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Original article

# A SURVEY ON VACCINES KNOWLEDGE AND ACCEPTANCE AMONG INDIVIDUALS WITH DIABETES AND THEIR CLOSE CONTACTS

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## Abstract

**Introduction:** The *Asociación para el Cuidado de la Diabetes en Argentina* - CUI.D.AR, carried out an online survey specifically designed to collect the knowledge and perceptions people who suffered from diabetes mellitus and their close contacts had on the Influenza virus and the potential risks associated with the infection. The survey also explored the confidence level in vaccines in general and in anti-influenza vaccines in particular.

**Methods:** Between September 30th and November 15th 2021, 1425 participants anonymously and voluntarily completed the questionnaire. The survey respondents included people with different types of diabetes (n = 822), their relatives, carers and close contacts (n = 603). They were of diverse ages, most of whom lived in different geographical areas of the country.

**Results:** Overall, 85% of the participants considered that the Influenza virus and the disease represent a risk for people with diabetes. Seventy-two percent of the participants expressed that the person with diabetes had received their annual immunization, even during the COVID-19 pandemic. The referred level of confidence in vaccines was high. The participants assigned an important role to health professionals in vaccines prescription and expressed the need for more information about vaccines in the media.

**Discussion:** The present survey contributes real-world data that could help optimize diabetic people's immunization.

**Key words:** vaccines, diabetes mellitus, surveys and questionnaires, Influenza vaccines

## Resumen

*Encuesta sobre conocimientos y aceptación de vacunas entre personas con diabetes y su entorno cercano*

**Introducción:** La Asociación para el Cuidado de la Diabetes en Argentina - CUI.D.AR, realizó una encuesta *online*, diseñada para recabar conocimientos y apreciaciones de las personas con diabetes mellitus y su entorno cercano sobre el virus Influenza y los riesgos potenciales asociados con la infección y explorar el nivel de confianza en las vacunas en general y en la vacuna antigripal en particular.

**Métodos:** Entre el 30 de septiembre y el 15 de noviembre de 2021, un total de 1425 participantes completaron el cuestionario de forma anónima y voluntaria. La población que respondió la encuesta incluyó personas con distinto tipo de diabetes (n = 822), familiares, cuidadores y/o contactos cercanos (n = 603) principalmente residentes en diferentes áreas geográficas del país y de diversas edades.

**Resultados:** El 85% de los participantes, en conjunto, consideraba que el virus Influenza y la gripe son un riesgo para la salud de las personas con diabetes. El 72% de los participantes refirió que la persona con diabetes se había aplicado la vacuna anualmente, incluso durante la pandemia de COVID-19. El nivel expresado de confianza en las vacunas fue elevado. Los participantes asignaron un rol importante a los profesionales de la salud en la indicación de la vacuna antigripal y expresaron la necesidad de mayor información en los medios de comunicación sobre las vacunas.

**Discusión:** La presente encuesta aporta datos obtenidos en el contexto de la vida real que podrían contribuir a optimizar la inmunización de las personas con diabetes.

**Palabras clave:** vacunas, diabetes mellitus, encuestas y cuestionarios, vacuna antigripal

## KEY POINTS

- In 2021, an online survey was answered by 1425 people with diabetes and their close contacts, mainly residents in different areas of Argentina and from all age groups.
- The annual vaccination rate of people with diabetes was 72% and was maintained even during the COVID-19 pandemic.
- The confidence level found in vaccines in general and in the influenza vaccine, in particular, was very high, and there is awareness about the risk posed by influenza for people with diabetes.
- Most surveyees said they had not found impediments that discouraged vaccination, but the difficulty among those who did lay in vaccines' unavailability.
- Finally, it is necessary to highlight the need for more information regarding the topic in the media.

People with diabetes mellitus are more susceptible to numerous infections[1-5], and respiratory pathogens are among the leading causes of severe conditions[3, 4, 6]. In the presence of diabetes, influenza triples the risk of hospitalization, quadruples the probability of requiring intensive care[3, 5], and increases the incidence of cardiovascular events[3, 4, 7].

