**SCHOOL OF PUBLIC HEALTH**

**COLLEGE OF HEALTH SCIENCES**

**UNIVERSITY OF GHANA**

# ADHERENCE TO COVID-19 PREVENTIVE MEASURES AMONG UNIVERSITY OF GHANA UNDERGRADUATE STUDENTS

**BY**

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## DECLARATION

I, Akpene Aku Nyamadi, hereby declare that with the exception of duly acknowledged references, this dissertation is my own work, and has neither been previously submitted to the University of Ghana, elsewhere for another degree, nor published elsewhere either in part or whole.

AKPENE AKU NYAMADI October 20, 2022

(STUDENT) DATE

DR. ALBERT ATABILA October 20, 2022

(ACADEMIC SUPERVISOR) DATE

## DEDICATION

It is with genuine gratitude and warm regard that I dedicate this work to my husband, Joshua, who has been the most reliable fountain of assistance and motivation throughout the intricacies of graduate school and this monumental achievement. Thank you for being the silent force behind my success story; for making me believe everything was possible; for making everything possible; for always understanding; for walking with me through the good, the bad, and all that came in-between. We made it baby!!!

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## ABSTRACT

**Introduction:** The COVID-19 pandemic has caused a lot of morbidity, mortality, and socio-economic losses globally. With no cure in sight, and limited understanding of the vaccines developed against it, adherence to the WHO recommended preventive measures is still necessary to manage the pandemic. Young adults are known to exhibit low adherence toward these measures, although they rapidly spread the disease when infected due to their highly active social networks, and they largely asymptomatic when infected. The paucity of data on adherence behaviour of young Ghanaian adults to the preventive measures warranted this study.

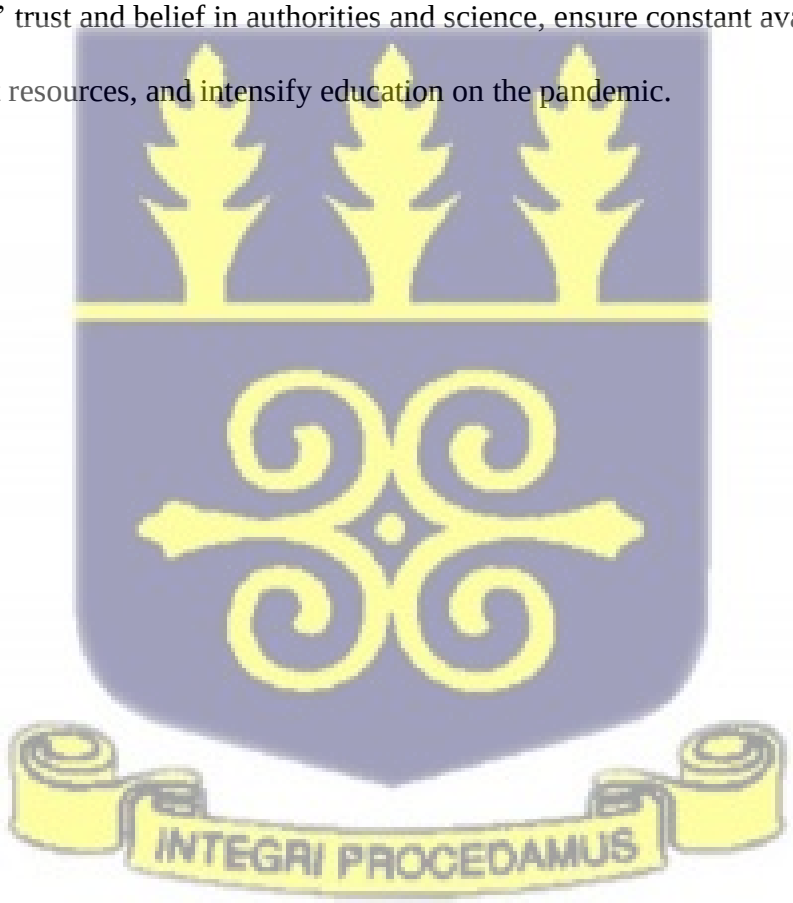
**Objective:** To investigate adherence to COVID-19 preventive measures and associated factors among University of Ghana undergraduate students.

