.120

*Correlation is significant at the 0.05 level (2-tailed).

Discussion

Diabetic patients, even well-controlled patients, have higher influenza-related morbidity and mortality than non-diabetics (Jiménez-García et al. 2013; Knapp 2013). Serious complications that may develop secondary to seasonal influenza in diabetic patients include poor glycemic control, otitis, bronchitis, and pneumonia (Allard et al. 2010). Many diabetic patients have low adherence to their treatment, which makes them more immunocompromised and susceptible to infection and other complications (Hamid et al. 2018; Kadhim et al. 2019; Atia et al. 2024). Although many procedures are available to prevent seasonal influenza, vaccination is considered the most effective (Gazibara et al. 2019). The WHO advocates that 75% is the minimum percentage of liable patients who should take influenza vaccines to ensure effective protection against seasonal influenza (Carrillo-Santisteve et al. 2012). Many countries in different parts of the world did not reach the target coverage rate of vaccination against seasonal influenza (Attia et al. 2023).

This study was performed to examine the level of knowledge and attitudes towards seasonal influenza and influenza vaccines and to assess the extent and factors associated with the uptake of influenza vaccines in a sample of diabetic patients residing in Al-Nasiriya, a southern city in Iraq. In general, the current study revealed good levels of knowledge in the majority of participating diabetic patients about both seasonal influenza and its vaccines. This result is similar to the findings of Al-saad et al., who showed that nearly three-quarters of diabetic patients have good knowledge about seasonal influenza, while about two-thirds of the patients reported good knowledge regarding the influenza vaccine (Alsaad et al. 2021). It was reported that the level of knowledge about seasonal influenza and the influenza vaccines has an important direct effect on the tendency to receive the vaccine among patients with diabetes mellitus (Chinwong et al. 2023).

It is important to note that the current study did not find a significant impact of the educational level of participants on their knowledge scores; this was contrary to the expectation that patients with academic degrees are assumed to have higher knowledge than those with lower

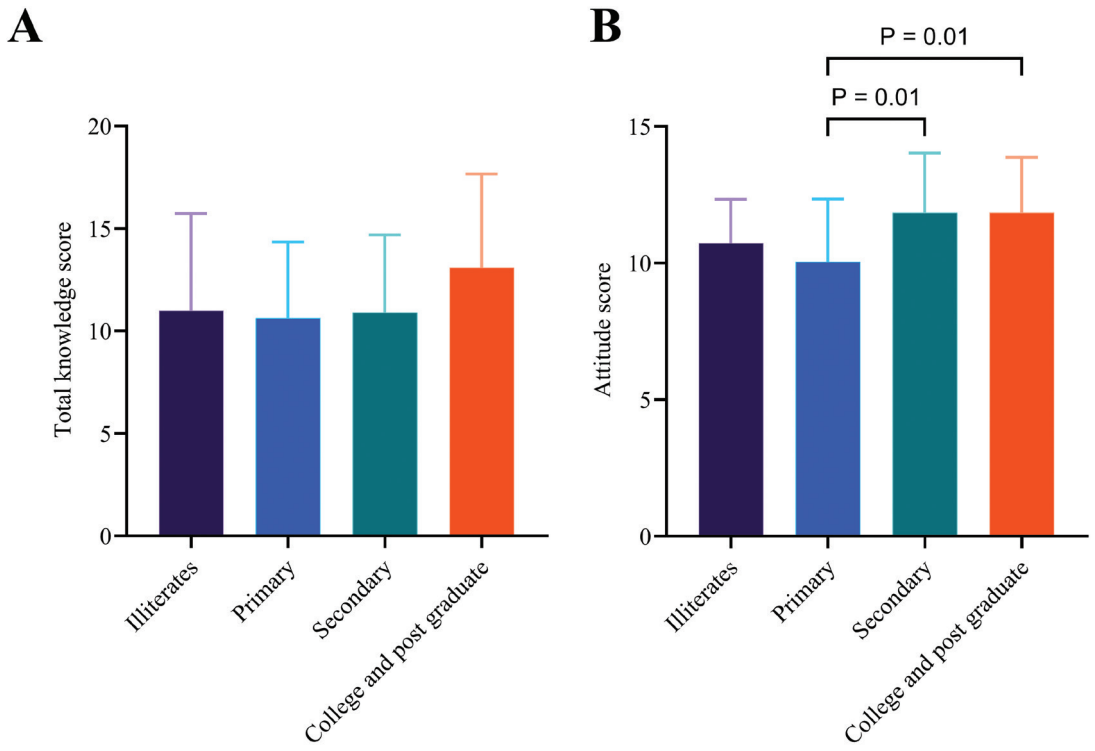

Figure 2. Effect of the education level of participants on their scores, A) Total knowledge score of seasonal influenza and its vaccine (p-value = 0.090), B) Attitude score of seasonal influenza and its vaccine (p-value = 0.004). Data presented as mean ± standard deviation; one-way ANOVA with *post hoc* Tukey test used.

education achievements or illiterate patients. Perhaps this finding is not related to the official education process but can be attributed to other causes, such as defects in certain aspects of the health system, like social awareness campaigns and education of diabetic patients by health practitioners (Alsaad et al. 2021).

