



Short communication

Influenza and pneumococcal vaccine prescription for adults during COVID-19 first wave in three regions of Argentina



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ABSTRACT

Immunizations for influenza and pneumococcus are effective interventions in reducing morbidity and mortality. The objective of this study was to describe the vaccination rates in volunteers from three regions of Argentina during the COVID-19 pandemic. In 2020, 3853 adults were surveyed, 61.6 % were females, 45 % were aged between 40 and 60 and 18.6 % were > 60 years old. The commonest comorbidities were hypertension (12.9 %), dyslipidemia (8.5 %), and smokers or former smokers (9.2 %). The global influenza vaccination rate was 37.7 %, pneumococcal vaccination 24.7 %, and both 17.8 %. Multivariable regression showed that the vaccination rate increased with age and the presence of comorbidities. However, in the subgroup with indications for both vaccines, 71.7 % had the influenza vaccine, 59 % had the pneumococcal vaccine, and 28.3 % received neither. Our study suggests that influenza and pneumococcal vaccine percentages in high-risk patients in Argentina remain sub-optimal. Immunizations with proven reductions in morbimortality could have also been relegated during the COVID pandemic.

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1. Introduction

The pandemic due to the new Coronavirus 19 (COVID-19) has generated deep changes in society and lifestyle, most of which have been detrimental to the population's health [1]. Aside from causing significant morbidity and mortality directly in affected patients, the pandemic has caused significant delays for non-COVID patients in accessing emergency services for serious conditions such as myocardial infarction and stroke [2]. In addition, there have been reports of increasing frequency of psychological issues and development of unhealthy habits.

Immunizations are interventions with proven efficacy in reducing the morbidity and mortality associated with infectious diseases

including COVID and influenza [3] although side effects from pro-inflammatory activation have been reported [4,5]. Recommendations for influenza and pneumococcal vaccinations differ between regions and countries, but elderly people and patients with comorbidities are undoubtedly high-risk groups. Argentinian national immunization programs are among the broadest in the world. In our country, individuals considered to be at high risk have access to scheduled vaccines at no cost. Despite costs are not a barrier to receive influenza and pneumococcal vaccination in our country, some publications have consistently shown insufficient vaccine coverage among the most vulnerable populations [6]. The net impact of the COVID-19 pandemic on this intervention among general adult's patients has not been well established.

The aim of our study was to evaluate influenza and pneumococcal vaccination percentages in an unselected sample of adults from three regions of Argentina before the availability of vaccines against COVID-19.

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2. Materials and methods

During March and April 2020, a survey was designed by cardiologists and psychologists with the aim to assess the impact of the COVID-19 pandemic on habits, lifestyle, and psychological factors in the Argentinian general population (see [Supplementary material](#)). The survey was anonymous and sent through email, WhatsApp and social media platforms and gathered in an online platform from May to July 2020. General population aged >18 years old from three regions of Argentina were invited to answer the survey. Physicians and other health team member, physicians and other health team members were excluded. Completion of the survey only one time was assessed by using the national identity document. The results regarding the changes in lifestyle, eating and alcohol consumption patterns and stressful factors have been previously published [7]. Briefly, the questionnaire was divided into basic demographic data, physical exercise (type, time per week, changes during pandemic), time spent with computer monitors, alcohol consumption, eating patterns, cardiovascular disease and risk factors, and specific vaccine information. The basic demographic profile included educational level (elementary, high school, tertiary, or university), work status (unemployed, employees under contract, independent worker, and retired people) and household composition. The influenza and pneumococcal vaccination percentages in this sample of the general population in Argentina were described, and the predictors of immunization and socio-demographics characteristics for receiving vaccination were examined. The indications of immunization among adults with risk factors were based on the Consensus of the Argentine Society of Cardiology [8].

Descriptive analyses were performed using mean ± standard deviation (SD) for continuous variables and proportions with 95 % confidence intervals (CIs) for categorical variables. Categorical variables were compared using the Chi-square test or Fisher’s exact test. Continuous variables were compared using the Student’s *t*-test or the non-parametric Wilcoxon rank-sum test, depending on the nature of the distribution. The age was categorized into four groups (below 20 years, 20–40 years old, 40–60 years old and older than 60 years old). Subgroup analysis for retirees based on the cut-off of > 65 years (retirement age in Argentina) was performed. Vaccination percentages in patients with and without risk factors were compared.

Odds ratios (ORs) and their 95 % CIs for the association between immunization and independent variables of interest were obtained

using multivariable-adjusted logistic regression models. Potential confounders evaluated in the models were age and sex. Statistical analyses were performed using Stata (Version 12.0, Stata Corp., College Station, TX, USA). All p-values reported were two-sided, with a p-value below of 0.05 considered statistically significant.