Timely and appropriate immunization is the most cost-effective form of primary prevention of infections and their complications[6, 8-11]. With the currently available vaccines, people with diabetes develop an adequate immune response[3, 8, 9, 12] and adverse effects are usually mild[8].

As for the flu vaccine, the benefits are consistent and have been demonstrated in extensive studies and meta-analyses. Overall, the seasonal flu vaccine presents 58% effectiveness in reducing hospitalization and its efficacy for preventing death from any cause ranges from 38% to 56%[1, 3]. It has been documented that the influenza vaccine is associated with a lower incidence of respiratory failure in people over 75 years and pneumonia at any age[1, 10, 12]. The data also reveals that the vaccine is responsible for significantly decreasing mortality caused by cardiovascular events in people with diabetes[1, 3, 7, 12]. The efficacy of the pneumococcal vaccine varies from 56% to 84% (with the 23-valent polysaccharide vaccine) to prevent pneumonia and reduce the use of health care services, even in patients aged over 75 years with diabetes[8].

Based on the efficacy and safety of vaccines, annual vaccination against influenza, pneumococcus, and hepatitis B is strongly recommended for all people with diabetes[3, 6, 11, 14-16]. Diphtheria/tetanus (DT) and zoster vaccines are also recommended for adult patients[17]. In Argentina, all the immunizations mentioned, except for the last one, are included in the National Vaccination Calendar for free[16, 18].

In Latin America, 90% of countries have national policies/programs that include seasonal influenza vaccination. However, regional data on vaccination coverage are scarce, especially stratified according to risk levels[19]. It is essential to know the percentage of individuals who effectively access vaccination to implement communicable disease prevention strategies successfully[20].

Observational studies, such as surveys, allow data to be obtained and elaborated quickly and efficiently and provide valuable evidence to health policy-makers when evaluating vaccines' effectiveness under real-world conditions[14]. Research surveys on the population's needs, opinions and knowledge regarding issues related to their health are valuable to generate positive changes in people's quality of life.

The *Asociación para el Cuidado de la Diabetes en Argentina* (Association for the Care of Diabetes in Argentina - CUI.D.AR) is a non-profit organization whose goal is to improve the quality of life of people with chronic diseases such as diabetes. This paper synthesizes the results of a survey on people with diabetes and their close contacts. The survey has been specifically designed to gather the knowledge and the perceptions participants have about the influenza virus, the disease and their associated potential risks. It also seeks to explore the confidence

level in vaccines in general and in the influenza vaccine in particular.

## Materials and methods

The survey "What is your opinion and level of confidence in vaccination?" was allocated to people with diabetes mellitus and their close contacts, such as relatives, caregivers or other close contacts (people who are not blood relatives or active caregivers of the individual with diabetes, but are part of their environment and actively participate in daily decisions) mainly residing in Argentina (96%), while also including a small share of non-residents in the country (4%). The structured questionnaire presented 21 closed questions following a logical order so that the same topic questions were presented correlatively. Questions included multiple choice and close-ended questions (yes/no and rating scale/drop-down).

The questionnaire was available through an online form to a non-probabilistic population sample between September 30 and November 15, 2021. The dissemination was carried out through CUI.D.AR social networks (Facebook, Instagram, and Twitter) and mailing campaign sent to the CUI.D.AR database.

Participants answered the questionnaire anonymously, and their profile was strictly descriptive. Gender, age, place of residence and type of diabetes (if applicable) was the only information required to analyze it in a segmented way based on these variables. The findings are presented in percentages to facilitate interpretation.

