

Research Article

# Attitudes and Practices of Students at the High School of Parcelles Assainies unit 13 on COVID-19 in Dakar, Senegal

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## Abstract

Coronavirus disease (COVID-19) was declared a major public health problem in 2019. Like various countries of the world, Senegal has not been spared this scourge. As a result, it was necessary to study the attitudes and practices of the students of the Parcelles Assainies unit 13 high school in Dakar. A cross-sectional, descriptive and analytical study was conducted in 2021. The study population was the students of the Parcelles Assainies high school unit 13. Univariate and multivariate analyses were performed using Excel and R software. The average age of the students surveyed was 18.57 years, females predominated (66%). Almost all respondents (93.5%) had a television and 82.8% a mobile phone. Of those surveyed, 81.5% respected the stay-at-home concept. Wearing a mask, washing hands with soap and water, and avoiding gatherings were noted among the students surveyed in 99.3%; 97.56% and 92.68% of cases. Phone ownership was more likely for students surveyed to consistently wear masks (ORaj=2.87 [1.29-6.35]) and to wash their hands regularly with soap and water (ORaj=0.33 [0.12-0.89]). Students surveyed who raised awareness about COVID-19 were more likely to wear masks (ORaj=3.71 [1.79-7.66]). Those who agreed to live with someone who had recovered from COVID-19 washed their hands more with soap and water (ORaj=2.99 [1.09-8.19]). The implementation of handwashing devices was well adopted by the students of the High school of Parcelles Assainies. Ministry for Health and Social Action (MHSA) policies were thus decisive in the fight against COVID-19.

## Keywords

COVID-19, Student, School, Prevention, Senegal

## 1. Introduction

In 2019, the world was facing a global health crisis, the COVID-19 pandemic. The virus originated in Asia and has spread to every continent except Antarctica. Cases were increasing daily in different continents [1].

COVID-19 is caused by severe acute respiratory syndrome coronavirus 2 (SARS-COV-2). The virus was initially called 2019-nCov or novel coronavirus 2019 by the World Health Organization (WHO), before being renamed COVID-19

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(Coronavirus Disease 2019) [2].

Coronaviruses are RNA viruses of the coronaviridae family that are responsible for digestive and respiratory infections in humans and animals [3]. Their name means "corona virus" and comes from the fact that they all have a crown-like appearance when viewed under a microscope.

The pathology develops after an average incubation period of about 5 days (range: 2-14 days), COVID-19 infection initially manifests as a dry cough associated with a fever of moderate intensity (38-39 °C) [4].

In Senegal, the first confirmed case was reported on 2 March 2020. More than 2/3 of the confirmed cases, or 88.1%, were reported in the Dakar region [5] despite the emphasis on Risk Communication and Community Engagement (RCCE) [5, 6]. To cope with the increase in confirmed cases of COVID-19, especially in Dakar, it was necessary to study the attitudes and practices of the population. Thus, the general objective was to study the attitudes and practices of middle and secondary school students of the High school of Parcelles Assainies U14 on coronavirus (COVID-19) infection.

## 2. Study Framework

The study took place in the Dakar region, located on the Cape Verde peninsula and covers an area of 550 km<sup>2</sup> or 0.28% of the national territory. It is home to almost all of the country's infrastructure and more than a quarter of the country's population. In 2019, the Dakar region had a total population of 3,732,282 inhabitants, i.e. a population density of 6.823 inhabitants per Km<sup>2</sup> with a demographic weight of 25% of the national population. This region includes the departments of Dakar, Pikine, Guédiawaye, Rufisque. Parcelles Assainies is a commune in the department of Dakar and comprises of 26 units.

The Parcelles Assainies U13 high school, where the survey is carried out, was created in 2007. It was relocated in 2017 to the site of the Unit 14 elementary school. In 2021, the school had 1475 students divided into three levels 2nd, 1er and Terminal with series L, L, S<sub>1</sub> and S<sub>2</sub>.

