

# Covid-19 Vaccination in Chronic Hemodialysis Patients in Senegal: Prevalence and Side Effects



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## Abstract

**Introduction:** The aims of this study were to determine the prevalence of COVID-19 vaccination among chronic hemodialysis patients in Senegal, to describe side effects and to assess the factors associated with their occurrence. **Patients and methods:** This was a cross-sectional, multicenter, descriptive, and analytical study from April 1 to July 1, 2021, including all chronic hemodialysis patients in the target centers who had received at least one dose of COVID-19 vaccine and consented to participate in the study. **Results:** Of 535 patients surveyed, 367 were included, representing a prevalence of COVID-19 vaccination of 68.6 %. The median age of patients was 51 years, with extremes of 20 and 100 years, and a sex ratio of 1.08. The chAdOx1-S [recombinant] vaccine (Astrazeneca) was the most widely administered (98.4 %). Side effects were noted in 52.6 % of patients. They were dominated by local effects (65.6 %), followed by influenza-like symptoms (60.8 %). Other side effects were digestive (11.1 %), neurological (9 %), ENT (5.3 %) and cardiovascular (4.8 %). No deaths were recorded. Coagulation of the extracorporeal circuit during the 4 sessions following vaccination, despite anticoagulation of the circuit, was observed in one patient. Age < 50, diabetes and anticoagulation were associated with side effects in the bivariate analysis. In the multivariate analysis, age < 50 years was a risk factor, while anticoagulation had a protective effect. **Conclusion:** Vaccination against COVID-19 is well tolerated among chronic hemodialysis patients in Senegal.

**Keywords:** COVID-19 vaccination; Hemodialysis patients; Side effects; Senegal; Symptoms

## Introduction

A new coronavirus was identified in late 2019 as the cause of pneumonia in the Chinese city of Wuhan in Hubei province [1]. It spread rapidly leading to an epidemic around China before being classified as a pandemic since March 11, 2020 by the World Health Organization (WHO) [2]. People with comorbidities like chronic hemodialysis patients, have an increased risk of contracting the disease and developing severe forms [3]. In addition to being in a group at very high risk of infection, these patients have a higher mortality rate than the general population, which can exceed 20 % depending on the study [4]. Barrier restrictions such as self-isolation and social distancing are not applicable to these patients, who need to visit the hemodialysis center 3

times a week and are generally surrounded by other patients and medical staff [5]. After the failure of the first preventive measures, including confinement and barrier measures, vaccination against SARS-CoV2 (severe acute respiratory syndrome coronavirus 2) has become indispensable, reducing the severity of infection and hospitalization rates [6]. In order to make better use of this precious resource, many countries have developed vaccination program strategies during the first wave of the pandemic, targeting high-risk individuals such as chronic hemodialysis patients [7]. However, due to the lack of evidence for the safety and efficacy of SARS-CoV2 vaccines in these patients, the medical community has developed a form of hesitancy regarding the use of vaccines [2].