A response time of approximately 3 minutes was calculated because a more extended duration increases the dropout rate. A neutral Spanish language was used to maintain impartiality and avoid bias influencing the choice of one option over the rest. The questions were designed to gather information on:

- The participants' profile
- Knowledge about the influenza virus and flu and their potential risks and complications for people with diabetes
- The intervention of health professionals in vaccination strategies
- The participants' confidence levels and opinions about vaccines in general and influenza vaccine in particular
- Compliance with immunization plans and their periodicity
- Potential impediments, problems or setbacks that discourage the application of the influenza vaccine
- The participants' preference regarding the means they choose to be informed

## Results

In total, 1425 participants completed the survey. Of the 822 people with diabetes (57.7% of the sample), 58.0% and 38.3% had type 1 and type 2 diabetes, respectively, and 3.7% had latent autoimmune diabetes in adults (LADA) or gestational diabetes. The remaining 603 participants (42.3% of the sample) were family members, caregivers or close contacts of an individual with diabetes. Overall, there was evidence of a higher relation percentage (69.8%) with type 1 diabetes, either because they were people with the disease or people who were close contacts.

Regarding the age of people with diabetes, the most represented range were children under 18 (29.5%), and the least represented were people over 80 (1.3%). The rest of the age ranges, divided by decades, were equally represented. Of the people with diabetes, 59.6% were female, 40.0% male and 0.4% stated a different gender or preferred not to disclose it.

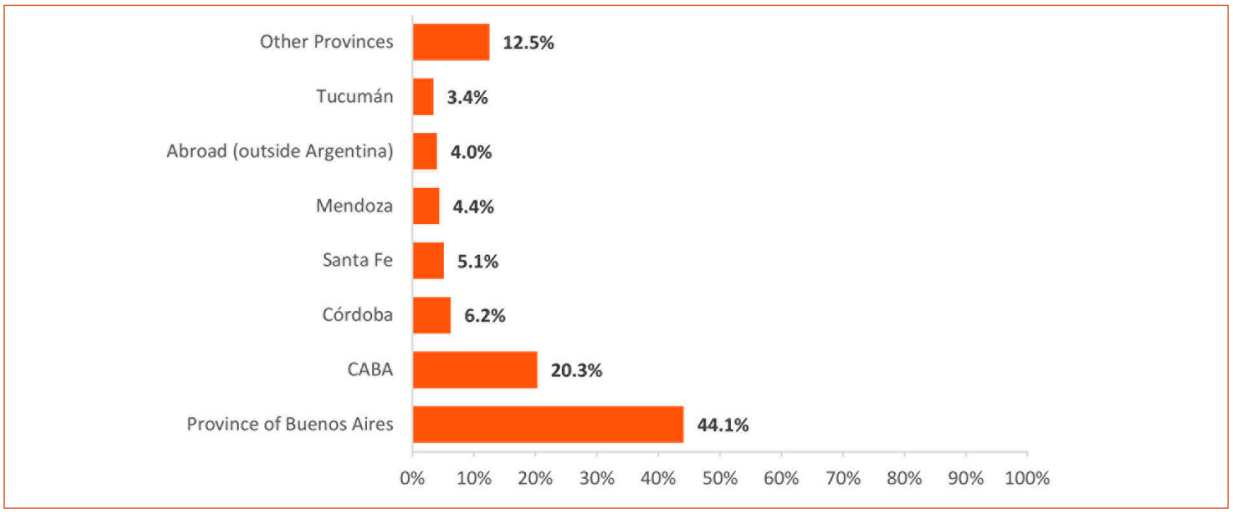
As for the geographical distribution of the participants, all the provinces were represented, including the Autonomous City of Buenos Aires (CABA) and a percentage of residents outside the country (4%). The province of Buenos Aires contributed the largest number of participants (Fig. 1).

Concerning the health system providing health care services, 51.2% of people with diabetes received assistance through health insurance institutions, including ~4% covered by the Comprehensive Medical Attention Program (PAMI by its Spanish acronym, a public health insurance organism managed by the Argentinian Ministry of Health), 33.9% through prepaid medicine companies, and 14.9% received care in the public sector.