## 3. Methodology

### 3.1. Type, Population and Study Period

A cross-sectional, descriptive and analytical study on attitudes and practices was conducted among all secondary school students at the High school of Parcelles Assainies in 2021.

Included in the study were all secondary school students studying at the High school of Parcelles Assainies during the 2021-2022 school year.

Students at the high school who refused to participate in the survey or were absent during the collection are not included.

### 3.2. Sampling

Sample size was calculated using Schwartz's formula. It was estimated at 200 students. A simple random sample was conducted. The method was to enroll students after the end of classes.

### 3.3. Data Collection

Data were collected by a team via a pre-established questionnaire. It included variables related to socio-demographic and economic profile, presence of pathologies, attitudes, and practices about COVID-19. The sociodemographic profile included age, sex, marital status, education, industry, availability of assets and means of communication. The presence of conditions such as diabetes, high blood pressure and asthma. Attitudes focused on feelings about the disease, the acceptability of being tested, and quarantine. As for the practices, they focused on raising awareness about COVID-19, respecting the stay-at-home concept, wearing a mask and washing your hands.

The data collection was carried out with the ODK (Open Data Kids) application. This tool allows you to collect data using mobile devices (running Android) and save it to an online server.

### 3.4. Data Analysis

The data analysis was done with Excel and R software. It consisted of two parts, descriptive and analytical. Qualitative variables were described with their frequencies and for quantitative variables by their mean and standard deviation.

Bivariate analysis was performed. The Chi-2 or Fisher tests were used according to their conditions of applicability. The test was significant if the p was less than 0.05. To account for confounding factors, a multivariate analysis was conducted. The latter used a simple logistic regression model, taking into account in the initial model the set of variables whose p is less than 0.25 in the bivariate analysis. The comparison of the models is performed by testing the likelihood ratio with a top-down procedure. The relevance of the model is studied by the Hosmer and Lemeshow test [7].

## 4. Results

A total of 200 students were enrolled.

### 4.1. Sociodemographic and Economic Characteristics

The average age of pupils in the High school of Parcelles Assainies is 18.57 years with standard deviation of 6 and the age group (15-22) years old was the most represented (28.5%). Most of the students surveyed were single, 99% compared to 1% married.

More than half of the students surveyed were female (66%). They were in their final year of high school (57%); second (25.5%) and first (17.5%).

Nine out of ten people (93.5%) had a television in their home; 82.8% had a phone. They had a smartphone-type phone in 89.02% (N=164) of the cases, of which 98.63% (N=146) had access to social networks. The most used social network was WhatsApp (98.61%). (cf table 1)

**Table 1.** Distribution of surveyed students by application.

Application	Absolute frequency (n)	Relative frequency (%)
WhatsApp	142	98.61
Facebook	69	47.92
Twitter	21	14.58
LinkedIn	1	00.69
Telegram	33	22.92
Instagram	99	68.75
Snapchat	99	68.75
Other	10	06.94

## 4.2. Presence of Cardiovascular Conditions or Risk Factors

Only one smoker was identified, a rate of 0.5% (N=200). One diabetic was surveyed, a rate of 0.5% (N=200) and 7 hypertensive people (3.5%). The period diagnosed averaged 5.86 months with extremes of 1 and 12 months. The median was 12 months. More than half of hypertensive patients, 57.14% (N=4) were regularly monitored.

For a total of 30 students (15%) suffering from cardiac and/or respiratory conditions, 46.57% (N=14) were regularly monitored; Sixteen (16) or 53.33% were asthmatic.

