

## Facemask usage as prevention for COVID-19: A comparative study among people moving about Nigeria and South Africa

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### Abstract

**Background:** Corona Virus Disease (COVID-19) is one of the most contagious diseases in recent times that emanated from Wuhan, China. Even though vaccines have been discovered, the virus remains deadly. However, one of the preventive measures put in place by World Health Organization (WHO) to prevent the transmission of the virus from one person to the other is the usage of face mask.

**Aim:** To determine and compare the prevalence of proper usage, improper usage, and non-usage of facemask in the context of COVID-19 among the populace in Nigeria and South Africa.

**Method:** The study utilized Naturalistic Observational design where people moving about were observed and their usage of face mask in the context of COVID-19. 2000 people were observed in each participating country (N=4000).

**Results:** The study reveals that in the two countries male people moving around were more than the female. Also, the prevalence of proper usage of face mask was higher among male South Africans than their female counterpart. Although, the prevalence of proper usage of face mask among both sexes in South Africa is higher than that of Nigeria. Nigeria male and female passers-by have the highest prevalence of improper and non-usage of facemask in this study.

**Conclusions:** The prevalence of proper usage of face mask was found to be higher among South Africans compare to Nigerians while the improper usage of face mask was found to be higher among Nigerian compare with South Africans

**Keyword:** COVID-19, Prevalence, Face mask, Passers-by, Usage

### 1. Introduction

Corona Virus Disease (COVID-19) was first reported on 31<sup>st</sup> December, 2019 when Wuhan Municipal Health Commission reported a cluster of cases of pneumonia in Wuhan, Hubei Province China and has since spread extensively across all the countries of the world.<sup>1</sup> COVID-19 was identified to be caused by a new strain of Coronavirus SARS-Cov-2 (severe acute respiratory syndrome coronavirus-2).<sup>2</sup> SARS-CoV-2 belongs to the genus of beta Coronaviruses which also includes SARS-CoV-1 and MERS-CoV; causative agents for Severe Acute Respiratory Syndrome (SARS) in 2002 and Middle East Respiratory Syndrome (MERS) in

2012.<sup>2</sup> Scientific evidence shows that COVID-19 was far more highly contagious than any of the previously identified strain of corona viruses.<sup>3</sup> Corona virus is a type of respiratory infection being transmitted through droplets >5-10µm in diameter and droplet nuclei <5µm in diameter.<sup>1</sup>

According to the current available evidences, COVID-19 virus is primarily transmitted between people through respiratory droplets that are released when an infected person is in close contact (within 1m) and sneezes, coughs or speaks into other persons faces or when it contaminates surfaces, making human being to unknowingly infect themselves by using the contaminated hands to touch their eyes, nose and mouth.<sup>5-8</sup> Also, COVID-19 has been proven not to be airborne

that is the droplets cannot be transmitted through inhalation of such droplets because the COVID-19 droplet is heavy and quickly settles down within 1m distance of its escape from an infected person.<sup>9,10</sup> Therefore, transmission of the COVID-19 virus can occur by direct contact with infected people and indirect contact with surfaces in the immediate environment or with objects used on the infected person.

Although evidence that face masks can provide effective protection against respiratory infections in the community is scarce,<sup>11</sup> however it has been recommended as the best approach of preventing COVID-19 and other respiratory droplets<sup>12-14</sup>. For instance, an evidence based review conducted on face mask usage revealed that public face mask wearing is most effective at limiting the virus when compliance is high.<sup>15</sup> Hence, the reason while relevant government agencies are enforcing the use of face mask on their populace.<sup>13</sup> One of the recommendations for the proper use of face mask is that it should cover nose and mouth including the jaw and to make sure there are no gaps between one's face and the mask.<sup>14,16</sup> There are other advantages of universal use of face mask. For instance, the use of face mask in the public domain does not only prevent people from contracting infections but also prevent infected people from spreading the diseases.<sup>16</sup> In addition, proper usage of face mask protects the caregivers of those who are self-isolating from contacting COVID-19 and limits the risk of contacting COVID-19 among elderly and those with co-morbid condition.<sup>17</sup> With all these advantages many people refuse to use face mask.<sup>18</sup> Even when used, it is sometimes used improperly which could expose people to COVID-19 infection.<sup>17</sup> Hence, this study aimed at determining the prevalence of proper usage, non-usage, improper usage of face mask among the populace in Nigeria and South Africa in the context of COVID-19. The aim of this study was to determine and compare the prevalence of proper usage, improper usage, and non-usage of facemask in the context of COVID-19 among the populace in Nigeria and South Africa.

