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Research Article

Seroprevalence of Anti-SARS-Cov-2 Antibodies Among Senegalese Medical Students

Séroprévalence des Anticorps Anti-SARS-Cov-2 chez les Étudiants en Médecine au Sénégal

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ABSTRACT

Introduction. COVID-19 affects all categories of people. However, due to their frequent contact with affected patients, medical students at Gaston Berger University were at high risk of SARS-CoV-2 infection. The true extent of the disease in these students has not yet beeń determined. The aim of the study was to evaluate the seroprevalence of anti-SARS-CoV-2 antibodies in these medical students, identify associated factors and determine their rate of anti-COVID-19 vaccination coverage.
Methods. This was a cross-sectional, descriptive, analytical study carried out among UGB medical students between April 12 and 16, 2022. A questionnaire was self-administered to the students via google form, before testing for anti-SARS-CoV-2 antibodies using the *Wondfo*® qualitative TDR test. Seroprevalence was then matched to questionnaire results, and p values < 0.05 were considered significant. **Results.** A total of 310 students with a mean age of 22.2 years (±2.3 years) were enrolled. Anti-COVID vaccination coverage was 22.6%. Overall seroprevalence was 47.6%. Out of the total population with antibodies, 101 were unvaccinated (32.5% of the total population). In univariate analysis, taking a COVID-19 vaccine was the only factor associated with the presence of anti-SARS-CoV-2 antibodies (p=0.0006). **Conclusion.** Seroprevalence, used as a surrogate marker of infection in unvaccinated individuals, enables us to assess the extent of COVID-19 in students.

RESUME

Introduction. La COVID-19 touche toutes les catégories de personnes. Cependant, en raison de leur contact fréquent avec les patients atteints, les étudiants en médecine de l'Université Gaston Berger étaient très exposés à l'infection par le SARS-CoV-2. L'étendue réelle de la maladie chez ces étudiants n'a pas encore été déterminée. L'objectif de l'étude était d'évaluer la séroprévalence des anticorps anti-SARS-CoV-2 chez ces étudiants en médecine, d'identifier les facteurs associés et de déterminer leur taux de couverture vaccinale anti-COVID-19. **Méthodologie.** il s'agissait d'une étude transversale, descriptive et à visée analytique réalisée chez les étudiants en médecine de l'UGB sur la période du 12 au 16 avril 2022. Un questionnaire avait été autoadministré aux étudiants via google form avant de procéder à la recherche d'anticorps anti-SARS-CoV-2 à l'aide de test qualitatif TDR *Wondfo*®. La séroprévalence a par la suite été appariée aux résultats de l'enquête et les valeurs de p < 0,05 avaient été considérées significatives. **Résultats.** Au total, 310 étudiants d'âge moyen 22,2 ans (±2,3 ans) avaient été enrôlés. Le taux de couverture vaccinale anti-COVID était de 22,6%. Une séroprévalence globale de 47,6% avait été retrouvée. Sur le total de la population présentant des anticorps, 101 n'étaient pas vaccinés (soit 32,5% par rapport à la population globale). En analyse univariée, la prise de vaccin anti-COVID-19 était le seul facteur associé à la présence d'Ac anti-SARS-CoV-2 (p=0,0006). **Conclusion.** La séroprévalence utilisée comme marqueur de substitution de l'infection chez les non vaccinés permet d'apprécier l'étendue de la COVID-19 chez les étudiants. En effet, les résultats montrent que 32,5% (101/310) étaient en contact avec le virus.

HIGHLIGHTS OF THE STUDY

What is known of the subject

Due to their frequent contact with affected patients, medical students at Gaston Berger University were at high risk of SARS-CoV-2 infection.

The aim of our study

Seroprevalence of anti-SARS-CoV-2 antibodies in medical students at the Health Sciences Training and Research Unit of the Gaston Berger University of Saint-Louis (Senegal).

Key Results

1. The mean age of students was 22.2 years (±2.3 years). Anti
2. The rate of COVID vaccination coverage was 22.6%.
3. Overall seroprevalence of anti-SARS-CoV-2 antibodies was 47.6%.
4. Among all students with antibodies, 32.5% were unvaccinated .
5. In univariate analysis, presence of COVID-19 vaccination was the only factor associated with the presence of anti-SARS-CoV-2 antibodies (p=0.0006).

