Influenza vaccination coverage rates and other related factors in high-risk groups in Birjand, East of Iran

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Abstract

Background and Aims: Influenza is an acute respiratory disease with the highest mortality rate in the high-risk groups. Vaccination is a key public health strategy to prevent influenza in high-risk people. This study aimed to assess the influenza vaccination coverage rate and identify its demographic determinants in patients with end-stage renal disease (ESRD), chronic obstructive pulmonary disease (COPD), and diabetes in Birjand, Eastern Iran.

Methods: This cross-sectional study included 400 patients (300 diabetic, 60 dialysis, and 40 COPD patients) from September 2017 to August 2018. Using interview method, we completed a questionnaire containing the patients’ demographic characteristics, questions about patients’ knowledge and attitude toward influenza vaccination, the influenza vaccination history, and the most common causes for vaccination. The relationship between the type of disease and patients’ characteristics (exposure) with vaccination coverage (outcome) was investigated.

Results: The mean age of participants was 58.7 ± 11.3 years. Also, 58.8% of the patients received at least one dose of the vaccine and the regular injection rate was 32.8%. The coverage of influenza vaccine in dialysis patients was significantly higher than other patients (p < 0.001). The mean knowledge score was 6.17 ± 2.15 out of maximum 9 scores. There was a positive association between age [p = 0.001, odds ratio (OR) = 1.04] and patients’ knowledge [p < 0.001, OR = 1.42] with the vaccination coverage.

Conclusion: The coverage of influenza vaccine in high-risk patients in Birjand was low. Hence, it is essential to increase the knowledge of high-risk groups about the importance of influenza vaccination and facilitate their access to vaccines.

Keywords: Birjand, chronic obstructive pulmonary disease, diabetes, dialysis, influenza, vaccination coverage

Introduction

Influenza is an acute and preventable viral respiratory disease that leads to about 3–5 million episodes of disease and about 500,000 annual deaths worldwide. It is estimated that 5–10% of adults and 20–30% of children are affected by influenza annually. Influenza epidemics are also associated with increased mortality and morbidity, especially in elderly people with underlying illness and pregnant women. Vaccination is one of the most important public health actions to prevent seasonal influenza and its transmission. The Centers for Disease Control and prevention (CDC) recommends influenza vaccination for adults 65 and older, children younger...
than 2 years, people with chronic diseases (such as chronic lung diseases, endocrine disorders, heart diseases, kidney diseases, liver disorders, neurological diseases, blood disorders, and asthma), obese people with a body mass index (BMI) of 40 or higher, people younger than 19 years who take long-term medications containing aspirin, and people with weakened immune systems. Among these conditions, this study focuses on patients with diabetes, chronic obstructive pulmonary disease (COPD), and end-stage renal disease (ESRD).

Patients with diabetes are one of the high-risk groups that can be affected by severe complications of influenza, and vaccination is recommended for them. These patients are more likely to be hospitalized, suffer from serious complications, or die due to influenza compared with healthy individuals. Studies showed that people with diabetes have three to six times more chance to be hospitalized due to influenza complications, and their mortality rates could increase by 5–15% in epidemics. The influenza vaccination coverage rate in patients with diabetes is lower than 75%, however. The vaccination rate of diabetic patients was 50–62% in the United States, 10% in Poland, 40% in Germany, and 70% in the Netherlands between 2004 and 2006; it was also evident that whenever the duration of diabetes was longer, the vaccination rate was higher.

Influenza is a frequent cause of COPD exacerbations, which is associated with severe airflow obstruction, increased hospitalization rate, decreased quality of life, increased mortality rate, and substantially increased healthcare-related costs. Despite the long-term history for seasonal influenza vaccination in high-risk groups such as COPD patients, the vaccination rate in this population is low. The influenza vaccination rates for COPD patients were lower than 50–60% in different studies. Influenza vaccination not only reduces the number of episodes and risk of severe illness but also reduces the number of referrals to the outpatient clinics.