Specific objectives include determination of the prevalence of proper usage, improper usage and non-usage of facemask among Nigeria and South Africa populace in the context of COVID-19. Additionally, to compare the prevalence of proper usage, improper usage and non-usage of face mask among Nigeria and South Africa populace in the context of COVID-19

## Methodology

**Study Location:** This study was conducted in Abuja Municipal Area Council of Federal Capital Territory [FCT], Abuja which is one of the three epicenters of COVID-19 in Nigeria and Quigney Area of East London which is also one of the epicenters in South Africa.

**Study Population:** This was conducted among people moving about in 3<sup>rd</sup> Avenue, Gwarimpa Abuja Municipal Area Council of FCT, Nigeria and Quigney suburb, East London, Buffalo city Metropolitan Municipality, Eastern Cape, South Africa.

**Study Design:** The study was Naturalistic Observational study in design where people moving about were observed and their usage of face mask in the context of COVID-19 was observed.

**Sample Size Determination:** The sample size was calculated using the formula for comparing two groups:

$$n = \frac{2(Z\alpha + Z\beta)^2 P_0 (1 - P_0)}{d^2}$$

Where;

n= Minimum sample size

Z $\alpha$  = Critical ratio at significance level of 5%

Z $\beta$  = Statistical power at 90%

P<sub>0</sub> = Means of the 2 prevalence of the two comparison groups  
i.e. (P<sub>1</sub>+P<sub>2</sub>) / 2

d = differences between P<sub>1</sub> and P<sub>2</sub>

Since, the prevalence of COVID-19 or usage of face mask has not been determined previously. The safest procedure was to assume it is 50% which maximizes the expected variance and therefore indicates a sample size that is sure to be large enough for a good representation.<sup>19</sup>

Taking the prevalence of usage of facemask in Nigeria to be 50% and in South Africa to be 55%.

This implies that  $P_1=0.5$  and  $P_2=0.55$

$$\text{Therefore, } P_0 = \frac{0.5 + 0.55}{2} = 0.525$$

$$1 - P_0 = 1 - 0.525 = 0.475$$

$$d = \text{differences between } P_1 \text{ and } P_2: (0.55 - 0.5) = 0.05$$

$$n = \frac{2(1.96 + 1.28)^2 \times 0.525(1 - 0.525)}{0.05^2}$$

$$n = 1,998$$

Approximately 2000 passers-by were used for this study in each country.

**Sampling Techniques:** Two groups of researchers conducted this research using the Federal Capital Territory Abuja in Nigeria and East London in South Africa.

Multistage sampling technique was used for selection of participants in both Nigeria and South Africa.

**Third Avenue Gwarimpa, Abuja Municipal Area Council FCT Nigeria.**

**Stage 1:** Selection of North Central Geo-political zone

Using the existing classification of Nigeria into 6 geo-political zones. North central geo-political zone was randomly selected using balloting techniques.

**Stage 2:** Selection of State

The North Central geo-political zone has 6 states with FCT. FCT was randomly selected using simple random sampling balloting technique.

**Stage 3:** Selection of Area Council

Using simple random sampling balloting techniques Abuja Municipal Area council was selected among the 6 area councils in FCT.

**Stage 4:** Selection of Ward

Abuja Municipal Area Council has 8 Wards/cluster areas, out of which Gwarimpa was randomly selected using balloting techniques.

**Stage 5:** Selection of Avenue

Using the existing classification of Gwarimpa into 7 avenues, 3<sup>rd</sup> Avenue Gwarimpa was randomly selected.

**Stage 6:** Selection of street

Gwarimpa 3<sup>rd</sup> Avenue has 12 streets, 10 streets were randomly selected randomly using balloting technique.

**Stage 7:** Selection of participants

Two hundred participants i.e. passers-by were observed and categorized into 3 per each street within 2 hours interval (10am-12pm, 1pm-3pm) each day for a total of 5 days by 3 research assistants who were observing the appropriate use of face mask among them. The research assistants each focused on each of the three categories i.e. properly usage, improperly usage and non-usage at all. The research assistants observed passers-by per day at interval of 60 seconds until all the 200 passers-by were complete across all the 10 streets were completed given a total sample of 2000 in 3<sup>rd</sup> Avenue, Gwarimpa, AMAC FCT Abuja, Nigeria.

