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Brief Report

Personal Protective Equipment Use Among the Public in Response to COVID-19 in Nigeria: A Need for Massive Education

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ABSTRACT

Objective. The existence of asymptomatic carriers of a COVID-19, a contagious respiratory infection, might make the use of personal protective equipment (PPE) by the public an inevitable practice. Our focus in this study is to assess the knowledge and attitude of Nigeria public with respect to the correct use of these personal protective equipment in preventing the spread of the disease. **Methods.** Prevention guidelines by Centre for Disease Control were considered in structuring questionnaire to assess PPE types, use and doffing protocol among the public in states with report of COVID-19 in Nigeria, between 1-31 March 2020. **Results.** Out of the five hundred and twenty two (522) respondents, 270 (51.7%) made use of PPE. Some of the justifications for not using the PPE were; less value on importance of PPE and reliance on divine protection. PPE used by the public were facemask (61.5%), gloves (2.6%) and a combination of facemask and gloves (35.9%). With respect to the doffing sequence in respondents using more than one PPE, error was reported in 85.7% of the respondents. **Conclusion.** Some of the findings in this work could indicate the contributing factors to the spread of COVID-19 infection in Nigeria. Hence, public enlightenment and creating awareness in the general population are equally as important as the recommendation of PPE use by the general public.

What is already known on this topic
- Personal protective equipment use is recommended to prevent the transmission of contagious disease.
- PPE use has been previously assessed amidst workers in different profession

What this study adds
- This study is the first to assess PPE use by the public in a pandemic disease.
- Public education on PPE and protocol of its use is important for the purpose of use to be achieved in public.

INTRODUCTION

A bioweapon from China, virus of United States origin, accidental laboratory escapee, Wuhan wildlife market virus and divine nature origin – are at the moment conspiracy theories about coronavirus disease – 2019 (COVID-19), that will be confirmed or refuted as events unfold. Some of the symptoms of the disease include fever, cough, dyspnea, fatigue (common) and diarrhea, headache, hemoptysis and excessive sputum production (less common) [1]. Since the pandemic declaration on 11th March 2020, three hundred and twenty-three (323) COVID-19 positive cases including five (10) deaths were reported in Nigeria as of 13th April, 2020 [2]. As the world awaits effective disease control, current global primary concerns on SARS CoV-2 is on curtailing spread of the virus – which is by aerosol/aerated solids or fluid from human secretions or discharges, as well as droplets from normal breathing, coughing, sneezing and surface contact [3].Pharmaceutical disease control measures like vaccination and antiviral medications are effective but development of these take time when diseases are novel [4]. As a result, non-pharmaceutical preventive measures are usually at the forefront of disease control thus making personal protective equipment (PPE) useful in early stages of disease outbreaks [5]. Earlier on, World Health Organization (WHO) did not recommend the use of facemask by the public, as this increases cost, procurement burden and neglect of essential COVID-19 prevention measures [6].Subsequent research by Rothe et al.[7], Pan et al. [8] and Bai et al. [9] provided justification for review of use of PPE by the public. Consequently, Centre for Disease Control (CDC) recommended that the public wear home-made facemasks over their mouth and noses when social distancing is impracticable [10].

Among health workers, there are reports on PPE use in disease outbreaks. However, such a report is scanty on the types and procedures by which the PPEs are doffed and donned in public of affected communities during disease outbreaks. Thus, our focus in this study is to assess the knowledge and attitude of Nigerian citizens to the correct use of PPE used to prevent the

spread of the disease. It also highlights where future control interventions at pandemics involving airborne disease should be directed.