Regarding knowledge and perceptions of the influenza virus and the risks associated with infection, 81% of people with diabetes (666 participants) and 91% of their family members, caregivers and close contacts (546 participants) considered that they pose a health risk to those with diabetes. Accordingly, 86.2% of participants (1228 individuals) stated that the flu could affect diabetes control.

About half of the participants (54.1%) responded that they did not remember or had never received particulars from their physicians about

**Figure 1** | Place of residence of people with diabetes mellitus (out of a total of 1425 participants)




the flu's risks to people with diabetes. People with type 2 diabetes showed a more significant lack of knowledge: 3 out of 4 had not received or did not remember receiving information about the flu's risks. Participants who reported receiving the most information were those with type 1 diabetes younger than 18 years or with type 2 diabetes between 50 and 59 years.

More than 96% of participants (1371 individuals) considered it important to extremely important for physicians to take an active role in vaccine prescription, and 9 out of 10 people with diabetes (88.2%) responded that the doctor had instructed them to get the flu vaccine at least once.

Regarding the confidence levels of the participants in the vaccines in general and in the influenza vaccine in particular, the results were very similar: 9 out of 10 people expressed sufficient, much, or absolute confidence, and less than 10% reported having little or no confidence. On average, 64% of the participants (912 individuals) conveyed answers in a range between a lot and absolute confidence.

A 88% of respondents (1254 participants) stated that the person with diabetes had gotten the flu shot annually. The reasons for the decision to get it or not –which exclude each other mutually– are broken down in Figure 2.

Of the people who answered 'yes', half argued that they had chosen vaccination to avoid complications of the underlying disease; others had done so to prevent the flu, and others, yet to a lesser extent, provided other reasons. The people who chose not to get the flu vaccine mainly claimed that they considered it unnecessary, feared or doubted the vaccine and its effects, or gave other reasons for their decision. In some cases, the lack of vaccination was due to problems with vaccine availability or struggles in affording it.

The COVID-19 pandemic made no significant change in the proportion of people with diabetes who received annual flu vaccination on a regular basis (72.0% in pandemic vs 73.5% pre-pandemic). However, there was a perceived impact on the group who had previously received the vaccine intermittently, as the number of people with diabetes in this group decreased from 8.6% pre-pandemic (123 individuals) to 2.3% during the pandemic (33 individuals). This decline appears to have contributed to the higher percentage of those who did not receive the vaccine during the COVID-19 pandemic. (Fig. 3).

Indicating coherence among the answers to related questions, 71% of the participants answered that the person with diabetes had been vaccinated in the last year, a percentage consistent with that of those who stated that they continued to receive the annual influenza vaccination during the pandemic (72%).

We asked if, at any time, any inconvenience discouraged or prevented people with diabetes from getting the influenza vaccine. Eighty-four