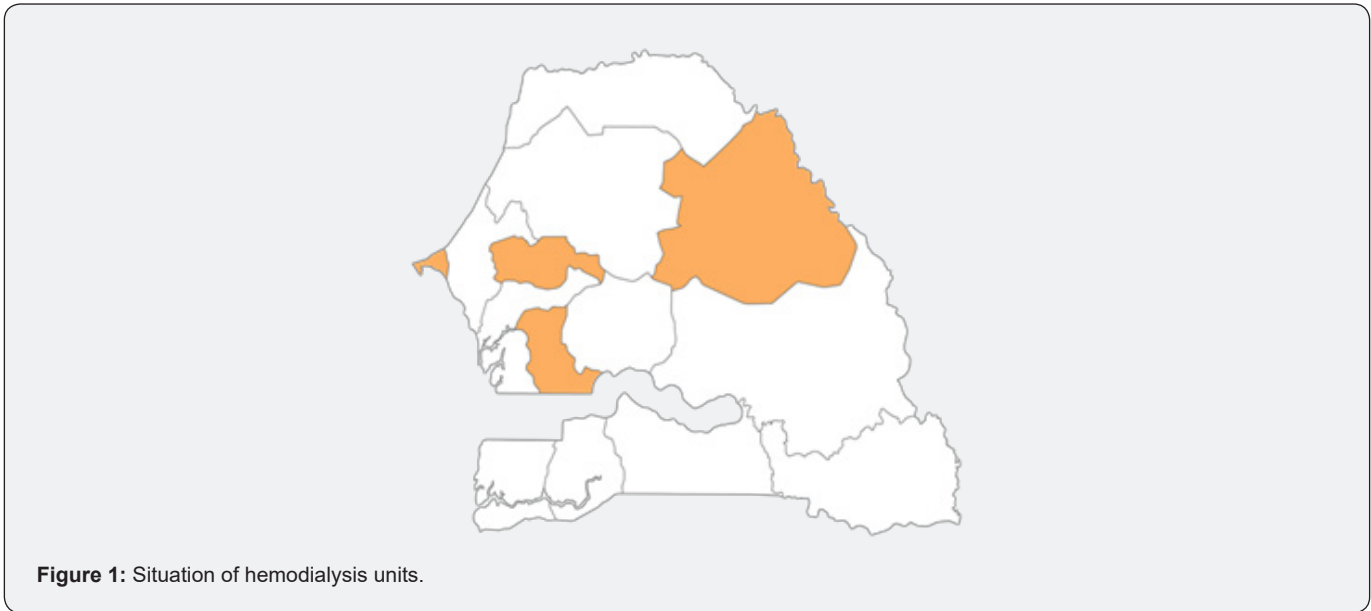
The main objective of the present study was to determine the prevalence of COVID-19 vaccination in chronic hemodialysis patients in Senegal, and the secondary objectives were to describe side effects and to assess factors associated with their occurrence.

**Patients and Methods**

**Type, site and study period.**

This was a multicenter, cross-sectional study conducted

during the period from April 1 to July 1, 2021. Participants were recruited from 7 hemodialysis units in Dakar (Aristide le Dantec hospital and university center, Idrissa Pouye hospital in Grand Yoff, Pikine hospital, Roi Bedouin hospital, Dakar hemodialysis center, Alioune Badara Cissé center, Ouakam military hospital) and hemodialysis units in the regions of Matam, Kaolack and Diourbel (Figure 1).



**Figure 1:** Situation of hemodialysis units.

**Patients**

Patients undergoing chronic hemodialysis since more than 3 months, over 18 years of age, who had received at least one dose of COVID-19 vaccine available during the study period and who consented to participate in this study were included. Patients with psychiatric pathologies or dementia were not included. The principles of patient anonymity and confidentiality were respected.

**Study design**

Data were collected using a standardized questionnaire for all patients, with multiple choice questions previously validated during a pre-test carried out on 35 patients in the Annex hemodialysis unit at Aristide Le Dantec hospital. The questions were as direct as possible, with limited answers to yes/no (closed questions). Data collection was carried out during an interview with the patients. It was completed by the nephrologists in charge of the centers, using the patients’ dialysis medical files. For included patients, the following parameters were studied: sociodemographic, clinical, and therapeutic characteristics, history of COVID-19 infection, associated symptoms, type of

Vaccine and side effects associated with COVID-19 vaccine administration.

Regarding post-vaccination side effects, participants were asked to choose from symptoms they had experienced in the week following vaccination. This part was designed to answer questions on general, site-specific, musculoskeletal, gastrointestinal, psychological, neurological, endocrine, cardiovascular, respiratory, urinary and allergic symptoms. The final section asked when the symptoms appeared.

**Statistical Analysis**

Data collection and analysis were carried out using Sphinx plus version 5 and SPSS (Statistical Product for Social Science) version 20.0 respectively. Quantitative data were presented as means and standard deviations (if the distribution was normal) and as median and interquartile range (if the distribution was abnormal). Qualitative data were presented as numbers and percentages. In bivariate analysis, data from the 2 patient groups (patients with side effects and those without) were compared on quantitative parameters using the T-test, and on qualitative parameters using

the Chi-2 test. All test results were two-tailed and assessed at the 5% significance level ( $p \leq 0.05$ ). For multivariate analysis, the binary logistic regression method ("side effects": YES/NO) was used. All variables with a p-value  $\leq 0.25$  were retained to model the occurrence of side effects. Top-down modeling was used. Adjusted odds ratios with their [95% CI] were determined for each variable retained in the final model. Models were compared by AIC and the quality of adjustment by the Hosmer test.