MATERIALS AND METHODS

Using an observational study design, this survey was conducted in six (Lagos, Enugu, Federal Capital Territory, Edo, Bauchi and Katsina) randomly selected states, representative of the geopolitical zone with reports of Coronavirus diseaseas at 15th April 2020 in Nigeria. A custom-developed questionnaire consisting of five sections - (1) Socio-demographic (sex, age range, job type, highest qualification) status; (2) Travel history; (3) Personal protective equipment; (4) Personal prot ective equipment training; (5) Personal protection practice procedure, was used for the study. Every Nigerian public with or without a personal protective equipment was qualified and approached to participate in the study. However, individuals with obvious respiratory abnormality were excluded from the study. The average time taken for respondent in completing the questionnaire was 10 minutes. The data were organized and analyzed using Statistical Package for Social Sciences (SPSS), version 20. Chi-square test was used in studying the association of the variables involved in the study and at a significance level of 0.05.

RESULTS

A total of 522 respondents, who were nationals of the country participated in the study. Among the participants, 270 (51.7%) were males. About half (48.2%) of respondents has an age range of 19-30 years old. The highest qualification in 216 (41.6%) study participants was a University degree (Table 1).

Table 1: **Demographic characteristics of the study population in relation to COVID-19**

Variable	N (%)	χ^2	p-value
Gender			
Male	270(51.7)		
Female	252(48.3)	0.62	0.431
Age (years)			
≤ 18	9(1.7)		
19-30	219(42.0)		
31-40	173(33.1)		
41-50	58(11.1)		
> 50	63(12.1)	295.08	<0.001
Highest qualification			
No formal education	145(27.8)		
OND/HND	98(18.8)		
First degree	201(38.5)		
MSc/PhD	78(14.9)	68.91	<0.001

With varying justifications, about one third (32.8%) of the public did not use PPE during this period of pandemic. The PPE used by respondents are facemask (216/351), gloves (9/351) and both (126/351). Respondents had varying justifications for their non-use of PPE. In addition to the recently recommended public use of facemask, some respondent used gloves. On use of more than one PPE, only 14.3% followed the recommended order of doffing while50% respondents had an irregular order in donning and doffing facemask (Table 2). About half (47.4%) of respondents received PPE training before use. Non-government organization was responsible for the training of most (81%) respondents (Fig. 1).
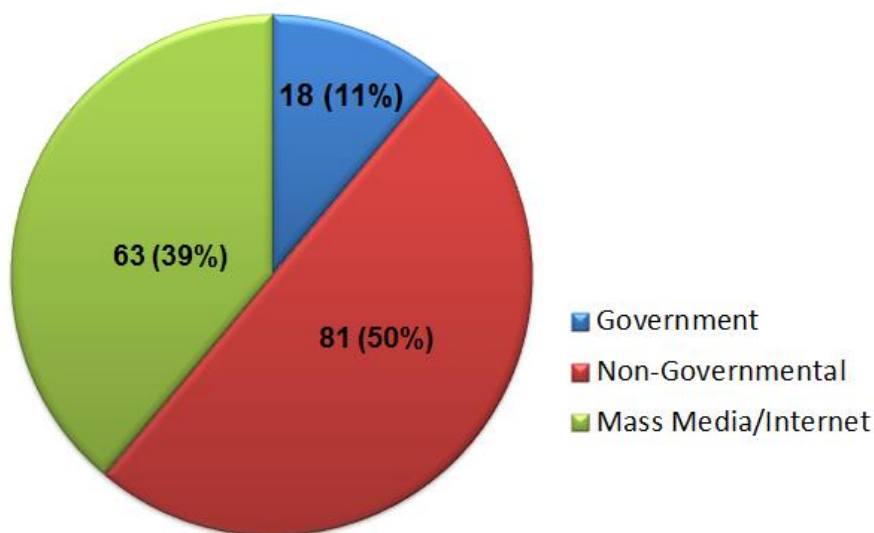

Figure 1. Source of training on use of Personal Protective Equipment.