**Figure 2** | Influenza vaccination or lack of it and reasons for that decision (out of a total of 1425 participants)

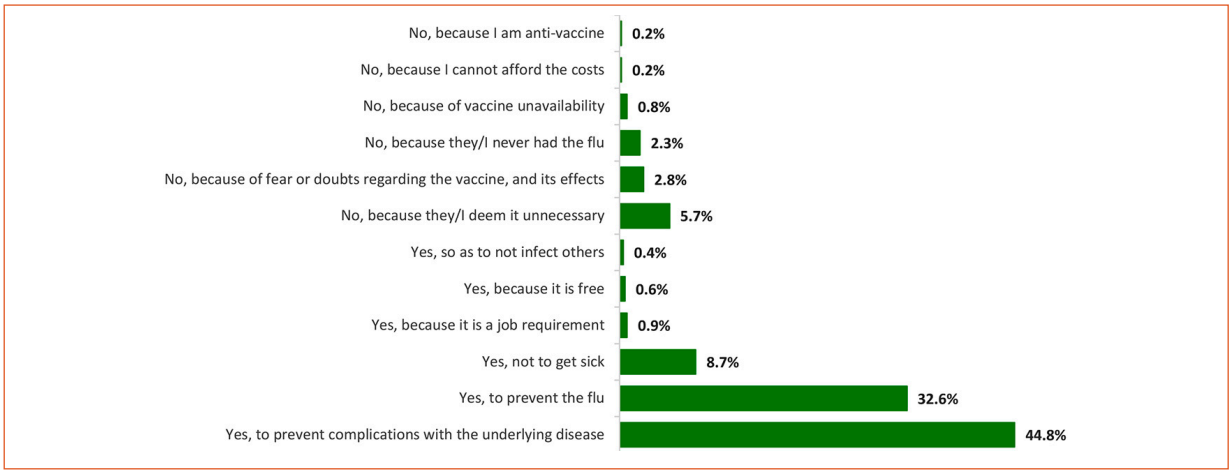
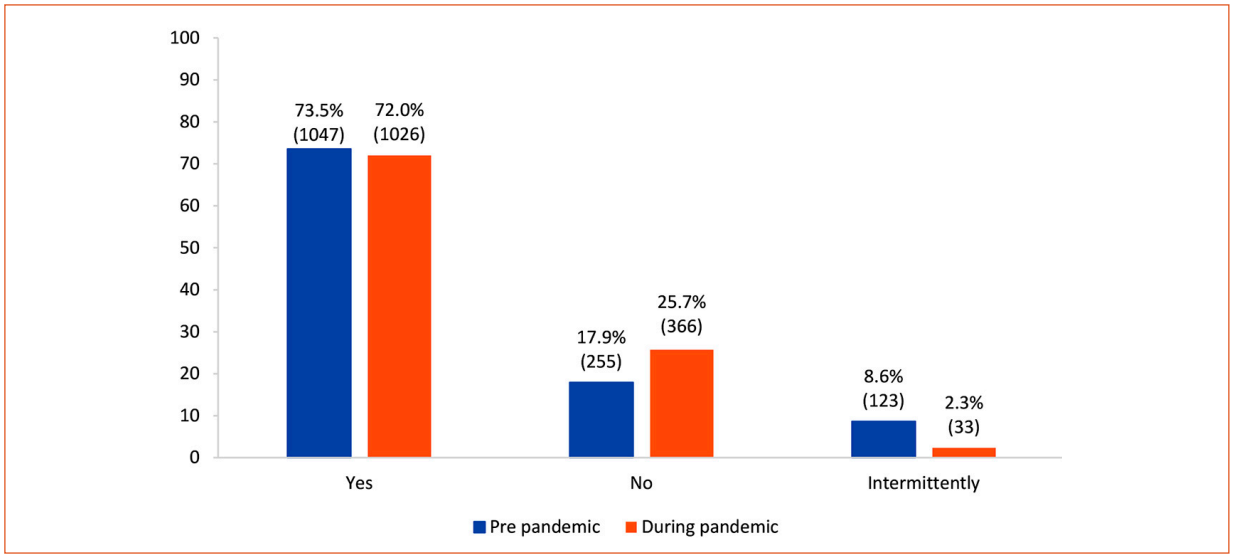