3. Results

A total of 3853 volunteers answered the survey and their baseline characteristics are summarized in [Table 1](#). Overall, 61.6 % of participants surveyed were females; almost 45 % were in the age group between 40 and 60 and 18.6 % over 60 years old. The main risk factors were hypertension (12.9 %), dyslipidemia (8.5 %) smokers or former smokers (9.2 %) and 3.9 % had known cardiovascular disease. The influenza vaccination percentage was 37.7 %, pneumococcal vaccination 24.7 %, and double vaccination 17.8 %. We found no gender difference in vaccination uptake of influenza vaccination (37.8 % in females and 36.4 % in males, OR = 0.99, CI 95 % 0.81–1.07, *p* = 0.35) but a slight male predominance in pneumococcal vaccination (23.6 % versus 26.5 %, OR = 1.16, CI 95 % 0.9–1.35, *p* = 0.046). In addition, older people were the most vaccinated population. Influenza vaccine was given to 72.3 % of those over 60 years versus 29.3 % of the youngest (OR = 6.28, CI 95 % 5.22–7.25, *p* < 0.001). A similar pattern was observed for pneumococcal vaccine (61.9 % versus 16.0 % OR = 8.39, CI 95 % 6.99–10.07, *p* < 0.001) and both vaccines (56 % versus 9 % OR = 12.86, CI 95 % 10.57–15.65, *p* < 0.001).

Patients with diabetes, hypertension, dyslipidemia and cardiovascular disease showed higher percentages of vaccination. However, current smokers had a lower immunization percentage for influenza, pneumococcus, and both agents ([Table 2](#)).

Multivariable-adjusted regression analyses indicated that double vaccinated participants increase with age (OR: 9.7 CI 95 % 7.9–11.9 in older than 60 years), hypertension (OR: 2.11 CI 95 % 1.65–2.7), diabetes (OR: 2.79 CI 95 % 1.55–5.03) and the presence of cardiovascular disease (OR: 1.7 CI 95 % 1.19–2.66).

Subgroup analysis for the higher-risk group and indications for vaccination (older than 65 years, diabetics and/or with cardiovascular disease) was performed. A total of 577 participants had indications for both vaccines. Within this group, 414 (71.75 %) participants had the influenza vaccine, 341 (59 %) had the pneumococcal vaccine and 163 (28.25 %) received neither. Among the 3276 participants that did not have high risk, 31.2 % participants

Table 1
Baseline characteristics of the population, according to sexes.

	Overall (3853)	Women (2373)	Men (1480)	P value
Age groups (years) n (%)				
< 20	95 (2.47 %)	65 (2.74 %)	30 (2.03 %)	0.16
21–40	1298 (33.69 %)	758 (31.94 %)	540 (36.49 %)	0.004
41–60	1743 (45.24 %)	1119(47.16 %)	624(42.16 %)	0.002
>60	717 (18.61 %)	431(18.16 %)	286(19.32 %)	0.368
Educational Level n (%)				
None (analphabet) / Primary	39 (1.01 %)	23 (0.97 %)	16 (1.08 %)	0.736
Secondary (high school)	486 (12.61 %)	285 (12.01 %)	201 (13.58 %)	0.153
Tertiary/University	3328 (86.38 %)	2065 (85.34 %)	1263 (87.02 %)	0.139
Retired, n (%)	434 (11.26 %)	336 (8.72 %)	98 (2.54 %)	< 0.001
Risk factors n (%)				
Currently smoking, n (%)	353 (9.16 %)	235 (9.9 %)	118 (7.97 %)	0.0434
Hypertension	499 (12.95 %)	242 (10.2 %)	257 (17.36 %)	< 0.001
Diabetes	68 (1.76 %)	25 (1.05 %)	43 (2.91 %)	<0.001.
Hypercholesterolemia	329 (8.54 %)	165 (6.95 %)	164 (11.08 %)	< 0.001
Cardiovascular disease	151 (3.92 %)	72 (3.03 %)	79 (5.34 %)	<0.001
Vaccination status n (%)				
Influenza	1436 (37.27 %)	898(37.84 %)	538 (36.35 %)	0.352
Pneumococcus	953 (24.73 %)	561(23.64 %)	392 (26.49 %)	0.047
Double vaccinated	685 (17.78 %)	414 (17.45 %)	271 (18.31 %)	0.495

Table 2
Immunization odds in different subgroups. Bivariate analysis.

	Influenza Vaccine	P value	Pneumococcal vaccine	P value	Both vaccines	P value
>60 years	OR 6.28 (CI 5.22–7.56)	0.0000	OR 8.39 (CI 6.99–10.07)	0.0000	OR 12.86 (CI 10.57–15.65)	0.0000
Diabetes	OR 3.86 (CI 2.25–6.82)	0.0000	OR 3.97 (CI 2.38–6.67)	0.0000	OR 5.43 (CI 3.25–9.10)	0.0000
Dyslipidemia	OR 3.45 (CI 2.71–4.41)	0.0000	OR 2.20 (CI 1.73–2.80)	0.0000	OR 3.34 (CI 2.60–4.27)	0.0000
Current smoking	OR 1.00 (CI 0.79–0.126)	0.9596	OR 0.94 (CI 0.72–1.22)	0.6683	OR 1.02 (CI 0.75–1.37)	0.8560
Cardiovascular disease	OR 3.58 (CI 2.25–5.16)	0.0000	OR 3.25 (CI 2.45–4.86)	0.0000	OR 4.86 (CI 3.44–6.85)	0.0000

received influenza vaccine, and 24.1 % received pneumococcal vaccine.