ESRD patients are also at the risk for influenza complications, and infection is the second cause of death in these patients. Vaccination is one of the most important strategies for early prevention in this group.

Following the recommendations by the World Health Organization (WHO), the Iranian health department recommends influenza vaccination for high-risk groups as well. In this regard, for patients with diabetes and COPD, the cost of vaccination is covered by insurance companies at a reasonable price, and they are a priority in terms of injection time. In addition, vaccines for dialysis patients are available free of charge.

Owing to the important role of annual influenza vaccination in patients with COPD, ESRD, and diabetes, as well as the lack of accurate information on vaccination coverage rates in these groups in Iran, we conducted this study to evaluate the coverage rate of influenza vaccination and identify its determinants in patients with diabetes, COPD, and ESRD in Birjand, Eastern Iran, in 2017.

**Material and methods**

**Study population**

This cross-sectional and descriptive-analytical study included 400 high-risk patients (300 diabetic, 60 dialysis, and 40 COPD patients) from April 2017 to February 2018. Owing to the limited number of dialysis and COPD patients, all dialysis patients referred to the Dialysis Center of Birjand, and all COPD patients hospitalized in the infection ward of Vali-Asr hospital for 1 year were selected by census method. Also, using systematic random sampling, patients with diabetes were selected from the patients covered by Birjand Diabetes Clinic.

Patients suffering from one of the mentioned diseases for at least 3 years were included in the study. The exclusion criteria were unwillingness to participate in the study and a history of egg allergy. If diabetic and COPD patients had any other comorbidities, they were excluded from the study. Dialysis patients were included in the study regardless of their comorbidity or any other underlying disease.

**Data collection**

The data were collected using a questionnaire, which included the patients’ demographic characteristics, diseases profile, and the annual history for seasonal influenza vaccine. In case of a negative answer to annual injection, the patient was asked if s/he had ever received an influenza vaccine. We included only patients immunized in the
past year. The second part of the questionnaire included questions about the patients’ knowledge and attitude toward influenza vaccination. Score 0 was assigned to negative answers and 1 to positive answers (score range = 0–9). The third part of the questionnaire assessed the reasons given by the patients for receiving or not receiving the influenza vaccine. These reasons for receiving the vaccine were as follows: ‘the opinion that they belong to the high-risk patients’, ‘easy access to the vaccine’, ‘recommendation by the physician’, and ‘believing in the efficacy of the vaccination’. In contrast, the reasons for not receiving the vaccine included ‘doubts about the efficiency of vaccination’, ‘fear of the vaccine complications’, ‘fear of injection’, and ‘no recommendation by the physician’. To confirm the content validity, the questionnaire was reviewed by several experts, and their ideas were applied in the final questionnaire. All interviews were conducted by one of the researchers.

We entered the data of 30 completed questionnaires in the Statistical Package for the Social Sciences (SPSS version 16), and the Cronbach’s alpha coefficient was calculated for different parts of the questionnaire to confirm its reliability. The Cronbach’s alpha coefficient was 0.68 and 0.72 for knowledge and vaccine usage questions, respectively. After preparing the questionnaire and explaining the study aims to the participants, the questionnaire was completed by an interviewer. The study design and protocols were approved by the Ethics Committee of the Birjand University of Medical Sciences (ID: IR.BUMS.REC.1396.14).

Statistical analysis
Data were analyzed in SPSS version 16 using chi-square and logistic regression statistical tests, and \( \alpha = 0.05 \) was considered as the significance level. In logistic regression, we entered the relevant variables in vaccination coverage, including age, sex, type of disease, education, occupation, marriage status, and knowledge.

Results
Population
This study included 400 patients (300 diabetic, 60 dialysis, and 40 COPD patients) with a mean age of 58.7 ± 11.3 years (age range = 24–96 years). Also, 229 (57.3%) patients were female, 356 (89%) were married, and 156 (39%) were in the age group of 50–60 years. The demographic characteristics of participants were categorized based on the disease type (Table 1).