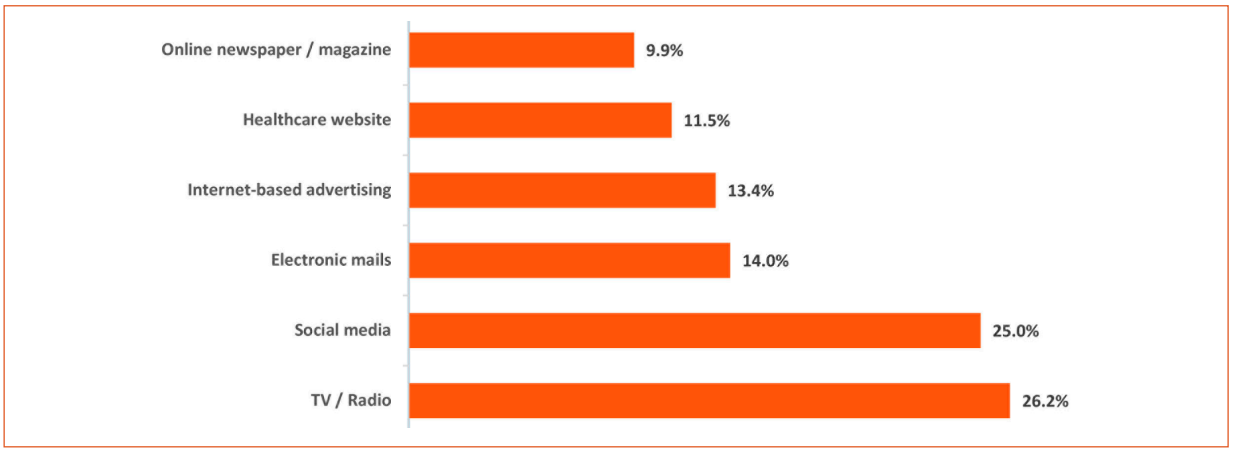

**Figure 3** | Percentage of consistent annual flu vaccination among people with diabetes before and during the COVID-19 pandemic (out of a total of 1425 participants)




per cent of participants reported that they never had any problems in this sense. Those who reported having had some inconvenience mentioned the most frequent problem was the lack of vaccine availability (5.9%), followed by lack of trust in it (4.0%), previous bad experiences (3.2%), and logistics issues (scarce doctor's appointments, error in prescriptions, excessive distance to vaccination centers), or monetary reasons.

For 75% of the participants, it was important for the person cohabiting with an individual with diabetes to get the flu vaccine. Of the participants, 74.3% were aware that the flu vaccine was included in the National Vaccination Calendar for free for people with diabetes, and 93.5% of participants considered that there should be more information in the media about vaccines. As for the preferred means of communication to receive information about influenza, its risks and prevention, answers varied, although television, radio and social network options prevailed (Figure 4). Social networks were the means of communication chosen in the first place by people between ages 18 to 50.

**Figure 4** | Preferred means of communication to receive information about influenza, its risks and prevention (out of a total of 1425 participants)




## Discussion

The population that answered the survey included people with diabetes and close contacts, mainly residents in different geographical areas of the country, of different ages and with varied health care coverage.

As a positive result, most survey respondents knew that the influenza virus poses a health risk to people with diabetes. Besides, 88% of them had been advised once to apply the influenza vaccine. Furthermore, 96% considered it essential that the physician's role in vaccine prescription was active. However, a high percentage of surveyees, especially those with type 2 diabetes and their close contacts, did not remember or had not received from their doctor information about the potential risks the influenza virus can pose for diabetes.

In the present survey, many participants expressed confidence in vaccines, and only a few people expressed distrust or previous bad experiences. Concerning potential impediments to immunization, most participants reported no problems which might have discouraged being vaccinated against influenza. Whenever that was the case, the most frequent problem reported was vaccine availability, which has also been documented in other countries in Latin America[21].

The 72% annual influenza vaccination of people with diabetes reported by surveyees remained unchanged during the COVID-19 pandemic. In addition, these data indicate that influenza vaccination coverage has improved in the population with diabetes in the country compared to previously published data.

Specifically, in 2013, the *Encuesta Nacional de Factores de Riesgo* (National Risk Factors Survey) conducted by the Argentinian Ministry of Health included for the first time a module designed to know the use of four of the recommended vaccines for adults (influenza, pneumococcus, hepatitis B and tetanus)[20]. According to the data collected then, 54.2% of the influenza vaccine use was for people between 18 and 64 with diabetes. Only 19.3% of individuals with diabetes reported receiving the pneumococcal vaccine, although the actual figure might be underestimated because some people received this vaccine outside the period considered in the survey (2008-2013)[20]. Other local data available was from a survey on the diabetic population of Villa María, Córdoba, carried out in 2008-2009. In this study, only 41% of the sample population aged >45 reported receiving the influenza vaccine within the last 12 months[22].