**Results**

**Prevalence of COVID-19 vaccination**

Of the 535 chronic hemodialysis patients surveyed, 367 were included, giving a prevalence of 68.6 % of patients vaccinated against COVID-19 (Figure 2).

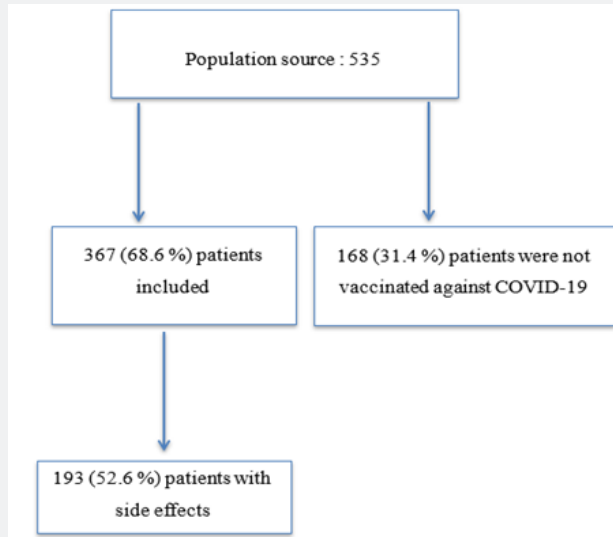


Figure 2: Flow chart.

**Patient characteristics during the survey**

The median age (interquartil range (IQR)) of patients (48 % female) was 51 (39- 62) years. The median time on dialysis was

44.5 (25 -73) months. Initial kidney disease was undetermined in 43.7 %. Comorbidities were dominated by hypertension (83.3 %), obesity (14.2 %) and diabetes (11.4%). Patient characteristics are shown in Table 1.

Table 1: Patient characteristics during the survey (n = 367).

Variables	Numbers (%) or median (IQR) (n= 367)
Age (yrs)	51 (39-62)
Men	191 (52)
<b>Marital status</b>	
Single	59 (16.08)
Married	246 (67.04)
Widowed	59 (16.08)
Not available	3 (0.8)
<b>Profession</b>	
No profession	236 (64.31)
Informal sector	62 (16.89)
Formal sector	66 (18.80)
<b>Education level</b>	
Illiterate	126 (34.3)

Primary school	43 (11.7)
High school	113 (30.8)
University	85 (23.2)
Time on dialysis (months)	44.5 (25 - 73)
<b>Initial kidney disease</b>	
Undetermined	160 (43.7)
Nephropathy attributed to hypertension	128 (34.9)
Diabetic kidney disease	37 (10.7)
ADPKD	23 (6.3)
Others	19 (4.4)
History of COVID-19	47 (12.8)
<b>Comorbidities</b>	
Hypertension	324 (88.3)
Diabete	52 (14.2)
Obesity	42 (11.4)
Heart disease	29 (7.9)
<b>Vascular access</b>	
AVF	287 (78.2)
Tunneled catheter	73 (19.8)
Simple catheter	7 (1.91)
<b>Drugs</b>	
Erythropoietin	193 (53.4)
Iron	143 (39)
Anticoagulation (LMWH; VKA)	17 (4.6)
Antibiotics	3 (0.8)
Corticoids	2 (0.5)
Vaccination against covid-19	367 (68.6)
chAdOx1-S [recombinant]	361 (98.4)
COVID-19 Vaccine BIBP	4 (1.1)
Tozinaméran	2 (0.5)

**Table 2:** Distribution of different signs observed from 193 patients.

Variables	Number (%), n = 193
<b>General signs</b>	
Asthenia	72 (37.3)
Fever	59 (30.6)
Headaches	48 (24.9)
Myalgias	41 (21.2)
Arthralgias	38 (19.7)
Chills	12 (6.2)
Sweats	6 (3.1)
<b>Local signs</b>	
Pain at injection site	98 (50.8)
Heavy limb	33 (17.1)