Vaccine coverage
The average vaccine coverage for at least three sequential years was 32.8%. Also, the average vaccine coverage in diabetic patients was 29.7%, in dialysis patients was 55%, and in COPD patients was 22.5%. In general, 58.8% of patients had received one dose of influenza vaccine last year; this figure was 90% for dialysis patients, 51% for diabetic patients, and 70% for COPD patients (Figure 1).

Vaccine coverage based on patients’ age, chronic disease type, and educational level
History of regular vaccine injection was significantly different based on age (\( p < 0.001 \)), type of disease (\( p < 0.001 \)), and level of education (\( p < 0.03 \)) (Table 2). While the highest influenza vaccination coverage rate was detected in dialysis patients (55%), the lowest coverage rate was related to COPD patients (22.5%). The coverage rate was significantly higher in patients aged over 60 years compared with other age groups; this higher coverage rate was also seen in illiterate patients and those with educational level lower than diploma (Table 2). In general, the history of regular vaccine injection was not different in terms of sex; however, it was significantly higher in females (69.2%) than males (44.1%) with dialysis (\( p = 0.04 \)). In diabetic (\( p = 0.14 \)) and COPD patients (\( p = 0.40 \)), there was no significant difference between males and females.

The participants’ mean knowledge score was 6.17 ± 2.15 out of maximum 9 scores. While the lowest score was seen in COPD patients (5.3 ± 2.7), the highest score was found in dialysis patients (6.9 ± 1.8). Accordingly, dialysis patients had significantly higher scores than COPD patients (\( p = 0.001 \)). The difference was not significant between the diabetic patients and other patients (\( p > 0.05 \)), however.

In logistic regression analysis, after entering the relevant variables in vaccination coverage, including
Table 1. Demographic characteristics of participants categorized based on disease type.

| Characteristic | Diabetic | Renal failure | COPD | Total |
|----------------|----------|---------------|------|-------|
|                | N (%)    | N (%)         | N (%)| N (%) |
| Sex Male       | 120 [40] | 34 [56.7]     | 17 [42.5] | 171 [42.8] |
| Female         | 180 [60] | 26 [43.4]     | 23 [57.5] | 229 [57.3] |
| Age group <50  | 58 [19.3]| 16 [26.7]     | 7 [17.5] | 81 [20.3] |
| Age group 50–60| 133 [44.3]| 12 [20]      | 11 [27.5] | 156 [39] |
| Age group 60–70| 80 [26.7]| 19 [31.7]     | 12 [30] | 111 [27.8] |
| Age group >70  | 29 [9.7] | 13 [21.7]     | 10 [25] | 52 [13] |
| Marriage Single| 26 [8.7] | 12 [20]       | 6 [15] | 44 [11] |
| Marriage Married| 274 [91.3]| 48 [80]     | 34 [85] | 356 [89] |
| Job Employed   | 59 [19.7]| 2 [3.3]       | 15 [6] | 67 [16.8] |
| Job Housewife  | 154 [51.3]| 24 [40]      | 20 [50] | 98 [49.5] |
| Job Others     | 87 [29] | 34 [56.7]     | 14 [35] | 135 [33.8] |
| Education Illiterate | 65 [21.7]| 24 [40] | 21 [52.5] | 110 [27.5] |
| Education Undergraduate | 195 [65] | 29 [40.3]| 17 [42.5] | 141 [60.3] |
| Education Postgraduate | 40 [13.3]| 7 [11.7] | 2 [5] | 49 [12.3] |
| Residency Urban | 289 [96.3]| 52 [86.7] | 21 [52.5] | 362 [90.5] |
| Residency Rural | 11 [3.7] | 8 [13.3] | 19 [47.5] | 38 [9.5]  |

COPD, chronic obstructive pulmonary disease.

age, sex, type of disease, education, occupation, marriage status, and knowledge, only age [odds ratio (OR) = 1.04, confidence interval (CI) = 1.01–1.06] and knowledge score (OR = 1.42, CI = 1.26–1.60) had a significant positive association with vaccination coverage. In other words, the possibility of vaccination increased with older age and higher knowledge score (Table 3).