INTRODUCTION

On December 31st, 2019, the World Health Organization (WHO) was informed of an outbreak of 29 cases of "lung disease of unknown etiology" in China, Hubei Province, Wuhan, a city of 11 million people [1]. These infections were attributed to a new virus belonging to the Coronavirus family. It was named SARS-CoV-2 and the disease it is responsible for is called COVID-19 (Coronavirus Disease 19) [1]. Since the beginning of 2020, the world has been facing an unprecedented health crisis due to the COVID-19 pandemic, which continues to spread at lightning speed, affecting almost every country. This led to the WHO declaring a public health emergency of international concern on 30 January 2020. Six weeks later, on 11 March 2020, the WHO declared a pandemic, with 114 countries affected, 118,000 confirmed cases and more than 4,000 deaths [1]. Methods based on the molecular technique of polymerase chain reaction remain the reference for diagnosing Severe Acute Respiratory Syndrome due to SARS-CoV-2. However, given the constraints involved in performing these molecular tests, especially in countries with limited resources, the official figures may not reflect the reality of the epidemic. For this reason, serological tests are more accessible and appropriate for estimating the actual exposure of the population. Anti-SARS-Cov-2 antibodies can be detected in patients approximately one week after infection. Serological detection of anti-SARS-CoV-2 antibodies provides evidence of a previously infected population and also enables the scale of the pandemic to be mapped. Medical students on placement in health facilities have often been left stranded during epidemic waves of COVID 19. Universities, being places where people gather, are conducive to the spread of SARS-CoV-2. There are few studies in the literature on the impact of the pandemic on medical students, or on their knowledge, attitudes and practices. It is in this context that we conducted this study, the objectives of which were to:

- Determine the seroprevalence of anti-SARS-CoV-2 antibodies in medical students at the health sciences training and research unit of the university Gaston Berger university of Saint-Louis (Senegal);
- Determine the Covid-19 vaccination coverage rate among these students;
- And to identify the factors associated with the presence of anti-SARS-CoV-2 antibodies.

PATIENTS AND METHODS

Students were enrolled at the Health Sciences training and research unit of the Gaston Berger University in Saint-Louis, Senegal. Anti-SARS-CoV 2 antibodies were tested at the CERPAD laboratory. This was a cross-sectional, descriptive, analytical study conducted between 12 and 16 April 2022, corresponding to the fifth wave in Senegal. The study was conducted among medical students at the health science training and research unit of Gaston Berger University (UGB) in Saint-Louis, Senegal. Students who met the following conditions were included in the study:

- Be regularly registered
- Agreed to participate in the study following free and informed consent.
- Non-inclusion criteria
- The following were not included in the study:
- Students who had not received blood samples
- Students who were absent on the day of the study.

Enrolment of students and self-administration of a questionnaire. Recruitment included students who had enrolled during the study period and met the inclusion criteria defined above. For each participant, a questionnaire was self-administered via Google Forms across the platforms of the different graduating classes. The following parameters were studied:

- Socio-demographic characteristics: age, gender, level of study, number of students per room, geographical origin, nationalitý ;
- Knowledge about SARS-CoV-2: transmission routes, signs and vaccination ;
- Information on COVID-19: history of confirmed COVID-19 or in the entourage, anti-COVID-19 vaccination, type of vaccine received ;
- Attitudes and practices towards SARS-CoV-2: compliance with barrier measures and vaccination.

Sampling and testing for anti-SARS-CoV2 antibodies. After enrolment and self-administration of the questionnaire, an EDTA blood sample was taken from each participant. The blood sample was then centrifuged and the plasma was aliquoted and stored at -20°C until testing. Total anti-SARS-CoV 2 antibodies were detected using the 2019-nCoV Antibody Test kit (Wondfo, Guangzhou, China). This is an immuno-chromatographic test for the rapid, qualitative detection of anti-SARS-CoV-2 IgM/IgG antibodies. The test uses the Spike protein for antibody detection. Plasma was subjected to the antibody assay, using the lateral flow assay method according to the manufacturer's protocol (Guangzhou

Wondfo Biotech). Briefly, 10 µL of serum sample was added to the sample loading zone, followed by 2 drops of buffer. After 15 minutes incubation, positive samples containing antiviral IgM and/or IgG will show both T (test) and C (control) line bands; samples with only a C line band are considered negative. The sensitivity and specificity of the test were 96.18% and 100% respectively. Data were collected and analysed using Excel 2013 and Epi Info version 7. Means and percents were compared using the Chi2 and Fisher tests, according to their applicability. Any difference of less than 0.05 was considered statistically significant. This study was carried out with the free, informed and verbal consent of the students. The study was authorised by the Director of the unit. Ethical principles and medical confidentiality were respected throughout the study.

