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Original Research Article

Factors determining acceptance of coronavirus vaccine in diabetics at the endocrinology unit of Joseph Raseta Befelatanana Hospital

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ABSTRACT

Background: Since the advent of the COVID-19 pandemic, diabetics have been categorized as being at risk of severe disease, and should benefit from vaccination to prevent the onset of severe disease and excess mortality. However, various studies reported limited participation of diabetic patients in vaccination. The aim of this study was to assess diabetic's understanding and practices regarding vaccination against COVID-19 and the determining factors.
Methods: This was a cross-sectional study conducted over a 6-month period. Diabetic outpatients and inpatients who were able to answer our questions and who had given informed consent were invited to participate. Patients unable to complete the survey were excluded from the study.
Results: One hundred patients from the 110 diabetics included were retained, giving a participation rate of 90.9%. The median age of participants was 58.4 years (IQR: 19-85), with a sex ratio of 1.04. The positive determining factors significantly linked to participation in vaccination were the attainment of a university degree (p=0.04), confidence in the vaccine (p=0.02), and the presence of a personal history of infection or of being around COVID-19. Reasons for refusing vaccination included fear of the vaccine (88%) and of its adverse effects (80%).
Conclusions: This study suggests the need to prioritize strategies focused on improving the level of information, education and knowledge of patients regarding the severity of coronavirus disease and the importance of vaccination.

Keywords: Coronavirus, Diabetes mellitus, Primary prevention, Vaccination

INTRODUCTION

Since the detection of the first case in Wuhan, China in December 2019, through the discovery of atypical pneumonia of unknown cause, covid-19 has become a pandemic affecting almost every country in the world.[1,2] However, in the face of this pandemic, where no consensus has yet been reached on an effective treatment, or where the proposed molecules are not available in developing countries. Preventive measures such as vaccination remain an essential tool for curbing the spread of the disease. Several vaccines against COVID-19 have been validated by the WHO as meeting acceptable standards of quality, safety and efficacy on the basis of clinical trials. These vaccines are: Pfizer/BioNTech vaccine, AstraZeneca/Oxford ChAdOx-1-S or AZD1222 vaccine, Janssen/Ad26.COV 2.S vaccine, Moderna vaccine (mRNA1273), Sinopharm vaccine, Sinovac-CoronaVac vaccine, Bharat Biotech BBV152 COVAXIN vaccine, Covovax vaccine (NVX-CoV2373) and Nuvaxovid

vaccine (NVX-CoV2373). The WHO recommends vaccination of all individuals over the age of 18 if vaccines are available. Particularly those at risk of severe disease and those likely to be exposed to the virus. The target group for this vaccine is therefore vulnerable individuals at risk of severe disease, including diabetics.[4,5] Their attitude towards vaccination is therefore essential, not only to combat transmission but also to reduce the risk of severe forms in this field. In Saudi Arabia, the COVID-19 vaccination acceptance rate among type 1 and 2 diabetics was 79%.[6] In Italy, the vaccine hesitancy rate was 14.2%.[7] In both countries, public awareness of COVID-19 and the COVID-19 vaccine was fairly high, and the most common reason for reluctance towards the COVID-19 vaccine was safety concerns.[6,7] But what about the situation in Madagascar regarding diabetic individuals' knowledge of COVID-19, the COVID-19 vaccine and their attitudes towards these vaccines. The aim of this study is to assess the factors influencing acceptance of COVID-19 vaccination among diabetics.