Swelling at the injection site	24 (12.4)
Pruritus at injection site	9 (4.7)
Post-vaccination cellulitis	2 (1.0)
Hemorrhage at injection site	1 (0.5)
Erythema at injection site	1 (0.5)
<b>Digestive signs</b>	
Abdominal pain	11 (5.7)
Vomiting	10 (5.2)
Diarrhea	7 (3.6)
Nausea	6 (3.1)
<b>Cardiovascular signs</b>	
Palpitations	6 (3.1)
Angina pain	3 (1.6)
Arterial hypotension	2 (1.0)
<b>Neurological signs</b>	
Dizziness	6 (3.1)
Sleep disorders	6 (3.1)
Paraparesis	1 (0.5)
Cramps	1 (0.5)
Hypersensitivity	1 (0.5)
<b>ENT signs</b>	
Rhinorrhea	5 (2.6)
Ageusia	4 (2.1)
Anosmia	2 (1.0)
Dysphonia	1 (0.5)

### Post-vaccination side effects

Side effects were noted in 52.6 % patients. They were dominated by local effects (65.6 %) (Figure 3). The different signs are reported in Table 2. No deaths were recorded. Coagulation

of the extracorporeal circuit during the 4 sessions following vaccination, despite anticoagulation of the circuit, was observed in one patient. Cellulitis on day 4 post-vaccination, requiring short-term hospitalization, was noted (Figure 4). Side effects occurred mainly the day after vaccination in 56 % of cases (Figure 5).

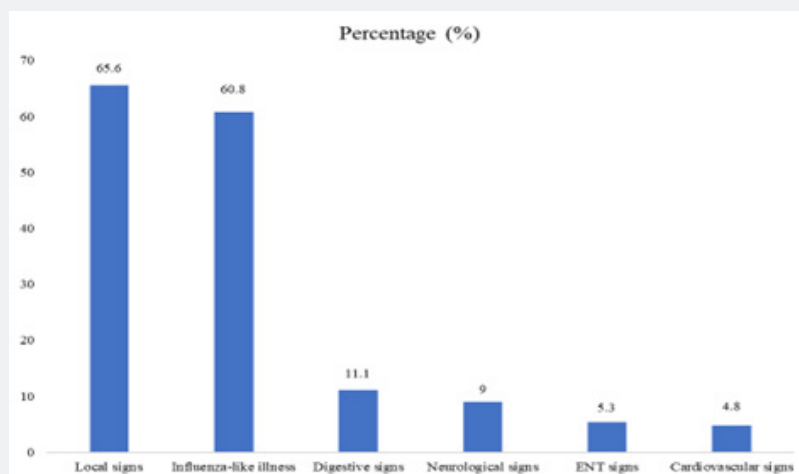
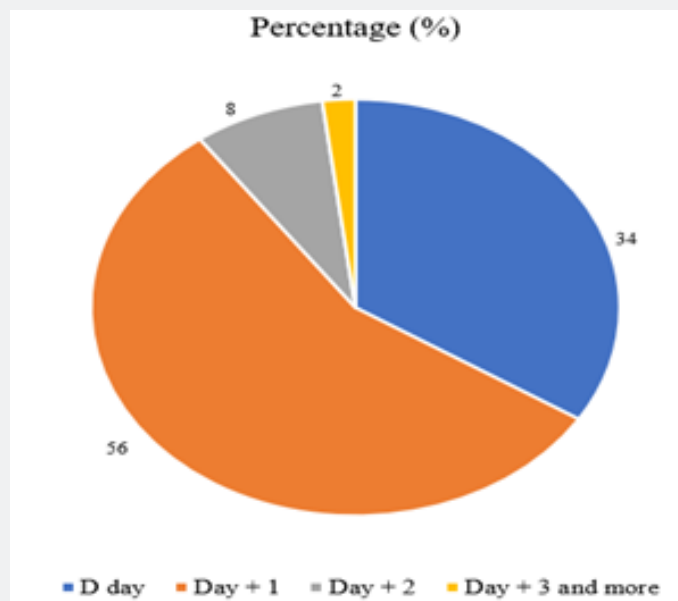


Figure 3: Distribution of side effects observed from 193 patients.



**Figure 4:** Cellulitis at D4 post-vaccination in a 29-year-old chronic hemodialysis patient at Aristide le Dantec hospital.