RESULTS

Of a total of 768 students regularly registered during the 2021-2022 academic year at the UFR-2S, only 310 were enrolled, corresponding to a participation rate of 40.36%.The mean age of the study population was 22.2 years (±2.3 years) and the age group between 21 and 25 years was the most representative with a prevalence of 70% (217/310) (Figure 1). There was a predominance of males, with a sex ratio of 1.5.

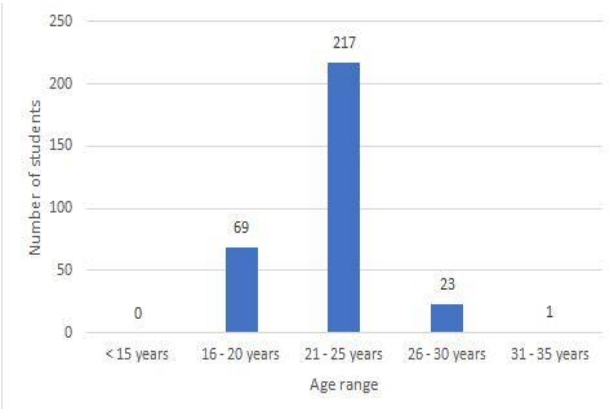

Figure 1. Distribution of students according to age group

In university accommodation, the average number of students per room was 4 (±1.8). The majority of rooms had between 4 and 6 students (Figure 2).

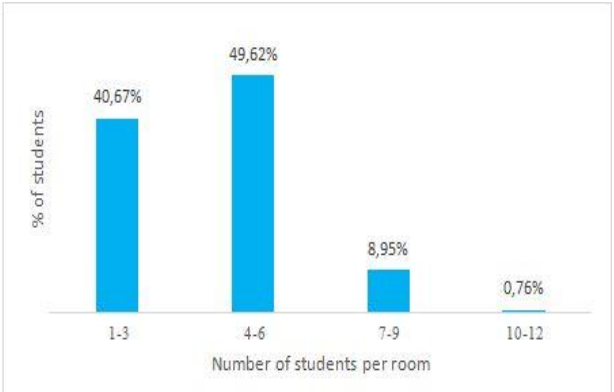

Figure 2. Number of students per room

According to the survey results, only 23 students had a history of COVID-19 or a prevalence of 7.4% (Figure 3).

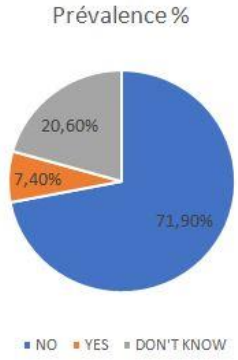

Figure 3. Distribution of students according to history of COVID-19

Only 28.6% of students had heard of COVID-19 in their neighbourhood. The people infected were parents (31.32%), neighbours (24.09%) and colleagues (16.86%) (figure 4).

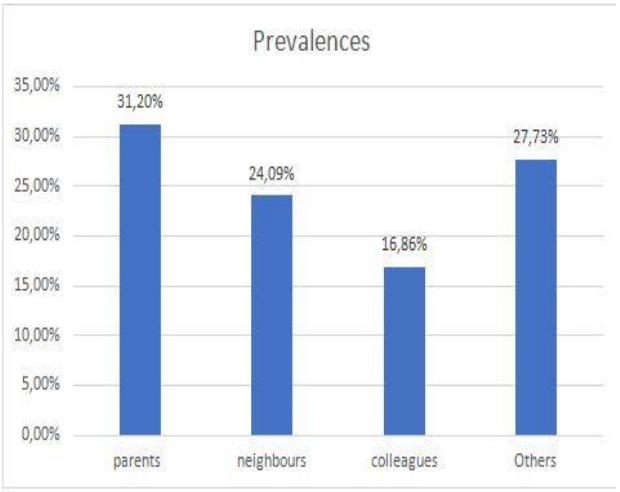

Figure 4. Distribution of students by COVID-19-infected family member

Vaccination coverage according to the survey results was estimated at 22.4%.