4. Discussion

The main results of our study were: i) a Influenza vaccination percentage of 37.7 % and pneumococcal vaccination of 24.7 % among unselected adults from Argentina; ii) among the high-risk subgroup of participants, about one in three did not have influenza or pneumococcal vaccine; iii) double vaccination coverage in the high-risk participants were very low.

Despite our study shows that the percentages of influenza and pneumococcal vaccinations rise with age and comorbidities, a large number of high-risk patients didn't have any schedule vaccinations. This observation it isn't new; thus, Vizzoti *et al.* found an influenza vaccination percentage of 51.6 % and a pneumococcal vaccination of 16.2 % in the general population in Argentina before the pandemic [6]. In line with the aforementioned, the Cor-COVID LATAM survey found in the Southern Cone an influenza percentage of 69 % and pneumococcal percentage of 43 % at the beginning of the COVID pandemic [9]. These percentages are similar to those we found in our high-risk population, but are far from ideal.

The relationship between respiratory tract infections and cardiovascular events has been well established for decades, as well as the safety of vaccination administration against these diseases. Even more, a randomized controlled trial has demonstrated recently that influenza vaccination after acute myocardial infarction or in patients with high-risk coronary disease reduces total and cardiovascular mortality [10]. Nevertheless, the rates of adult vaccination against influenza and pneumococcus are still low, both in Latin America and in other regions [6,9,11].

A possible explanation for our findings could be a decrease in general vaccination coverage and the COVID-19 pandemic. This relationship could be explained by the disruption of the provision of health services and primary health promotion. Difficulties in access to care for chronic diseases during the COVID-19 pandemic have been pointed out as “the other side of the coin” of this global problem, generating an additional burden on the health systems [1,2]. Other authors have reported changed in influenza and pneumococcal vaccination during COVID-19 pandemic [12–14], which had been due to multiple causes. Interestingly, in two of these studies [13,14] an increase in the attempt to uptake a pneumococcal vaccine has been observed. While we have not observed a trend toward more pneumococcal vaccination in our study, the relationship between the COVID-19 pandemic and vaccination rates in our country is a hypothesis, since we do not have enough data to establish a historical trend.

A special mention deserves the differences between influenza and pneumococcal vaccination, even though the risk factors for receiving immunization for both vaccines are almost identical. This observation is consistent with prior publications [6,9,11], but this cannot be explained by the available information obtained in the

survey. In our data, the elderly population, hypertension, diabetes, chronic comorbidities, or having more than one of these risk factors were all associated with an increased likelihood of vaccination. However, almost one in three high-risk adults who should be immunized according to our local guidelines did not have influenza or pneumococcal vaccine. On the other hand, about one in three low-risk participants had received either of these vaccines. Given the fact that there were no problems with vaccine supplies during the period analyzed, other factors are needed to explain the lack of adherence to these important prevention strategies. Accordingly, a recent systematic review analyzed the barriers to vaccine access in Latin America [12]. The authors found that many factors influence this issue, including economic, financial, educational and cultural barriers, and low confidence in the efficacy and safety of vaccines among the main obstacles. Healthcare professionals' attitudes towards vaccine is another central factor [15]. Lately, the COVID-19 pandemic and its impact on health services could be an additional barrier, as our study suggests.

Our study has some limitations that should be considered when interpreting the results. First, the original purpose of the survey was not vaccine access. Thus, we could not extract some risk factors with clear indications of these vaccines such as alcohol consumption and chronic obstructive pulmonary disease. In addition, being the primary aim of the survey, we had to stratify the population over 60 instead of 65, which is the subgroup considered as high risk in Argentina. On the other hand, since we have not contrasted the responses of the participants, there could have been a recall bias among them. Another important limitation of our study is the sampling used. Thus, it is possible that those who participated in the survey have been more motivated to do so for some reason, and that the reality is even worse than what we reported. Besides, due to we do not have precise data regarding vaccination rates in our country, we cannot be sure that there has been a decrease in the vaccination rate after the start of the COVID-19 pandemic. Lastly, we could not separate out 13-valent pneumococcal from 23 to valent pneumococcal vaccines because of the nature of the primary data.

5. Conclusion

Our study suggests that influenza and pneumococcal vaccine percentages in high-risk patients in Argentina remain sub-optimal. Immunizations with proven reductions in morbidity and mortality could have also been relegated during the COVID pandemic.

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Data availability

Data will be made available on request.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary material

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.vaccine.2023.01.056>.

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