The participants' attitudes in the current study towards seasonal influenza and its vaccines varied; most participants (43.2%) agreed that seasonal influenza is a mild condition and, hence, does not require vaccination. Most participants (75.7%) were willing to be vaccinated if a good vaccine was available to prevent seasonal influenza. Almost a similar finding was reported by a Saudi study, which found that more than two-thirds of diabetic patients considered influenza a mild infection and not associated with serious complications for diabetics compared to non-diabetics (Alhussain et al. 2021). Likewise, a previous study reported that most participating diabetic patients (81.2%) agreed to receive the influenza vaccine if it was an efficient prevention method (Olatunbosun et al. 2017).

The present study found that as diabetic patients become older, their attitude scores towards seasonal influenza and its vaccines become smaller; this result, which differs from a previous study (Hung et al. 2020), may be attributed to the finding that the largest percentage of the participants (about 40%) had diabetes for less than 5 years and may consider themselves protected from the health problems associated with seasonal influenza. The current study showed that total attitude scores increase significantly as the level of education is higher, with the highest scores among patients having secondary and academic degrees; this result can be understood by the explanation that higher education is potentially associated with more hours of using the internet and medical media, which can improve the attitudes regarding the risks of seasonal influenza and the benefits of influenza vaccines, especially for diabetic patients (Samel-Kowalik et al. 2021).

The practice of vaccination with the influenza vaccine among participants of the current study was 32.4%, far less than the recommended 75% coverage rate advocated by WHO. The rate of coverage of influenza vaccines among diabetic patients was 29.1% in a Saudi study (Alhussain et al. 2021), and a lower rate of 19.4% was recorded in another Tunisian study (Kharroubi et al. 2021). The most frequent factor that influenced the patients in the current study to take the influenza vaccine was advice from a family member or friend; the impact of this factor can be attributed to the cultural and tribal nature of Al-Nasiriya City. This finding can be invested in increasing the coverage rate of influenza vaccines by conducting campaigns at social and tribal events and promotions through social media. The physician recommendations were the second most important factor to uptake of the influenza vaccine in the current study. The crucial role of physicians in mo-

tivating diabetic patients to accept and administer influenza vaccines was found in other studies (Alsaad et al. 2021; Dallagiacoma et al. 2021; Kharroubi et al. 2021). Physicians can significantly enhance awareness and improve the level of knowledge and attitudes of diabetic patients toward vaccination against seasonal influenza because of the physicians' scientific background and professional experience with the increased mortality associated with seasonal influenza and the great benefits of administering influenza vaccines (Yaqub et al. 2014) and because they are the most trusted healthcare professionals from the point of view of diabetic patients (Bertoldo et al. 2019). Physicians have a great role in promoting vaccination uptake, providing diabetic clients with accurate information about the risks of influenza infection and the benefits of vaccination, and supporting these clients in regular uptake of influenza vaccines (Burns et al. 2005; Szucs and Müller 2005).

On the other hand, more than half of diabetic patients who did not take the influenza vaccine in the current study considered seasonal influenza a minor infection that does not require any vaccine for prevention. This finding highlights the low awareness level of diabetic patients towards the possibility of serious complications and subsequent hospitalization and high mortality associated with seasonal influenza (Alsaad et al. 2021). Two less frequent reasons for avoiding the influenza vaccine in the current study were fear of injections and the perception of the participants that the available vaccines are inefficient in preventing seasonal influenza. A previous study similarly found that the cause behind the refusal of diabetic patients to be vaccinated was their belief that the influenza vaccine was ineffective (Jiménez-Garcia et al. 2017), while another study reported that a minority of diabetic participants were afraid of needles by which the vaccine is administered (Alhussain et al. 2021).

Although influenza vaccines in Iraq are free of charge in primary healthcare centers and outpatient clinics in public hospitals, the amount of vaccines in the specified time of uptake is insufficient to cover all individuals, including diabetics. The private sector overcomes the shortage and provides the vaccines at largely higher prices, adversely affecting the willingness and practice of vaccination. The charge of the influenza vaccine was the cause of refusal for 16% of participants in the current study. The enthusiasm of diabetic patients and their rate of uptake of influenza vaccines can be improved by ensuring constant availability of vaccines at low, affordable prices or being free of charge (Gupta et al. 2012; Ko et al. 2021).

The characteristic strength of the current study is the sparsity of local studies in Iraq in this field. However, the current study had limitations. First, there is a limited number of participants because the study was stopped due to the general shutdown in response to the COVID-19 pandemic at the beginning of 2020. Second, the interest data was obtained from participants' reports, which may cause recall bias. Third, an interviewer-administered questionnaire was used to gather data with the possibility of causing social desirability bias.

Conclusion

The current study concluded that most participants had good knowledge about seasonal influenza and its vaccines. The highest percentage of participants, less than that in the knowledge part, revealed positive attitudes towards seasonal influenza and its vaccines. Unfortunately, about two-thirds of participants had not taken influenza vaccines previously because most considered seasonal influenza a mild illness.

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Additional information

Conflict of interest

The author of this work has nothing to disclose.

Ethical statements

The authors declared that no clinical trials were used in the present study.

The authors declared that no experiments on humans or human tissues were performed for the present study.

Informed consent from the humans, donors or donors' representatives: The study was approved by the Research Ethics Committee of the College of Pharmacy, University of Baghdad, approval number (RECOL0202013H), approval date (13th January 2019). Written informed consent was obtained from all the participants, and the study was carried out per the Declaration of Helsinki and its later amendments.

The authors declared that no experiments on animals were performed for the present study.

The authors declared that no commercially available immortalised human and animal cell lines were used in the present study.

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Author contributions

The author solely contributed to this work.

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Data availability

All of the data that support the findings of this study are available in the main text or Supplementary Information.

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Supplementary material 1

Study questionnaire

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