METHODS

Patients and data collection

We recruited 110 diabetic patients followed on an outpatient or inpatient basis in the endocrinology unit of the Joseph Raseta Befelatanana Hospital (JRB) for a cross-sectional study during the period from August 2022 to February 2023. We included diabetic patients over 18 years of age and not pregnant who agreed to participate in the study and answer the questionnaires. Patients unable to complete the survey were excluded from the study. A pre-established questionnaire in Malagasy and French was designed to collect the study data. Interviews were carried out by qualified personnel able to communicate with patients in Malagasy or French. The interview lasts 10-15 minutes. Responses were transcribed by the interviewer into a data collection sheet and entered into IBM SPSS© 26, while respecting patient anonymity. The variables collected were socio-demographic data, length of diabetes, co-morbidities, knowledge of COVID-19, knowledge of the COVID-19 vaccine, source of information, opinions and behaviors of individuals concerning COVID-19 and the COVID-19 vaccine, essentially acceptance of vaccination which is defined by the fact of having been vaccinated by at least one dose verified on the vaccination card. Our sample was of an exhaustive type.

Statistical analyses

Categorical variables were presented as numbers and percentages, and continuous variables were presented as medians with their interquartile ranges. The primary outcome of the study was diabetic acceptance of the COVID-19 vaccine. To determine the factors affecting vaccine acceptance, a univariate analysis was performed using the Mann-Whitney test for continuous variables and the chi-square test for categorical variables. Odds ratio (OR) values and their 95% confidence intervals were calculated. A p value <0.05 was considered statistically.

RESULTS

Demographics

In this study, 110 diabetics were included, 100 (90, 10%) of whom were selected for interview and included in the final analysis. The median age of participants was 58.4 years (IQR: 19-85) with a predominance between 60-80 years (n=52; 52%). Our population was predominantly male n=51 (51%) giving a sex ratio of 1.04. In addition, more than half (58%) lived in urban areas. Concerning their level of education, 40% (n=40) had completed university studies and 15% (n=15) had primary education. The majority of the population n=61 (61%) had their diabetes discovered in less than 5 years, and 66% (n=66) had hypertension. Among the study population, 22% (n=22) had either a personal history of COVID-19 infection or a history of COVID-19 infection in their family circle (Table 1).

Table 1: Demographic details of study participants (n=100).

Variables	N (%)
Age (median, IQR) in years	58.4 (19-85)
<20	1 (1)
20-39	10 (10)
40-59	34 (34)
60-79	52 (52)
≥80	3 (3)
Male	51 (51)
Residence	
Urban	58 (58)
Rural	42 (42)
Education (degree)	
University	40 (40)
Secondary	45 (45)
Primary	15 (15)
Age of diabetes (year)	
5 at most	61 (61)
6-10	27 (27)
>10	12 (12)
Hypertension	66 (66)
Personal or family history of COVID-19 infection	22 (22)

Seventy-five (75%) of patients knew the name pathogen responsible for the disease. The majority of the study population n=78 (78%) recognized that COVID-19 is a very serious disease. Ninety-four patients (94%) knew who was at risk of severe COVID-19, and diabetics were known to be at high risk (91.48%), followed by hypertensives (66%). Regarding the history of COVID-19 infection, 22% of the study population had a personal or family history of COVID-19 infection, and 51% reported

that contact with the COVID-19 virus does not confer immunity (Table 2).

Table 2: Knowledge of the COVID-19 and COVID-19 vaccines.

	N (%)
Knowledge of the COVID-19 pathogen	75 (75)
Knowing the severity of COVID-19	78 (78)
Knowledge of people at risk of severe forms of COVID-19	94 (94)
Diabetic	86 (91.5)
Hypertension	62 (66)
Older people	32 (34)
Having received information on vaccines against COVID-19	94 (94)
Source of information	
TV/Radio	89 (94.7)
Healthcare personnel	28 (29.8)
Hospital	30 (31.9)
Name of vaccines known to participants	
Jansen®	77 (77)
Covishield®	51 (51)
Astrazeneca®	26 (26)
Pfizer®	12 (12)
Sinopharm®	3 (3)

Of the population studied, 29% (n=29) had been vaccinated against COVID-19 and 94% (n=94) of the patients included had received information about the COVID-19 vaccine. The source of information was the media in 94.7% (n=89) and health workers in 29.8% (28). Among the COVID-19 vaccines available in Madagascar, the Janssen/Ad26.COV 2.S vaccine was the most widely known by our study population [n=77 (77%)]. Concerning the place of vaccination, 94% of patients knew where to go to have access to vaccination, and the basic health center was mentioned most often [n=88 (93.6%)], followed by university hospitals where vaccinodromes have been set up for vaccination [n=81 (86.2%)]. Only 29 patients (29%) accepted vaccination.