## 4.3. Attitudes and Practices

### 4.3.1. Belief and Feeling About the Disease

Most of the students surveyed, 83.5%, believed in the existence of the Coronavirus disease; Only 16.5% did not believe it. Fear (73.05%) was the top feeling they felt about COVID-19. (cf table 2)

**Table 2.** Distribution of respondents by feelings towards COVID-19.

Feelings towards COVID 19	Absolute frequency (n)	Relative frequency (%)
Fear	122	73.05

Feelings towards COVID 19	Absolute frequency (n)	Relative frequency (%)
Incomprehension	32	19.16
Indifference	19	11.38
Empathy	11	6.59
Hatred towards the disease	03	1.80
Other	01	0.60

### 4.3.2. Acceptance of Measures (Quarantine, Living with a Recovered Person, Testing)

Quarantine in case of contact with a confirmed case was accepted by 86.5% (N=173) of students. Refusal was noted in 13.5% (N=27) of cases. The most commonly reported reasons for refusal were fear of not being able to go to school (40.44%), fear of being distant from family (44.74%), testing positive (25.93%) and stigmatized (22.22%).

Almost all of the students surveyed, 91.5% (N=183) would agree to live with a person who had recovered from COVID-19; refusal was reported in 8.5% (N=17). Fear of being infected (64.71%) was the main reason for refusal. Fear of dying (41.18%), fear of not being cured (29.41%), distrust (17.65%) and 11.75% could not justify this fear was also mentioned.

In total, 79.5% (N=159) of the students surveyed would agree to be tested for COVID-19. For the 20.5% (N=41) who had refused. The reasons were most often due to fear of illness (53.66%), not going to school (26.83%) and being stigmatized (19.51%).

### 4.3.3. Implementation of Measures (Awareness-Raising, Respect for the Stay-at-Home Concept)

More than seven out of ten students surveyed, 73% (N=146) were aware of COVID-19. The areas of awareness were prevention (88.36%); transmission (54.11%); treatment (21.23%); the virus (13.70%); statistics (7.53%) and stigma (1.37%).

In sum, 81.5% (N=163) of the students surveyed respected the concept of "stay at home" and 18.5% (N=37) did not. The basis for non-compliance was fear of missing classes (54.05%), being in exam class (45.95%), spending time with friends (29.73%).

### 4.3.4. Use and Proxy Mode of Surgical and FFP2 Masks

Coughing or sneezing precautions were noted in 89% (N=178) of the students surveyed. Precautions taken in case of coughing or sneezing were wearing a mask (81.9%); nose through a tissue and then throw it in a garbage can (66.29%); using the crook of your elbow to cover your mouth and nose (65.73%); cover the mouth with a tissue (39.89%); cover the

mouth, nose with my hand (14.61%); covering the mouth and nose by the with their clothes (7.3%); Covering the mouth with an object (5.62%).

The systematic use of wearing a mask was the main precaution taken by the students surveyed when leaving their homes (80%). In addition to this, other protective measures were carried out such as the systematic wearing of masks (80.00%); putting a bottle of hand sanitizer in your pocket or bag (61.5%); regular hand-washing (70.5%) and social distancing (49.5%). Only 2.5% of the sample did not take any precautions.

In terms of masks, 84% (N=168) of students wore them.

More than half of the students surveyed (52.38%) often wore masks, 29.17% always wore them and 18.45% rarely wore them.

The use of surgical masks was noted in 92 students (54.76%). The average duration of surgical mask wearing was 5.56 hours with extremes of 1 and 30 hours.

The reuse of surgical masks was noted in 17.39% (N=16) of the students surveyed. Mask washing was the main precaution taken for the reuse of surgical masks 37.5% (N=6) followed by mask sterilization (31.25%). However, 31.25% of the study population did not take any precautions.

Regarding the methods of acquisition of surgical masks, it was noted that 71.74% (N=66) of the masks were purchased and 28.26% (N=29) were offered free of charge.

The average purchase price of a surgical mask was 0.53 USD dollar with extremes of 0.8 and 8.3 USD dollar.

The price of surgical masks was most often considered affordable 53.03% (N=35); 36.36% (N=24) considered it expensive and 10.61% (N=7) very expensive.

More than 9 out of ten students, 91.57% (N=76) would advise those around them to wear a surgical mask to protect themselves against COVID 19.

The most common assessment of the use of surgical masks by the students surveyed was that it protected them against the coronavirus (90.22% (N=83), but interfered with breathing (50.00%); prevented people from expressing themselves clearly (38.04%); decreased visibility with the wearing of glasses (13.04%).