**Quigney Area, East London South Africa**

**Stage 1:** Selection of Province

Using the existing classification of South Africa into 9 Provinces, one province was randomly selected using balloting technique. Thus, Eastern Cape Province was selected.

**Stage 2:** Selection of Municipality

Eastern Cape Province has 2 Metropolitan Municipalities and 6 District Municipalities: Buffalo City Metropolitan Municipality and Nelson Mandela Bay Metropolitan Municipality. Using simple random sampling balloting technique Buffalo City Metropolitan Municipality was selected.

**Stage 3:** Selection of city within the Buffalo City metropolitan municipality

Random sampling using balloting technique was used to select East London out of the cities within the Buffalo metropolitan municipality.

**Stage 4:** Selection of Quigney Suburb

Random sampling using balloting technique was used to select Quigney Suburb among the 18 other suburbs within the East London street

**Stage 5:** Selection of small Area:

Based on the 2011 census Quigney has 15 small areas, 10 small Areas were randomly selected using balloting techniques within the Quigney Area.

**Stage 6:** Selection of participants

Two hundred participants i.e. passers-by were observed and categorized into 3 per each small area within 2hours interval (10am-12pm, 1pm-3pm) each day for a total of 5 days by 3 research assistants who were observing the appropriate usage of face mask among them. The research assistants each focused on each of the three categories i.e. properly usage, improperly usage and non-usage at all. The research assistants observed passers-by per day at interval of 60 seconds until all the 200 passers-by were complete across all the 10 small areas were completed given a total sample of 2000 in Quigney area of East London South Africa.

**Data Collection:** Recording of data was done through time sampling every 60 seconds that an individual passed in front of the research assistant until the 200 allocated for the street or small area was completed. Data was collected on a printed Excel template having 6 columns and 200 rows for each of the streets or small areas. The first 3 columns were for males and the last 3 columns were for females. Each observation is recorded every 60 seconds into the eligible column and rows. The column comprises proper usage, improper usage and non-usage of facemask at all.

**Data Analysis:** Each excel template collected for each day for each of the two streets or areas for a total of 5 days were them summed up separately for Nigeria and South Africa. Data was

entered into a computer and analyzed using Statistical Package for Social Sciences (SPSS) version 22. The data was presented using frequency distribution tables, graphs and charts. Association between categorical variable was measured using Chi-square. Statistical significance was determined at P-value<0.05.

**Measurement of Outcome Variables:** Three outcome variables were measured.

Proper usage of face mask (Those who used it according to the recommendation that is covering nose and mouth including the jaw and to make sure there are no gaps between one's face and the mask)

Improper usage of face mask (Those who use it such that it does not cover their nose or mouth, hanged on their forehead or below their jaw only or hanged on one side of the face)

Non-usage of face mask (Those passersby who do not use face mask at all)

**Ethical consideration:** Approval was obtained from the Health Research Ethics Committee of the Federal Capital Territory, Abuja, Nigeria

## Results:

**Table 1: Distribution of participants by sex in the two study locations**

Variable	Nigeria (n=2000)		South Africa (n=2000)		Statistics
	Frequency	percentage	Frequency	percentage	
Sex					$\chi^2=7.754$
Male	1406	70.3	1323	66.1	df=1
Female	594	29.7	677	33.9	p-value=0.005

\*Statistically significant <0.005

Table 1 shows the distribution of the participants by sex across Abuja Municipal Area Council, FCT Nigeria and Quigney Area, East London South Africa. In Nigeria, the male constitutes (1406)70.3% while female 594(29.7%) while in South Africa, the male constitutes 1323(66.1%) while the female constitutes 677(33.9%).

**Table 2: Overall prevalence of use of face mask among respondents in Nigeria and South Africa**

Variables	Nigeria	South Africa
Proper usage	552(27.6)	1144(57.2)
Improper usage	492(24.6)	419(20.9)
Non-usage at all	956(47.8)	437(21.9)

Table 2 shows the distribution of the participants by sex across Abuja Municipal Area Council, FCT Nigeria and Quigney Area, East London South Africa. In Nigeria, the prevalence of the proper usage of facemask was 27.6%, while improper usage of facemask had prevalence of 24.6%, while improper usage of facemask had prevalence of 20.9% and those who do not used facemask at all constitutes 47.8%. However, in South Africa, the prevalence of the proper usage of facemask was 57.2%, while improper usage of facemask had prevalence of 20.9% and those who do not used facemask at all constitutes 21.9%.