Table 2: Types and compliance to use of PPE in relation to COVID-19

Variable	N(%)	χ2	P - value
PPE use status			
Use PPE	351(67.2)		
Do not use PPE	171(32.8)	62.06	<0.001
Type of PPE			
Facemask	216(61.5)		
Gloves only	9(2.6)		
Facemask + Gloves	126(35.9)	184.15	<0.001
Justifications for non-use of PPE			
Dependence on social distancing	54(31.6)		
Dependence on Hand sanitization	36(21.1)		
Dependence on absolute lockdown	9(5.3)		
Scarcity and cost of PPE	27(16.1)		
Dependence on spiritual protection	45(27.2)	35.05	<0.001
Type of Facemask			
N95	21(6.1)		
Surgical	269(78.7)		
Wool/Home made	52(15.2)	320.33	<0.001
Daily use of PPE			
Regularly	208(59.3)		
Occasionally	111(31.6)		
Rarely	14(4.0)		
Irregularly	18(5.1)	288.37	<0.001
PPE donning order			
Glove ⟶ FM	22(17.5)		
F/M ⟶ Glove	41(32.5)		
Irregular order	63(50.0)	20.04	<0.001
PPE doffing order			
Glove ⟶ FM	19(14.3)		
F/M ⟶ Glove	44(35.7)		
Irregular order	63(50.0)	23.19	<0.001
FM= facemask			

DISCUSSION

To the best of our knowledge, this is the first study to examine the type, attitude and factors influencing PPE use during the COVID-19 pandemic in Nigeria community. Facemasks and or hand gloves were the personal protective equipment used by the Nigerian public to prevent the community spread of SARS COV-2 virus. On the types of facemask, surgical mask is mostly used by the public. This could be due to the ease at which health information is readily available to the public on mass media and internet, individuals play an autonomous role in their own health [11]; making people to navigate health information on their own, with little knowledge about the importance, need and knowledge of evaluating such information [12]. Public use of gloves is a discrepancy to the recommendation of WHO. It could be as a result of the risk posed by asymptomatic infected patients, bandwagon and or spillover effect of its use in some provinces and municipalities in China, where the disease has been reported to controlled to a large extent. This is at variance to the report of Feng at al., who reported that upon commencement of local epidemics in community settings, there is a substantial increase in use of masks (N95 respirators inclusive) without any other protective equipment. Should infection rate be geometric in progression, the stability of PPE supply in which priority should be given to frontline health-care professionalswill be adversely affected with public dependence [13].

Deviations from recommended donning procedure increase the risk of contamination during doffing [14]. According to CDC recommendations, the correct doffing sequence includes removing gloves first, followed by gown, then mask, then hand hygiene [15]. In this observational study, more than two third of the public had PPE doffing errors. Although our study did not involve laboratory investigation to identify SARS-CoV-2 on doffed gloves and masks; public contamination has been related to PPE doffing error[16-18]. Specifically, the risk of contamination increases when gloves are removed first during PPE doffing [19]. Consequently, we could infer that study participants with multiple PPE doffing errors were more likely to have contaminated the environment and or self-contaminated in instances where facemask have trapped viral particles. Jingles on mass media, region specific traditional learning method and posters made available at specific locations would forestall recurrence of such anomaly which arises from unfamiliarity, complexity and unexplained habits of public to PPE use [20]. Our study had some limitations. Other COVID-19 infection control aside PPE were not examined. Due to lockdown and restriction of movement, not all the states reporting the disease could be covered in the study.However, the participant selection method gives a fair assumption. With the relative protection reported in PPE simulation studies, further comprehensive research to assess the effectiveness of its use by the public is paramount.

CONCLUSION

Self-reported compliance to the use of PPE is suboptimal in the Nigeria public. This implies knowledge gap within perception, knowledge and recommendation of PPE use to control infection. Therefore, whenever personal protective equipment is recommended, it is important to embark on massive effective public communication to ensure that its purpose of use is achieved.

AUTHOR CONTRIBUTIONS

Conceptualization, JSA; methodology, JSA, JND, RIAA, KAT; formal analysis, JSA, JND; writing—original draft preparation, JSA, JND, RIAA, KAT; writing — review and editing, JSA, JND, RIAA, KAT.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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