The use of FFP2 masks was noted in 66 students (39.29%). The average duration of surgical mask wearing was 3.53 hours with extremes of 1 and 24 hours.

The reuse of surgical masks was mentioned in 13.64% (N=9) of the students surveyed. Only 33.33% of students washed masks before reusing them.

Regarding the methods of acquisition of FFP2 masks, it was noted that 66.67% (N=44) of the masks were purchased and 33.33% (N=22) were offered free of charge.

The average purchase price of an FFP2 mask was 0.16 USD dollar with extremes of 0.01 and 0.49 USD dollar. The price of FFP2 masks was most often considered affordable 75.00% (N=33); 18.18% (N=8) considered it expensive and 6.82% (N=3) very expensive.

More than 8 out of ten students, 83.61% (N=51) would advise those around them to wear FFP2 masks to protect themselves against COVID 19.

The most common assessment of the use of FFP2 masks by the students surveyed is that it protected against COVID-19 (92.42% (N=61); prevented people from speaking clearly (59.09%); interfered with breathing with a feeling of suffocation (54.55%) and decreased visibility with the wearing of glasses (10.61%).

#### 4.3.5. Use and Proxy Mode of Homemade Mask

The use of homemade masks was reported in 20 students (11.90%). The average duration of surgical mask wearing was 5.75 hours with extremes of 1 and 24 hours. Surgical mask wearing was 4 hours or less in 6.5% and more than 4 hours in 93.5%.

The reuse of homemade masks was noted in 14% (N=70) of the students surveyed. Washing and sterilizing the mask were the main precautions taken with 92.86% and 14.29% respectively. One person, or 7.14%, did not take any precautions.

Regarding the methods of acquisition of homemade masks, it was noted that 45% (N=9) of the masks were purchased and offered free of charge while 10% (N=2) were self-made.

The average purchase price of a handmade mask was 0.24 dollar with extremes of 0.02 and 0.8 USD dollar.

The price of handmade masks was most often considered affordable 66.67% (N=6); 22.22% (N=2) considered it expensive and 11.11% (N=1) very expensive.

More than 8 out of ten students, 87.50% (N=14) advised those around them to wear homemade masks to protect themselves against COVID 19.

The most common assessments of the use of homemade masks by the students surveyed were that they protect them against the coronavirus 80% (N=16) and reduce breathing by 75% (N=75); leads to difficulties of speaking (50%) and decreases visibility with glasses (10%).

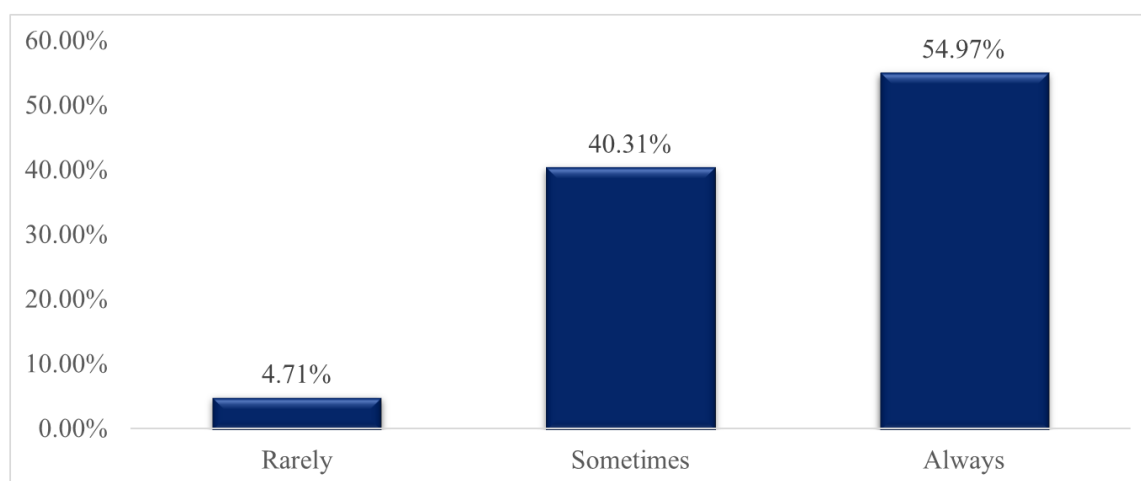
#### 4.3.6. Use of Hand Sanitizer and Hand Washing