**Figure 5:** Time to onset of side effects from the 193 patients.

### Factors associated with side effects.

Age < 50, diabetes and anticoagulation were significantly associated with the occurrence of side effects after COVID-19 vaccination in the bivariate analysis (Table 3). In the multivariate analysis, anticoagulation had a beneficial effect, while younger age had an aggravating effect (Table 4).

### Discussion

The COVID-19 vaccine is an essential step of the fight against the pandemic [8]. In chronic hemodialysis patients, the immune response after vaccination is comparable to that of controls [9]. It is associated to a reduced case-fatality rate [10]. Vaccination against COVID-19 is therefore essential in this high-risk group

to reduce mortality and hospitalization rates. However, there is a lack of data on the safety of COVID-19 vaccine in these patients. The aim of this study was to determine the prevalence of COVID-19 vaccination in chronic hemodialysis patients in Senegal, to describe the detailed profile of side effects of the vaccine and to analyze the factors associated with their occurrence. To our knowledge, this is the first study to address this subject in Senegalese chronic hemodialysis patients.

In our study, we noted a 68.6 % prevalence of COVID-19 vaccination among chronic hemodialysis patients. These results contrast with those found in a single-center French study, where the prevalence was 89.1 % [11]. A study conducted in Egypt by Nasser and al. found a prevalence of 91.6 % [12]. The low prevalence in our study could be explained by the poor communication during the pandemic, but also by the lack of confidence and the absence of adequate information concerning the safety and efficacy of COVID-19 vaccines.

In addition, there are enormous, fantasized risks surrounding vaccination in general, and COVID-19 in particular. Among the most frequently alleged, vaccination is the cause of debilitating conditions, autism, multiple sclerosis, and diabetes. Others support the idea that vaccines contain contaminants (mercury, aluminum), or that there is a conspiracy to hide the truth about the catastrophic side effects of vaccines, etc. [13,14].

In our study, side effects were noted in 52.6 % of the patients. They were dominated by local effects, particularly pain at the injection site and influenza-like symptoms, noted in 65.6 % and 60.8 % respectively. They are not specific to vaccination against COVID-19 and are almost universally observed in most other vaccinations [15]. Sakhi et al. [16] in France reported similar results, with pain at the injection site, fever and transient aches and pains, generally resolving with symptomatic treatment. Polewska K et al. [17] Also in Poland, similar results were reported: mild to moderate pain at the injection site and systemic reactions such as fatigue, myalgia, and joint pain.

Gastrointestinal symptoms were reported (11.1 %) in our study, dominated by abdominal pain (5.7 %) and vomiting (5.2 %). In the study by Nasser et al. [12], these symptoms were dominated by anorexia (25.4 %) and abdominal pain (7.5 %). In general, the majority of gastrointestinal tract-related side effects observed after COVID-19 vaccination are non-life-threatening and transient [18]. The most reported neuropsychiatric symptoms in our patients were dizziness (3.1 %) and sleep disturbance (3.1 %). Impaired sleep quality was reported in 10.65 % of healthcare workers after COVID19 vaccination [19]. It is essential to know if COVID-19 vaccination induces neuropsychiatric disorders [20].

In this study, age < 50 years was a risk factor associated to the occurrence of side effects. This could be explained by the fact that elderly subjects report fewer side effects, most likely due to a greater pain tolerance and/or a weakening of innate immune defense mechanisms. It is supported by the fact that the elderly

have lower systemic concentrations of IL-10, IL-6, and CRP after vaccination, which may contribute to their tendency to report fewer systemic side effects [17]. Our study has the advantage of being multicentric, with a considerable study population. However, some limitations must be noted. Firstly, we used self-reported data, which may lead to bias in information, such as inconsistent reporting by participants. Secondly, we assessed only short-term side effects occurring within one week of vaccination. The medium- and long-term effects of the vaccine are still unknown. Finally, patients received different types of COVID-19 vaccine, making it impossible to conclude on the side effects of a specific type. This study must be complemented by a study about the efficacy of this vaccination among the patients in our context.

## Conclusion

Our study has shown that vaccination against COVID-19 in chronic hemodialysis patients is well tolerated. Side effects were moderate, with spontaneous resolution of the symptoms. The benefits of vaccination outweigh the risks of non-vaccination. Therefore, the different actors must do their best to ensure maximum protection for chronic hemodialysis patients.

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