Analysis of determinants

In the present study, gender did not influence acceptance of vaccination (OR: 0.85; 95% CI: 0.36-2.03; p=0.44). Patients aged over 60 were more likely to accept vaccination, but there was no significant association (OR: 1.5; 95% CI: 0.62-3.63; p=0.24). Having a comorbidity such as hypertension in addition to diabetes was not significantly associated with vaccination (OR: 1.2; 95% CI: 0.47-3.04; p=0.43). In relation to the educational level of the study population, having a university degree was significantly associated with participation in vaccination (OR: 2.42; 95% CI: 1.01-5.82; p=0.04). The majority of our study population did not recognize COVID-19 as a very serious disease, but this did not significantly influence the decision to be vaccinated (OR: 1.51; 95% CI: 0.50-4.57; p=0.46). In our study, the more patients were afraid of the vaccine, the less they participated in vaccination, and this result was significant (OR: 0.33; 95% CI: 0.13-0.82; p=0.01). A personal or family history of COVID-19 infection was significantly associated with vaccination (OR: 3.33; 95% CI: 1.24-8.95; p=0.01) (Table 3).

Table 3: Predictors of acceptance for vaccines.

Variables	OR	95% CI	P value
Gender	0.85	0.36-2.03	0.44
Age >60 years	1.5	0.62-3.63	0.24
Hypertension	1.2	0.47-3.04	0.43
University level	2.42	1.01-5.82	0.04
Knowing the severity of COVID-19	1.51	0.50-4.57	0.06
Fear of vaccine	0.33	0.13-0.82	0.01
Personal or family history of COVID-19 infection	3.33	1.24-8.95	0.01

DISCUSSION

In this study, we were able to identify factors influencing acceptance of Covid-19 vaccination among diabetics followed up in the endocrinology department of the JRB teaching hospital Antananarivo, Madagascar. One hundred diabetic patients were selected for the study. The median age of the population was 58.4 years, and the population was predominantly male. Among the diabetics in our study, 29% had been vaccinated against COVID-19. Factors associated with diabetics' willingness to be vaccinated were university level and personal or family history of COVID-19 infection. Fear of the vaccine was the main factor associated with reluctance to vaccinate.

This study has certain limitations: the statistical power provided by our sample size does not allow us to accurately assert certain study results. A multicenter study may be needed to make the results more representative and significant.

In our study, we found a low proportion of patients vaccinated against COVID-19 (29%). This low proportion of diabetics vaccinated against COVID-19 was also

reported in various studies. Twenty-six percent of diabetics surveyed by Mbaya et al in Kinshasa, Congo as part of a retrospective study were vaccinated against COVID-19 in 2022.[7] On the other hand, Bayle et al reported that 66% of diabetics surveyed were vaccinated against COVID-19 in a study carried out in French Polynesia in 2021.[8] The less advanced nature of the information, education and communication system in African countries such as Madagascar compared with developed countries could contribute to this low rate of vaccination uptake.

In our study, 91.48% of the diabetics included were aware that diabetics are at risk of severe COVID-19. These individuals are therefore strongly advised to be vaccinated to avoid the occurrence of the severe form of COVID-19. The WHO has stipulated in its SAGE roadmap since October 2020 that diabetics are strongly recommended for vaccination, as are individuals with other comorbidities and the elderly.[9]

The majority of our study population had received information about COVID-19 vaccines, and the source of information for these patients was essentially television and radio. However, the sources of information about vaccination may differ from country to country, but the objective should generally be the same: to inform patients about the importance of getting vaccinated. Bayle in 2021 in France found that television/radio was the predominant source of information in 50% of cases out of the different sources of information.[8] Ouattara et al in Ivory Coast in 2023 reported in a cross-sectional study in 5 diabetes consultation sites that 81.9% of their populations had been informed by television and social networks.[10] These results show the importance and effectiveness of television and radio in the rapid and massive dissemination of information, and they are currently one of the most accessible media for the population.