Hand sanitizer was available in 78% (N=156) of cases. These gels were offered free of charge (57.05%) or purchased (42.31%). The average purchase price of hydro-alcoholic gel was 1.73 USD dollar with extremes of 0.16- and 9.09-dollar USD.

The purchase price was considered affordable (59.09%); expensive (30.30%) and very expensive (10.61%).

More than half of the students surveyed, 53.85% (N=84) often used hydro-alcoholic gel; 34.56% always and 9.62% rarely. The majority of 91.67% (N=143) would recommend hand sanitizer to protect themselves against COVID-19.

More than nine out of ten students surveyed, 95.5% (N=191) washed their hands with soap and water; 54.96% of the students surveyed always washed their hands (see [Figure 1](#)).



**Figure 1.** Distribution of students according to the frequency of hand-washing.

The average time taken to wash hands with soap and water was 3.87 minutes with extremes of 0.5 and 60 minutes.

#### 4.3.7. Perception of Drug (s)/Product (s) Used in Treatment to Cure Novel Coronavirus Disease or COVID-19

Among the students surveyed; 38.50% (N=77) believed that the drug or product used could cure COVID-19. Among the latter; 15.58% (N=12) were willing to go for them without being tested.

#### 4.3.8. Availability of Home Remedies That You Think Could Cure Coronavirus Disease

Forty-four (44) students (22%) had homemade medicine to treat coronavirus disease (COVID-19).

#### 4.3.9. Use of the Ministry of Health's Toll-Free Numbers

Only 10 people (5%) had ever used the Ministry of Health's toll-free numbers. Of these, 7 had called to inquire, 1 to have suspected of being contaminated, 1 to check if it was working and 1 for a suspected case. The numbers were unreachable in one case, successfully reachable in six cases, and unreachable in three cases.

#### 4.3.10. Screening at the COVID-19

A total of 16 people (8%) had been screened. Screenings were most often performed during mass screening activities (62.5%). Also, they were carried out when the person was a contact case (18.75%); one suspected case (18.75%).

Screenings were most often carried out in hospitals (68.75%). Nevertheless, 18.75% took place in a health center, 1 (6.25%) in a health post and 1 (6.25%) in a house.

#### 4.4. Factors Associated with COVID-19 Practices

The students surveyed who had a good knowledge of how COVID-19 is transmitted (ORaj = 6.55 [1.59-26.92]) and also those who had a Good knowledge of COVID-19 prevention were more in line with the stay-at-home concept. Phone ownership was more likely to lead students to consistently wear masks (ORaj = 2.87 [1.29-6.35]) and wash your hands regularly with soap and water (ORaj = 0.33 [0.12-0.89]). The students surveyed who raised awareness about COVID-19 wore masks more (ORaj = 3.71 [1.79-7.66]). Those who agreed to live with someone who has recovered from COVID-19 washed their hands more with soap and water (ORaj = 2.99 [1.09-8.19]). (see [table 3](#))

**Table 3.** Factors associated with good practices in relation to COVID-19.

Variables	"Stay at Home" OR [95% CI]	Systematic wearing of masks OR [95% CI]	Wash your hands regularly with soap and water OR [95% CI]
Age			
Under 18 years old	1	1	1
18 years and older	0.35 [0.07-1.57]	1.44 [0.64-3.27]	0.44 [0.18-1.06]