Table I. COVID-19 vaccination coverage

COVID-19 vaccination	N	%
Yes	70	22.6
No	240	77.4
Total	310	100

The Sinopharm vaccine was the most widely administered to students, with 34 cases/70 (48.6%), followed by the Johnson & Johnson vaccine with 27 cases/70 (38.6%). An overall seroprevalence of 47.6% (n=147/310) was found. Of the 147 students with antibodies, 101 were unvaccinated, representing a prevalence of 32.5% in the total population. The presence of anti-SARS-CoV-2 antibodies was associated with vaccination (0.0006). No significant difference was found between the presence of antibodies and age (0.6),

sex (0.2), type of vaccine (0.5) or previous infection with COVID-19 (0.19).

Table II. Distribution of students according to vaccine used

Types of COVID-19 vaccine	N	%
Sinophram	34	48.6
Johnson & Johnson	27	38.6
AstraZeneca	3	4.3
Pfizer	1	1.4
Others	5	7.1
Total	70	100

DISCUSSION

This was a cross-sectional, descriptive, analytical study of the seroprevalence of anti-SARSCoV2 antibodies in medical students at Saint-Louis. Our study population was young, with a mean age of 22.2 years (±2.3 years). The 21-25 age group was the most representative, with 217 cases (70%). This young student population found reflects the results of the university's schooling division, which reveals that during the 2019 - 2020 academic year, more than 78% of UGB students were under 25 years of age [2]. The results of the survey showed vaccination coverage of 22.6%. This coverage is very low compared with the results of Attinsounon et *al*. in 2022, who found a coverage rate of 51.6% among students [3]. This low vaccination coverage among students could be explained by a lack of awareness, but also by the fact that in Senegal, the vaccination policy against COVID-19 primarily targeted healthcare workers, the elderly and people with co-morbidities. As a result, young people were not eligible for vaccination. In addition, medical students were not vaccinated. The overall seroprevalence of anti-SARS-CoV-2 antibodies was 47.6%. Antibodies were more prevalent among the unvaccinated, with a prevalence of 32.5%. Much lower seroprevalences were found in other university communities in Cameroon by Essomba et *al* . in 2021 (27%) [4] and Esther et *al*. in 2020 (4.6%) [5], in unvaccinated blood donors in India (15% IgG) [6], and in healthcare professionals in 10 hospitals in Quebec (11.7%) [7]. Vitrat et *al* . found a prevalence of 16.1% among medical students in hospitals [8]. A similarly high prevalence was found in Oran, with rates of 29% [9]. The high seroprevalence among unvaccinated people found in our study could be explained by the promiscuity associated with the fact that there were practically 4 students per room, and also by the failure to comply with barrier measures. Seroprevalence also seems to increase with age. In 2023, Allen et *al*. reported rates of 18.2% in September 2020 and 45.5% in March 2021 among students at the University of Arkansas (21% among unvaccinated students) [10]. This increase over the years could be explained by greater vaccination coverage and also an increase in the number of people infected. We found vaccination to be the only factor associated with the presence of antibodies, with a statistically significant difference. No association was found with age, sex, type of vaccine or history of COVID-19. Wondeu et *al*. in 2023 found no significant difference with the presence of symptoms and the use of medication [11]. John et *al*. in 2023 in blood donors also found no significant differences with age group, diet, body mass index, ABO/Rh blood group or medication use and antibody status [6]. Other studies in medical settings have reported a significant association with age (< 30 years), male sex, student status, specialisation in medical laboratory and nursing science, working in a hospital where outbreaks have occurred, being a nurse or nursing assistant, and being infected [8], [7], [4], [12].

CONCLUSION

Seroprevalence, used as a surrogate marker of infection in unvaccinated students, provides an insight into the situation of students faced with the pandemic. In fact, 32.5% (non-vaccinated) had anti-SARS-CoV 2 antibodies, which highlights the need to strengthen barrier measures and improve living conditions for students in our universities.

Study limitations

The limitations of the study are mainly related to the sampling, which was somewhat low, and to the failure to quantify antibodies, which would have been much more informative.

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