Diabetics over 60 years of age were the most vaccinated patients in our study, but this association was not significant. This could be explained by the strong awareness of the Ministry of Public Health via the WHO recommendation to vaccinate especially the elderly and individuals with comorbidities. Guaraldi et al in 2021 found a high proportion of vaccination participation among patients in this age group ($p=0.003$).[11] Similarly, in France, the multi-center cross-sectional study conducted by Navarre et al found high vaccination uptake among patients aged over 60 ($p<0.005$). [12]

More than half of our vaccinated patients had a comorbidity such as arterial hypertension (68.97%). However, no significant association was observed between the existence of this comorbidity and participation in vaccination. Lu et al in China in 2022 identified a significant association between people with arterial hypertension comorbidities and their participation in vaccination ($p=0.021$).[13] This difference could be linked to the small sample size of our study population, which does not allow for sufficient statistical power. The high frequency of vaccinated patients with arterial hypertension could be explained by these individuals' awareness of their health status among vulnerable people, information widely disseminated by the media and health professionals. This awareness could have influenced their decision to take part in vaccination.

Patients who have passed university level is significantly associated with vaccination participation among diabetics. In Italy in 2021, Guaraldi et al found that patients with university education had a higher proportion of vaccination uptake ($p=0.001$).[11] Raut et al in 2023, India also reported that participants with a university education were the most motivated to be vaccinated ($p<0.001$).[14] Indeed, these data seem to confirm that people with higher levels of education generally have a better understanding of the importance of vaccination. Conversely, patients with lower levels of education may be more likely to be influenced by false beliefs and negative rumours about vaccination. Level of education can play a crucial role in access to information, discernment and informed health decision-making, including the decision to vaccinate. These findings underline the importance of implementing communication strategies tailored to reach different population groups according to their level of education.

The majority of our vaccinated patients recognized that COVID-19 is a very serious disease, but this population perception of the seriousness of COVID-19 infection did not significantly influence vaccination uptake. This finding may be due to the small size of our population. Lu et al in China in 2022 found a significant association between the population's perception of the severity of COVID-19 infection and participants' motivation to be vaccinated ($p=0.01$).[13]

In our study, a significant correlation was found between having a personal history of coronavirus infection, or having relatives infected with coronavirus, and participation in vaccination. This result is in line with that of Guaraldi et al in 2021 in Italy, where they reported that the presence of patients with infected relatives or close contacts, or even the fact that the subject himself/herself had already been infected with COVID-19, constituted a significant motivation to participate in vaccination ($p<0.001$).[11]

Our study was limited by the difficulty of interpreting the causality between the variables objectified as associated since it is a cross-sectional study.

CONCLUSION

Diabetics were previously identified as being among the most vulnerable subjects likely to develop a severe form of COVID-19. Prevention, particularly through vaccination, plays a key role in reducing the risk of developing severe forms of COVID-19 in at-risk populations such as diabetics.

In this study, we set out to evaluate the factors influencing acceptance of vaccination against COVID-19 in diabetics seen in the endocrinology department of the JRB hospital.

This study has enabled us to identify that acceptance of COVID-19 vaccination among diabetics is linked above all to the individual's level of education, which enables him or her to apprehend the seriousness of COVID-19 in diabetics and the benefits of vaccination. The decision to be vaccinated is also linked to the individual's personal or family history of COVID-19 infection, which leads to fear of the disease and encourages them to be vaccinated. On the other hand, the main reason for hesitating to vaccinate is fear of the vaccine and, above all, of its adverse effects.

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