**Methods:** This was a quantitative cross-sectional study involving 303 conveniently sampled on-campus resident undergraduate students of the University of Ghana, using an online self-administered questionnaire. Data was analysed with Stata 16 software. Bivariate analysis using Chi-square/Fisher's exact tests were performed to test associations between independent variables and adherence to COVID-19 respiratory hygiene, hand hygiene and physical distancing measures. Multiple and Penalized binary logistic regression analysis was done to determine the factors associated with adherence to these measures. A p-value <0.05 was considered significant.

**Results**: 72.9% of students had adequate knowledge of COVID-19 preventive measures, 25.7% had excellent knowledge, and 1.3% had poor knowledge. Respiratory hygiene adherence was the highest (59.1%), followed by physical distancing (21.5%) and hand hygiene (8.9%), while adherence to over 75% of the ten preventive measures

assessed was 29%. Positive risk perception (fear of infection) was the only variable significantly associated with hand hygiene adherence; being slightly worried and extremely worried about getting COVID-19 gave 3.8- and 4.4-times odds of adherence to hand hygiene respectively, over never being worried about contracting the disease. (AOR = 2.9, 95% CI = 1.28-11.00, p = 0.016 and AOR = 4.4, 95% CI = 1.44-13.59, p = 0.009 respectively).

**Conclusion:** UG undergraduate students' adequate knowledge levels of COVID-19 measures did not translate into their adherence behaviour. Authorities can positively influence students' adherence when they lead by example in adherence, reinforce students' trust and belief in authorities and science, ensure constant availability of pro-adherent resources, and intensify education on the pandemic.



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| | | |
|---|---|---|
| CEPI | - | Coalition for Epidemic Preparedness Innovations |
| COVID-19 | - | Coronavirus Disease 2019 |
| COVAX | - | COVID-19 Vaccines Global Access |
| DRC | - | Democratic Republic of Congo |
| DV | - | Dependent Variable |
| GAVI | - | Global Alliance for Vaccines and Immunizations |
| GHS | - | Ghana Health Service |
| GSS | - | Ghana Statistical Service |
| HB | - | Hygienic Behavior |
| HH | - | Hand Hygiene |
| HIV | - | Human Immunodeficiency Virus |
| IPC | - | Infection Prevention and Control |
| IV | - | Independent Variable |
| KAP | - | Knowledge, Attitudes and Perceptions |
| MMDAs | - | Metropolitan, Municipal and District Assemblies |
| MOF | - | Ministry of Finance |
| MOH | - | Ministry of Health |
| MOI | - | Ministry of Information |
| PCM | - | Preventive and Control Measures |
| PD | - | Physical Distancing |
| PH | - | Public Health |
| PHEIC | - | Public Health Emergency of International Concern |
| PM | - | Preventive measures |

| | | |
|---|---|---|
| RH | - | Respiratory Hygiene |
| SA | - | South Africa |
| SARS CoV-2 | - | Severe Acute Respiratory Syndrome – Coronavirus 2 |
| SDP | - | Social Distancing Protocols |
| SHS | - | Senior high school |
| UG | - | University of Ghana |
| UNCTAD | - | United Nations Conference on Trade and Development |
| UNDP | - | United Nations Development Programme |
| UNESCO | - | United Nations Educational, Scientific and Cultural Organization |
| UNICEF | - | United Nations Children's Emergency Fund |
| USA | - | United States of America |
| WACCBIP | - | West African Centre for Cell Biology and Infectious Pathogens |
| WHO | - | World Health Organization |