Half of the patients (198, 50.8%) received information about the importance of vaccine from their physicians. The most common cause for using the vaccine was patients’ belief in the development of immunity against disease (129, 98.5%), and 75 (57.3%) of these patients mentioned that physician recommendation was the reason for using the vaccine (Table 4).

The most common causes for the low rate of using vaccine were as follows: ‘belief that they will not get affected by the influenza virus’ (96, 35.7%), belief that influenza is not an important disease and does not need vaccine’ (95, 35.3%),
‘lack of recommendation by medical staff’ (89, 33.1%), and ‘problems related to unavailability and costs of vaccine’ (81, 30.1%) (Table 4).

Discussion
This study assessed the coverage rate of influenza vaccination in three high-risk groups, including diabetic, dialysis, and COPD patients. Our results indicated that influenza vaccination coverage in the study population was 32.8%. The influenza vaccination coverage rate in high-risk patients was between 30% and 70% in other studies.1,10–14 The coverage rate of vaccination in this study was lower than other studies, which may be due to various factors, such as low knowledge about the efficacy of vaccine, insufficient notification by the medical staff, economic difficulties in obtaining the vaccine, unavailability of vaccines, fear injection, and the fear of vaccine complications.

In this study, the highest influenza vaccine coverage was related to dialysis patients, so that the annual vaccine rate was 55% in this group. The annual influenza vaccination rate in Italian dialysis patients was 57.5%,15 in ESRD patients in the United States was lower than 50% in each season,16 and in a Korean study was 68.7%.11 As dialysis patients need regular medical treatment and referral to the medical center, they are more likely to be recommended to receive the vaccine by the medical staff. In this study, influenza vaccine coverage in female patients with dialysis was significantly higher than males, which is probably due to the sensitivity of women to their health.

Table 2. Comparison of vaccination coverage according to patients’ characteristics.

| Characteristic | N (%) | p value |
|---------------|-------|---------|
| Diseases      |       |         |
| Diabetic      | 89 [29.7]| <0.001 |
| Renal failure | 33 [55]  |         |
| COPD          | 9 [22.5] |         |
| Sex           |       |         |
| Male          | 49 [28.7] | 0.13    |
| Female        | 82 [35.8] |         |
| Age group     |       |         |
| <50           | 24 [29.6] | <0.001  |
| 50–60         | 35 [22.4] |         |
| 60–70         | 43 [38.7] |         |
| >70           | 29 [55.8] |         |
| Marriage      |       |         |
| Single        | 14 [31.8] | 0.35    |
| Married       | 116 [32.7] |         |
| Job           |       |         |
| Employed      | 17 [25.4] | 0.17    |
| House         | 73 [36.9]  |         |
| Others        | 41 [30.4]  |         |
| Education     |       |         |
| Illiterate    | 38 [34.5] | 0.03    |
| Undergraduate | 85 [35.3]  |         |
| Postgraduate  | 8 [16.3]   |         |
| Residency     |       |         |
| Urban         | 120 [33.1] | 0.60    |
| Rural         | 11 [28.9]  |         |

COPD, chronic obstructive pulmonary disease.

Table 3. Independent association of variables with vaccine coverage.

| Characteristic | B     | SE   | p value | Odds ratio | CI 95 (Exp B) |
|---------------|-------|------|---------|------------|---------------|
| Sex           | 0.32  | 0.25 | 0.21    | 1.37       | 0.82–2.28     |
| Age           | 0.04  | 0.01 | 0.001   | 1.04       | 1.01–1.06     |
| Disease       | 0.16  | 0.19 | 0.39    | 1.18       | 0.80–1.74     |
| Marriage      | 0.28  | 0.37 | 0.44    | 1.33       | 0.63–2.77     |
| Residency     | −0.56 | 0.45 | 0.21    | 0.57       | 0.23–1.09     |
| Job           | −0.10 | 0.18 | 0.57    | 0.9        | 0.62–1.29     |
| Education     | −0.26 | 0.21 | 0.22    | 0.77       | 0.50–1.17     |
| Knowledge     | 0.35  | 0.06 | <0.001  | 1.42       | 1.26–1.60     |