Globally, annual influenza immunization rates are far from the 75% proposed by WHO, despite

solid recommendations and growing evidence of benefits[21]. Reported coverage figures show considerable heterogeneity by country, covered period, age and risk level of people included in the studies. In the US, reported rates range from 50% to 62%; in Poland, they have been as low as 10%. On the other hand, they are close to 60% in the UK[3, 11], and Northern Ireland alone reached the recommended 75% target[3].

The coverage rate is even lower in Asian countries[6]. In Thailand, retrospectively analyzed data from outpatients with diabetes – who had received health care services between 2010 and 2018– indicated influenza and pneumococcal vaccination rates of 39.6% and 17.4%, respectively, and only 13.7% received both vaccines[6]. In Korea, the data analyzed for 2016-2018, founded on an annual survey (KNHANES), showed a 60% coverage of the influenza vaccine for people with diabetes[11]. Another retrospective analysis, based on data from the same survey compiled between 2014 and 2017, reported that the flu vaccination rate was only 36.5% among diabetes patients under 65[10]. In 2022 in Saudi Arabia, a self-administered questionnaire given to a sample of adult patients with diabetes who had been assisted in a specialized center revealed that the prevalence of influenza vaccination was 43.5%[15].

According to the published literature, the reasons for rejection and impediments to vaccination are remarkably diverse[3, 12, 13, 15, 23]. It is necessary to develop specific strategies for the context, the population and the vaccine to achieve high vaccination rates at population levels[24]. The underlying factors to support broad vaccine coverage are the dissemination of awareness and vaccine availability. However, an optimal doctor-patient interaction must also be added as a relevant factor[15, 24].

Twenty-five per cent of the participants in this survey were unaware that the flu vaccine is accessible and free for all individuals with diabetes in Argentina. In fact, the flu vaccine has been present in the National Vaccination Calendar since 2011, including people aged ≥ 65 and from 2 to 64 with risk factors, including diabetes. Also, the pneumococcal vaccine has been recommended since 2001 for people ≥ 65 years and ≤ 64 years with risk factors, including diabetes[20].

More than 93% of surveyees felt there was a need for more information about vaccines in the media. The media relevance was also revealed in the 2013 Risk Factors National Survey, in which 71% of participants claimed to have received information about adult vaccines through television, radio, the Internet or posters in public places[20]. The increasing digitalization of society and the use of innovative technological resources can be another means to increase vaccination rates, promote a positive attitude towards vaccines and collect information as a way of feedback for the health system[6,24].

There are different strategies for assessing the use of vaccines, surveys being one of them. Surveys are commonly used in different parts of the world and allow us to know the temporal evolution of vaccine coverage, detect problems or obstacles to vaccination, and develop strategies to overcome them[20]. However, this tool presents a disadvantage: vaccination coverage might be overestimated, and the data may pose interpretation challenges[20]. One of the limitations of this survey is that, due to its non-probabilistic nature, the information presented cannot be generalized to the entire population with diabetes in Argentina.

Finally, as in the present survey, the online format has advantages and limitations. The advantages include lower costs, time savings, simplified logistics and ease of use, while the disadvantages may include the challenge of comprising an adequate sampling framework and the exclusion of non-digitized parts of the population[25].

Vaccination rates result from the complex interrelationship between sociodemographic and behavioral factors, such as the perception of vaccines' efficacy and safety. Data obtained in a real-life context, such as those presented in this paper, can help to comprehend the experiences, opinions and behavior of people with diabetes and their close contacts. Monitoring indicators through this kind of survey allows the generation of real-life evidence essential to optimize immunization programs for at-risk groups, thus improving people's outcomes and quality of life[26, 27]. In addition, the potential hospitalization reduction can be cost-effective[28-30] and contribute to the health system's sustainability.

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