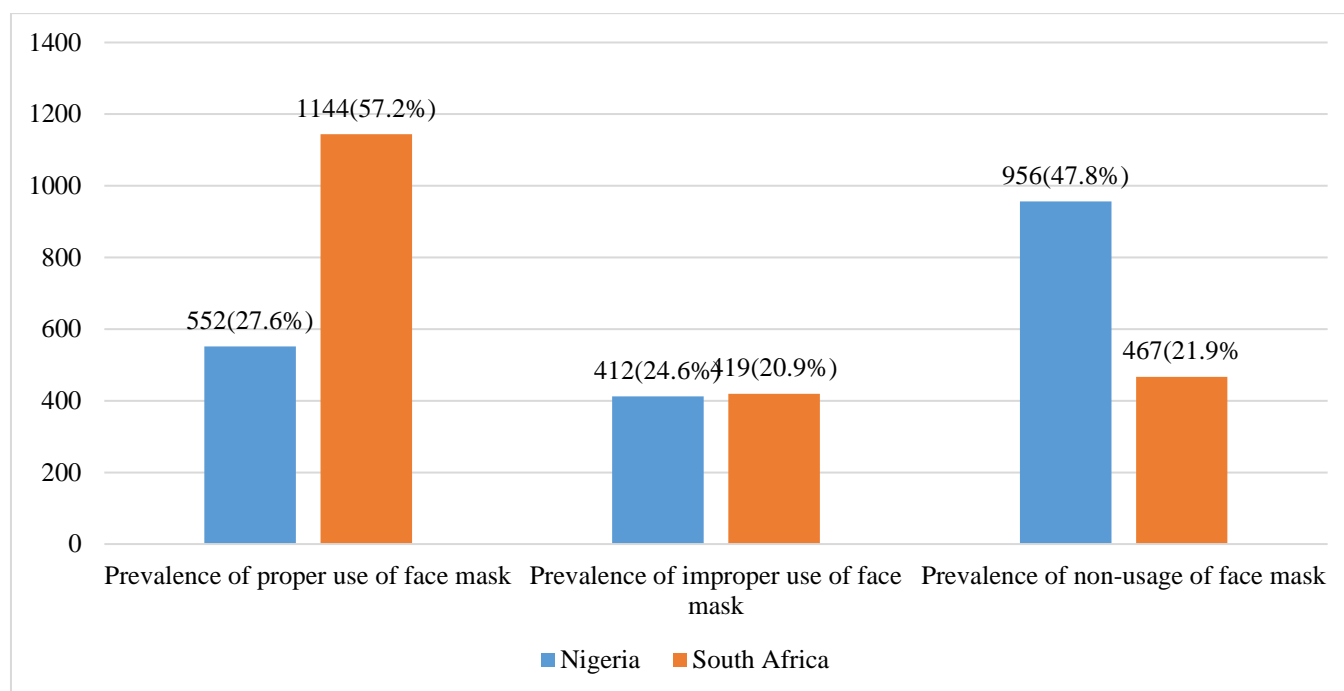


Figure 1: Prevalence of usage of face mask among Nigeria and South Africa populace

Above figure shows that Improper usage of face mask was found to be higher among Nigerian compare with South Africa with 412 (24.6%) compare with Quigney Area, East London South Africa where the prevalence of proper use of facemask was 419 (20.9%). Close half 956 (47.8%) compare with Quigney Area, East London South Africa where the prevalence of non-usage of facemask was 467 (21.9%). Non-usage was found to be higher in among Nigeria participants compared with South African participants.

**Table 3: Comparison of the prevalence of proper usage, improper usage and non-usage of face mask among Nigeria and South Africa populace**

Countries	Use of face mask			Statistics
	Proper usage	Improper usage	Not used at all	
Nigeria	552 (27.6)	492(24.6)	956(47.8%)	X <sup>2</sup> =113.629 df=1 p-value=<0.001*
South Africa	1144 (57.2%)	419(20.9)	437(21.9%)	