CI, confidence interval; SE, standard error.
### Table 4. The most common causes of vaccine usage in user patient and common causes the lack of vaccine usage in non-user patient.

| The most common causes of vaccine usage in user patient                  | Diabetic (N=89) | Renal failure (N=33) | COPD (N=9) | Total (N=131) |
|------------------------------------------------------------------------|-----------------|---------------------|------------|---------------|
| Immunity against disease and reducing work absence due to vaccination  | 87 (97.8)       | 32 (97)             | 9 (100)    | 129 (98.5)    |
| Being at risk of flu and preventing the transmission of disease to the family by vaccination | 77 (86.5)       | 32 (97)             | 9 (100)    | 118 (90.1)    |
| Easy accessibility and free availability of flu vaccine                | 29 (32.6)       | 28 (84.8)           | 5 (55.6)   | 62 (47.3)     |
| Recommendation by the physician and medical staffs                    | 36 (40.4)       | 30 (90.9)           | 9 (100)    | 75 (57.3)     |

| Common causes the lack of vaccine usage in non-user patient            | Diabetic (N=211) | Renal failure (N=27) | COPD (N=31) | Total (N=269) |
|------------------------------------------------------------------------|------------------|---------------------|------------|---------------|
| Believing that they do not get affected by the influenza virus         | 74 (35.1)        | 7 (25.9)            | 15 (48.4)  | 96 (35.7)     |
| Believing that influenza is not an important disease and does not need vaccine | 68 (32.2)        | 6 (22.2)            | 21 (67.7)  | 95 (35.3)     |
| Uncertainty about the efficacy and benefit of influenza vaccine        | 33 (15.6)        | 5 (18.5)            | 13 (41.9)  | 51 (19)       |
| Fear of complications of flu vaccine                                   | 47 (22.3)        | 4 (14.8)            | 14 (45.2)  | 65 (24.2)     |
| Unavailability and cost of the flu vaccine                             | 48 (22.7)        | 11 (40.7)           | 22 (71)    | 81 (30.1)     |
| The possibility of affection by flu after vaccine injection            | 41 (19.4)        | 1 (3.7)             | 16 (51.6)  | 58 (21.6)     |
| Fear of any kinds of injection                                         | 23 (10.9)        | 1 (3.7)             | 0 (0)      | 24 (8.9)      |
| Lack of enough time for the referral to inject the vaccine             | 24 (11.4)        | 2 (7.4)             | 3 (9.7)    | 29 (10.8)     |
| Lack of recommendation by physician and nurse                          | 77 (36.7)        | 6 (22.2)            | 6 (19.4)   | 89 (33.1)     |

COPD, chronic obstructive pulmonary disease.

Also, in this study, the vaccination coverage in diabetic patients was 29.7%. In several other studies,\(^5,10,17-20\) the vaccination rate in patients with diabetes was between 25% and 70%. Also, in this study, the vaccination coverage in diabetic patients over 60 years was significantly higher than other age ranges. In a study in Spain, vaccination coverage in diabetic patients over 50 years was significantly higher than the ages under 50 years,\(^7,8,12\) which is consistent with our results. As the age increases, the probability of regular referral to medical centers increases, which enhances the possibility to be recommended by medical staff for receiving the vaccine. This might also be due to the fact that the WHO recommends vaccination for high-risk groups, including elderly people.\(^1\)

In this study, the COPD patients had the lowest vaccination rate compared with the other two groups (22.5%). The influenza vaccination rates for COPD patients were reported as 46.2–60% in different studies.\(^7,8,12\) The low vaccination rate in COPD patients in this study could be attributed...
to the fact that these patients are visited by different physicians due to respiratory infections. In addition, as these patients experience different respiratory infections annually, they consider influenza as a low-risk virus needing no serious actions.\textsuperscript{7}