Variables	"Stay at Home"	Systematic wearing of masks	Wash your hands regularly with soap and water
	OR [95% CI]	OR [95% CI]	OR [95% CI]
Sexe			
Masculine	0.62 [0.23-1.62]	0.95 [0.46-1.96]	1.12 [0.59-2.14]
Feminine	1	1	1
Bride			
Yes	0.13 [0.008-2.21]	-	0.41 [0.02-6.73]
No	1		1
Television Ownership			
Yes	0.89 [0.11-7.55]	1.22 [0.32-4.64]	2.17 [0.69-6.75]
No	1	1	1
Phone Ownership			
Yes	0.48 [0.10-2.20]	2.87 [1.29-6.35]	0.33 [0.12-0.89]
No	1	1	1
High blood pressure			
Yes	-	0.61 [0.11-3.82]	2.58 [0.30-21.89]
No		1	1
Heart or respiratory condition			
Yes	0.43 [0.14-1.32]	0.52 [0.22-1.24]	0.68 [0.30-1.53]
No	1	1	1
Good knowledge of the modes of transmission of COVID-19			
Yes	6.55 [1.59-26.92]	0.64 [0.76-5.36]	0.37 [0.04-3.07]
No	1	1	
Good knowledge of the signs of COVID-19			
Yes	1.67 [0.33-8.33]	0.49 [0.06-3.98]	1.86 [0.51-6.71]
No	1	1	1
Good knowledge of COVID-19 prevention			
Yes	3 [1.02-8.80]	1.89 [0.71-5.31]	0.58 [0.18-1.80]
No	1	1	1
Belief in the existence of COVID-19			
Yes	-	1.98 [0.86-4.60]	1.46 [0.66-3.20]
No		1	1
Quarantine Acceptance			
Yes	1.12 [0.23-5.37]	1.17 [0.44-3.12]	1.14 [0.93-4.92]
No	1	1	1
Acceptance to live with a person who has been cured of COVID-19			
Yes	0.53 [0.06-4.29]	0.84 [0.23-3.10]	2.99 [1.09-8.19]
No	1	1	1
Acceptance to be screened at the COVID-19			

Variables	"Stay at Home"	Systematic wearing of masks	Wash your hands regularly with soap and water
	OR [95% CI]	OR [95% CI]	OR [95% CI]
Yes	1.88 [0.23-15.24]	1.82 [0.40-8.36]	0.51 [0.18-1.43]
No	1	1	1
Raising awareness of the COVID-19			
Yes	1.96 [0.72-5.34]	3.71 [1.79-7.66]	1.44 [0.74-2.80]
No	1	1	1

OR = Odds Ratio, CI = Confidence Interval

-: non applicable

## 5. Discussion

### 5.1. Limitations of the Study

A socio-anthropological study would have provided a better understanding of students' behaviors and factors associated with good attitudes and practices towards COVID-19. Despite this limitation, the results obtained allowed us to make the following discussions.

### 5.2. Sociodemographic Aspect

In our study, the 18 to 20 age group was the most represented with 73%. These results are different from those obtained during a study carried out in Mali on patients' attitudes and practices on COVID-19 at the Asacodjénka community health center where the 18 to 35 age group was the most represented (78.1%) [8].

It was noted that there was a predominance of single students, with married couples being the least represented, i.e. 1% of the population studied. This result is similar to that obtained from the study in a university setting in Kinshasa in 2020, where singles were the most represented (82%) [9].

Women accounted for 66% compared to 34% for men. This result could be explained by the fact that girls were much more willing to participate in the survey. This result is similar to that obtained by Diakit [10] in a CAP study conducted in 2021 in the population of Koulouba Point G Sogonafing facing the coronavirus disease with 51% female.

Among those surveyed, everyone is educated, with 57% of pupils in the final year of secondary school, and pupils in the first year of secondary school were the least represented with 17.5%. This result is higher than the study on the CAP of young people in MARRAKECH\_SAFI face of COVID-19, of which 50% of these respondents had a higher level of education [11].

