Survey of vaccination practices in patients with diabetes: A report examining patient and provider perceptions and barriers

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ABSTRACT

In a cross-sectional study involving 279 patients with diabetes attending a primary care center the proportion of patients vaccinated for seasonal influenza, pneumococcus and hepatitis B was 40%, 2% and 2%, respectively. We found significant barriers for vaccination in 24% of patients and in 42% of providers. © 2017 The Authors. Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Diabetes is one of the leading causes of morbidity and mortality in the world. Although prevention and treatment of cardiovascular complications is well established, there is less robust information on the prevention of infectious complications in patients with diabetes. Like the general population, children and adults with diabetes must complete the mandatory vaccination schedule according to age-related recommendations [1,2]. In addition, annual vaccination against influenza is recommended for all persons with diabetes equal or greater than 6 months of age [3]. In the case of influenza, patients with diabetes have been found to have a fourfold higher risk of death from influenza than the general population adjusted for age [3]. Case-control studies show that influenza vaccine reduces hospital admissions of patients with diabetes by up to 79% during influenza epidemics [4]. Like influenza, pneumococcal pneumonia is a preventable disease and in patients with diabetes the incidence of pneumococcal bacteremic pneumonia is higher than the general population, with mortality rates as high as 50% [5]. The US Centers for Disease Control and Prevention (CDC) recommends vaccination against influenza for all people with diabetes 2 through 64 years of age with 23-valent pneumococcal polysaccharide vaccine (PPSV23). In patients aged 65 years or older it is recommended the 13-valent pneumococcal conjugated vaccine (PCV13), that it should be administered at least 1 year after the PPSV23 vaccine [1]. On the other hand, hepatitis B virus vaccination is also recommended by the US Centers for Disease Control and Prevention to unvaccinated adults with diabetes mellitus due to higher rates of infection and progression to cirrhosis than in the general population [6]. For these reasons we wanted to review the proportion of patients with diabetes who have a history of vaccination against influenza, PPSV23 and hepatitis B virus in our health area. Moreover, we wanted to know the possible barriers, either by the patients or by the health-care professionals that make difficult the administration of such vaccines.

We carried out a cross-sectional study at a primary care health center located in Alfaz del Pi in the province of Alicante (Spain), serving a population of 21,700 inhabitants of the Spanish National Health System, of which approximately 1757 adult patients have known diabetes. Since the coverage probability for influenza in Spain is around 56%, a 2-sided 95% confidence interval with ±6% precision gives an effective sample size n ≥ 230.

The study was conducted between October and December 2016. A total of 279 consecutive adult patients with diabetes seen at the primary care center gave their informed consent for data collection. The study was approved by the Institutional Review Board of our Center. Data collected for the analysis were age, sex, cigarette smoking, history of cardiovascular or cerebrovascular disease, chronic kidney disease, chronic respiratory disease, hospital admission in the last 12 months and the most recent
The characteristics of patients included in the study are presented in Table 1. PPSV23 and hepatitis B vaccinations were anecdotal pre-recent hospitalization, poor glycemic control nor insulin use in patients older than 65 years, but vaccination was not associated with smoking. There was a higher frequency of influenza vaccination in subjects with type 2 diabetes. The rate of PPSV23 and hepatitis B vaccines was 40%, 2% and 2%, respectively.

Regarding beliefs 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 the vaccination or feared side effects. There were only 67 (24%) of the patients did not believe in the effectiveness of vaccination or feared side effects.

In our study we observed low vaccine coverage against influenza virus in patients with type 2 diabetes. The rate of PPSV23 and hepatitis B vaccination was practically anecdotal. The results obtained are even lower than a study of similar characteristics carried out in a public hospital in the United States in which the proportion of vaccine coverage against influenza, PPSV23 and hepatitis B, was 41%, 37% and 39% [7]. In a nationwide study in the United States, vaccination coverage for influenza, PPSV23, and hepatitis B in patients with diabetes was 62%, 53%, and 17%, respectively [8]. Failure to immunize patients with diabetes with pneumococcal and hepatitis B vaccine are probably unawareness of vaccination recommendations for this population in spite of the position of the US Centers for Disease Control and Prevention. The International Diabetes Federation did not establish a level of recommendation for vaccine preventable diseases [9]. The American Diabetes Association categorized recommendation for immunization in patients with diabetes as level of evidence C (conflicting evidence with the weight of evidence supporting the recommendation) [10]. Such level of evidence for pneumococcal vaccine probably was based on a randomized trial in which the 14-valent pneumococcal polysaccharide vaccine showed lack of efficacy in US Veterans [11]. However, the 13-valent pneumococcal conjugate-vaccine showed recently a vaccine efficacy of 89% in patients with diabetes [12].