In this study, the mean knowledge score was \(6.17 \pm 2.15\) out of 9 scores. While the lowest score was seen in COPD patients, the highest score was related to dialysis patients. Also, vaccination coverage was positively correlated with the participants’ knowledge. In another study in southern Africa, vaccination coverage was also higher in people with positive attitude,\textsuperscript{2} which is similar to the results of this study. Although the vaccination coverage was elevated in this study by increasing knowledge, the total rate was low despite the high level of knowledge among participants. This could be due to the fact that knowledge could not change their beliefs and attitudes. To cope with this problem and change patients’ behavior, further education is required using new and efficient health education models. Similarly, in the study by Honarvar, the knowledge level of hospital participants was high, but the vaccination rate among participants was low.\textsuperscript{14}

In this study, the most common cause of vaccination was belief in the immunity against the disease developed by vaccine. Furthermore, about 57\% of the participants reported that they had used the vaccine due to their physicians’ recommendation. In contrary, the most common causes for the low rate of using vaccine were as follows: ‘belief that they will not get affected by the influenza virus’, ‘belief that influenza is not an important disease and does not need vaccine’, ‘lack of recommendation by medical staff’, and ‘problems related to unavailability and costs of vaccine’.

In the study by Honarvar, the most common reasons for not using influenza vaccine were as follows: ‘the opinion that they are healthy and rarely get infected by influenza’, ‘the doubt about efficacy and utility of the vaccine’, and ‘fear of the vaccine complications’.\textsuperscript{1, 14} In another study by Askarian \textit{et al.},\textsuperscript{22} the reasons for not using influenza vaccine were as follows: ‘availability’, ‘limited information on the safety of the vaccine’, and ‘the lack of need for vaccine as the illness is not a serious problem’. In a study in China, two most common reasons for not using influenza vaccine in children were the lack belief in the safety of the vaccine and limited vaccine effectiveness; however, the most common reasons for not using influenza vaccine in elderly people were lack of need for the vaccine, lack of insurance coverage, and lack of recommendation by medical staff.\textsuperscript{23} In a study in Ecuador, the most common reasons for not vaccinating pregnant women included the lack of recommendation by healthcare providers and lack of access to vaccine.\textsuperscript{24} In South Africa, the main reasons for not using influenza vaccine included using other alternative methods for prevention and the lack of need for vaccine due to considering influenza a mild problem.\textsuperscript{2}

The reasons given by different participants are mostly due to the lack of proper information about influenza vaccine and lack of recommendation by the medical staff. Insufficient recommendation by medical staff is possibly due to time limitation when visiting patients or ignoring the importance to emphasize it. In this regard, measurements are required to increase the coverage of vaccination by proper training of medical staff.

### Limitations

In this study, we did not evaluate some COPD, dialysis, and diabetic patients due to the high number of patients and their unavailability. Also, some patients such as people with immune deficiency and pregnant women were not included due to their wide dispersed referral to special clinics. Hence, further studies are required for these cases. Also, we did not take into account patients with overlapping diagnoses. In addition, we did not use a valid and standard questionnaire, which might affect the results.

### Conclusion

The coverage of influenza vaccine in high-risk patients in Birjand was low. Hence, it is essential to increase the knowledge of high-risk groups about the importance of influenza vaccination and facilitate their access to vaccines.

### Declarations

#### Ethics approval and consent to participate

All participants signed an informed consent form. This study was approved by the Birjand
University of Medical Sciences, Iran (ID: IR.BUMS.REC.1396.14).

Consent for publication
Informed consent of the participants was taken for this study.

Author contributions
Azadeh Ebrahimzadeh: Conceptualization; Data curation; Methodology; Project administration; Writing – review & editing.

Bita Bijari: Data curation; Formal analysis; Methodology; Project administration; Software; Supervision; Writing – original draft; Writing – review & editing.

Amin Azarnoosh: Investigation; Writing – review & editing.

Fatemeh Shakhs Emampour: Data curation; Investigation; Writing – review & editing.

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Availability of data and materials
The data used to support the finding of this study are available from the corresponding author upon request.

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