\*Statistically significant <0.005

**Table 4: Gender comparison of the use of face mask among Nigerian and South African populace**

Countries	Male			Statistics	Female			Statistics
	Properly usage	Improper usage	Not used at all		Properly usage	Improper usage	Not used at all	
Nigeria	338(24.1)	366(26.0)	702(49.9)	$X^2=29.95$ $df=1$	214(36.0)	126(21.2)	254(42.8)	$X^2=20.740$ $df=1$
South Africa	740(55.9)	280(21.2)	303(22.9)	$pvalue=<0.001^*$	404(59.7)	139(20.5)	134(19.8)	$pvalue=<0.001^*$

\*Statistically significant  $<0.005$

Regarding the prevalence of proper usage among the male and female participants in Nigeria and South Africa, female passers-by have higher prevalence of proper usage compared with male participants - 214(36.0%) versus 338(24.1%) in Nigeria compared with 404(59.7%) versus 740(55.9%) in South Africa respectively. Also, in Nigeria and South Africa, male sex was associated with higher prevalence of non-usage of facemask at all compared with females (702(49.9%) versus 254(42.8%) in Nigeria and 303(22.9%) versus 134(19.8%) in South Africa).

### Discussion

The prevalence of proper usage of face mask was found to be higher among South African compared to Nigerians while the improper usage of face mask was found to be higher among Nigerian compare with South Africa. The high prevalence of proper usage of face mask may be due to the South African government regulation that mandated the usage of face mask in public places such as malls, supermarkets, offices and companies as contained in the government gazette released in April 2020.<sup>20</sup> Also, non-usage was found to be higher among Nigeria participants compared with South African passers-by. These were found to be statistically significant p-value  $<0.001$ . Although, studies carried out on the knowledge and perception of COVID-19 in Nigeria revealed that majority of the respondents are aware of the deadly nature of the virus<sup>21,22</sup> but the knowledge does not reflect in their behaviour towards the preventive measures put in place to combat and minimize the spread of covid-19. Therefore, this is in contrast with the findings of the present study.

Another finding in this study revealed that the prevalence of proper usage of face mask among males was found to be higher in South Africa compared with Nigeria. The high prevalence of non-usage among males in Nigeria could be due to their beliefs and perceptions about COVID-19. While the proper usage among men in South Africa could be attributed to the fact that men are more represented in South African work force<sup>23</sup> coupled with the awareness put in place by South African government through daily SMS to all citizens which has been of immense help in promoting a positive attitude towards the usage of face mask in preventing the spread and contraction of the virus. However, the prevalence of improper usage among the male was higher in Nigeria compared with that of South Africa. Also, the prevalence of non-usage of facemask among male participants was found to be higher in Nigeria compared to South Africa. Likewise, among the female passers-by the prevalence of proper usage of facemask was also found to be higher among the South African compared with Nigeria. Likewise, the prevalence of improper usage was almost the same among female people moving around in Nigeria compared with South African. Regarding the prevalence of non-usage of face mask at all, It was found to be higher among female in Nigeria compared with South African females. However, males in both South Africa and Nigeria were more associated with non-usage of facemask compared with the female counterparts. The poor compliance in the non-usage of face mask among male in South Africa and Nigeria may be due to the deviant nature of men with tendencies not to adhere to protocols while female who did not used facemask at all were much lesser compared to the male in both Nigeria and South Africa. This finding was similar

with the findings from a previous study that shows that female adhere more to medical advice and are more health conscious than their male counterpart<sup>24,25</sup>.

**Study Limitation:** This study was limited to observation of the people moving about their daily business and does not give account to the type of face mask used either surgical or cloth face mask.

### Conclusion

Conclusively, the study found out that male people moving around during the lock-down period were more than the females in both countries. The study also reveals that male South Africans adhere to usage of facemask in public space than females. While the prevalence of proper usage is higher among both sexes in South Africa, Nigerian population highest prevalence rate of non-usage and improper usage of facemask. The Nigerian government needs to enforce the usage of facemask among all the populace for the prevention of COVID-19. Defiant behaviours regarding the use of facemask among the populace especially the males in both Nigeria and South Africa should be combated with behavioural change modification through regular health education and awareness including legislation and penalties for non-usage. Government needs to put these measures in place in order to stem the tides of COVID-19 transmission in both countries.

### Declarations

### Competing interests

We have no conflicting interests to declare.

### Authors' contributions

OSO conceived the concept and designed the study; OSO, ROO, MSY & DK managed the data collection. ORA analysed the data. OSO, ROO and MSY contributed to drafting the manuscript. All authors read and approved the final version of the manuscript.

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**Availability of data:** Data will be made available upon request made to the corresponding author.

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