Table 1

| Characteristics | All patients (N = 279) | Influenza Vaccination YES (N = 112) | Influenza Vaccination NO (N = 167) | P value |
|-----------------|-----------------------|-------------------------------------|-----------------------------------|---------|
| Age (years)     | 67.3 ± 12.3           | 71.8 ± 9.9                          | 64.4 ± 12.8                      | <0.001  |
| Age ≥ 65 years  | 179 (64)              | 85 (76)                             | 94 (56)                          |         |
| Age < 65 years  | 100 (36)              | 22 (22)                             | 78 (45)                          |         |
| Sex (%)         |                       |                                     |                                   |         |
| Male            | 152 (54)              | 64 (57)                             | 88 (53)                          | 0.543   |
| Female          | 127 (46)              | 48 (43)                             | 79 (47)                          | 0.573   |
| Smoker (%)      |                       |                                     |                                   | 0.492   |
| Yes             | 59 (21)               | 20 (18)                             | 39 (23)                          | 0.341   |
| No              | 220 (79)              | 92 (82)                             | 128 (77)                         |         |
| Comorbidity (%) |                       |                                     |                                   |         |
| Stroke          | 33 (12)               | 12 (11)                             | 21 (11)                          | 0.314   |
| Coronary artery disease | 69 (25) | 31 (28) | 38 (23) | 0.169 |
| COPD            | 42 (15)               | 18 (16)                             | 24 (14)                          | 0.734   |
| Chronic kidney disease | 34 (12) | 14 (13) | 20 (12) | 1.000   |
| Hospital admission in the past 12 months (%) | 0.613 | 0.098 | 1.000 |
| Yes             | 43 (15)               | 19 (17)                             | 24 (14)                          |         |
| No              | 236 (84)              | 93 (83)                             | 143 (86)                         |         |
| Treatment with insulin (%) | 0.001 | 0.711 | 0.547 |
| Yes             | 57 (20)               | 20 (18)                             | 37 (22)                          |         |
| No              | 222 (80)              | 92 (82)                             | 130 (78)                         |         |
| HbA1c (%)       | 7.0 ± 1.4             | 7.1 ± 1.5                           | 6.8 ± 1.3                        | 0.011   |
| HbA1c > 7% (53.0 mmol/mol) | 92 (48) | 47 (42) | 45 (27) | 0.009   |
| HbA1c < 7% (53.0 mmol/mol) | 187 (52) | 65 (58) | 122 (73) |         |

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HbA1c value. The use of seasonal influenza, PPSV23 and hepatitis B vaccine for every patient included in the study was assessed through electronic health record review. A survey of attitudes about vaccination inquiring about vaccine safety and perception of effectiveness was carried out among patients and health care workers.

Patients included in the study had a mean age of 67 years, being 54% male and 25% presenting with severe comorbidity. A proportion of 15% of patients had suffered hospitalization in the last 12 months. A total of 57 (20%) received insulin treatment. The mean value of HbA1c was 7.0% (Table 1).

The proportion of patients vaccinated with seasonal influenza, PPSV23 and hepatitis B vaccines were 40%, 2% and 2%, respectively. There was a higher frequency of influenza vaccination in subjects older than 65 years, but vaccination was not associated with smoking. Presence of cardiovascular, respiratory or renal comorbidity, recent hospitalization, poor glycemic control nor insulin use (Table 1). PPSV23 and hepatitis B vaccinations were anecdotal precluding any statistical analysis.

Regarding beliefs 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. As for health-care workers (n = 12), only 7 (58%) had been vaccinated against seasonal influenza in the previous year. In the primary care center influenza vaccination had been promoted with advertising posters, but the same was not the case for PPSV23 or hepatitis B vaccine. All studied vaccines are administered at no cost for patients belonging to the Spanish National Health System.

The results are expressed as mean ± SD or frequency (percentage).
Since data from studies suggest that adults with diabetes have a reduced response to vaccination, administration of a double strength vaccine (40 μg per dose) or extending the interval to the final 4th dose (using 20μg per dose) may achieve seroprotection in most adults with diabetes.

In parallel to the lack of unequivocal support by scientific associations for diabetes, we have found significant attitude barriers in patients and health-care workers for vaccination against these preventable diseases.

Multiple strategies have been proposed in order to increase vaccine coverage in at-risk populations. But foremost, significant national and international scientific associations for the study of diabetes should modify their position regarding the strength of recommendations for vaccination. At a local level, the strategies that have proven to be useful to increase the vaccination rates have been the use of memory systems for prescribing physicians through medical records or electronic records. Remainders increased the percentage of vaccination rate by an average of 22 points [15].

In summary, we observed very low vaccine coverage rate against preventable diseases in patients with type 2 diabetes. The lack of full support for vaccine recommendation in standards of care and guidelines of well known scientific associations for diabetes constitute an important barrier. In addition, among patients and health-care workers there is a belief that vaccines are infective or cause significant adverse effects. Since convincing effectiveness is essential in prescribing physicians, it is necessary to implement guideline modification, and incorporate the most updated information on the efficacy and safety of vaccines. Subsequently, the use of recall systems in electronic history could improve adherence rates to vaccination.

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Conflicts of interest

None.

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