### 5.3. Attitudes and Practices

Most of the respondents (83.5%) believed in the existence of the Coronavirus disease. This result is similar to that obtained by Leye et al [5], in 2020 on the attitudes and practices of the population of the Dakar region on COVID-19, where almost all respondents believed in the COVID-19 disease. This result can be explained by the strong awareness of the Ministry of Health and Social Action (MHSA) of the population on the disease through various methods using various languages through the media and social networks. Thus, it was important to avoid any denial and to raise awareness of the existence of the disease in order to be able to carry out the fight against the COVID-19 pandemic. Regarding quarantine; 86.5% of respondents agreed to be quarantined against 13.5% refused. This refusal to be quarantined in case of suspicion of COVID-19 disease could explain the stigma among some respondents. Mandatory contact tracing, daily MHSA releases on the epidemiological situation, as part of COVID-19 public health responses, could make people more anxious and guilty of the effects of contagion, quarantine, and stigmatization of their families and friends [12]. Indeed, 53.66% of respondents refused to be screened for fear of the disease. This result can be superimposed on the one obtained in 2021, at the level of the population of the Dakar region on COVID-19 with 47% of participants who were afraid of the result of a COVID-19 screening test [5]; 81.5% of respondents respected the concept of "Stay at home". So the students surveyed were inclined to stay at home. This could be explained by the fact that the students did not have income-generating activities. Indeed, in a study done in Dakar on residents of the Western District in 2020, people engaged in income-generating activities are less inclined to stay at home [13].

Prevention remains the least effective way to deal with the COVID-19 pandemic. Thus, respecting the wearing of masks, washing hands with soap and water and distancing were essential to deal with the pandemic. In a study conducted in Malaysia, most participants took precautions, such as avoiding crowds (83.4%) and practicing good hand hygiene (87.8%)

in the week before the start of the movement control order [5]. Among those surveyed, 80% of students wore masks when leaving their homes. In China, only 2.0% of people said they did not wear a mask outside the home [14]. But taking into account the risks of transmission of the disease in the family and outside the family, wearing a mask should not be limited to outside the home. Wearing a mask was the main national recommendation because many people were experiencing mild symptoms of the disease while unaware that they were infested with the coronavirus. The Ministry of Health and Social Action had made toll-free numbers available to the population, but only 5% of respondents had called these numbers once. The possession of phones by the students surveyed had a positive impact on the prevention of the disease of COVID-19 by encouraging them to systematically wear a mask (2.87%) and to wash their hands regularly with soap and water (0.33%).

## 6. Conclusions

The COVID-19 pandemic has turned our healthcare systems upside down. The introduction of policies to combat COVID-19, such as wearing masks, hand-washing and raising awareness, were the main attitudes and practices adopted by students in the face of the disease. This study shows that students had a better knowledge of the disease, and that those who had a telephone or agreed to live with a person cured with covid19 respected these preventive measures. This is an incentive to step up the fight against epidemics by involving all levels of society, including schools.

## Abbreviations

COVID-19	Coronavirus disease
SARS-COV-2	Severe Acute Respiratory Syndrome Coronavirus 2
RCCE	Risk Communication And Community Engagement
MHSA	Ministry for Health and Social Action
WHO	World Health Organization

## Ethical Considerations

Participation in this study was voluntary. Consent was free and informed. All ethical considerations were taken into account from the collection of data to the publication of the results. An information sheet was shared with the participants.

There was a risk reduction for this study as there was no provision for drug administration, body fluid sampling, clinical and/or para-clinical examinations.

The anonymity of the students surveyed was respected. Only those responsible for the study had access to the data.

## Author Contributions

**Mamadou Makhtar Mbacke Leye:** Conceptualization, Data curation, Formal Analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Validation

**Mbayang Ndiaye:** Formal Analysis, Methodology, Project administration, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing

**Jeane Marie Diouf:** Conceptualization, Data curation, Formal Analysis, Resources, Funding acquisition, Investigation, Methodology, Visualization

**Ibrahima Seck:** Conceptualization, Data curation, Formal Analysis, Project administration, Resources, Software, Supervision, Validation

## Conflicts of Interest

The authors declare no conflicts of interest.

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