# CHAPTER ONE

# INTRODUCTION

## 1.1 Background

In December 2019, the World Health Organization (WHO) was notified of a cluster of highly contagious and fatal pneumonia-like infections of unknown cause among humans in Wuhan in the Hubei province of China. The cause of the disease was identified as the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), a new coronavirus strain. SARS-CoV-2 belongs to a group of related RNA viruses which cause respiratory tract infections in humans and birds. Mild strains cause some types of common cold with the more fatal varieties causing Severe Acute Respiratory Syndrome (SARS), Middle Eastern Respiratory Syndrome (MERS) and Coronavirus Disease 2019 (COVID-19). As per the US National Institutes of Health, SARS-CoV-2 is a successor to the virus which caused the SARS outbreak between 2002-2004 (NIH - USA, 2020).

The disease was named COVID-19 on 11 February 2020 by WHO, and as it spread to other Chinese provinces, and then to 19 countries with over 7,000 cases identified, the World Health Organization (WHO) declared COVID-19 a Public Health Emergency of International Concern (PHEIC) on 30 January 2020. By March 11, 2020 it had spread across the globe to 114 countries, causing 118,000 infections and 4291 deaths with thousands more fighting for their lives, thus WHO declared it a global pandemic. But it appeared to be just getting started on its path to crippling the global economy (WHO, 2020; Worldometer, 2020).

COVID-19 was found to be spread solely from human to human through saliva, respiratory droplets and aerosols from an infected person when they cough, sneeze or talk; or from touching the eyes, nose and mouth with a contaminated hand or object. It can affect persons of all races, ages, sexes and sizes, although the elderly and people with underlying medical conditions are at higher risk of developing serious illness. The disease has an incubation period of 2-14 days, and commonly affects the respiratory system, but can affect other body systems as well (WHO, 2021). Although it shares some symptoms with the common flu, COVID-19 seems to spread much faster, and infected people remain contagious for a longer period. A wide range of symptoms have been identified, which can vary from showing no symptoms, to mild or severe illness; and infected persons can experience different symptoms which may change over time: headache, diarrhea, vomiting, loss of smell and or taste, nasal congestion, runny nose, cough productive of sputum, sore throat, fatigue, fever, shortness of breath and difficulty in breathing, abdominal pain, muscle and joint pain (Oran & Topol, 2020; Xu et al, 2021; Lai et al, 2020; Furukwa et al, 2020; Ghandi et al, 2020; Niazkar et al, 2020; WHO, 2020; Gao et al, 2020). At least a third of infected persons are asymptomatic (do not show symptoms), and therefore tend to spread it sometimes unknowingly (Gao et al, 2020).

A Polymerase Chain Reaction (PCR) test is the gold standard for testing for current infections with the virus, but they are more expensive than antibody tests which test for a past infection.

In the early days, to reduce the spread of the disease and the death toll pending a cure, the WHO proposed two main categories of behavioural interventions for viral mitigation:

- Implementation of physical distancing protocols (e.g., reduced activity among people and public activity, lockdowns, quarantine, and isolation), more commonly referred to as Social Distancing Protocols (SDP).
- Enhancing the efficiency and increasing the frequency of hygienic behaviour (HB) (e.g., establishing effective handwashing routines and disinfection procedures, wearing of face masks, etc.) (WHO, 2020)

Details of the above categories of behavioural interventions for viral mitigation are:

**Hand hygiene measures**

1. Frequent handwashing with water and soap for at least 20 seconds
2. Use or an alcohol-based hand sanitizer when hands are not visibly soiled.
3. Avoiding touching the face with unwashed hands
4. Daily disinfection of cell phones
5. Cleaning and disinfecting surfaces

**Respiratory Hygiene measures**

6. Wearing a face mask when in public places.
7. Cover one's nose and mouth with elbow crease or a disposable tissue when coughing or sneezing.
8. Correctly discarding used tissue paper in the bin after sneezing or coughing
9. Handwashing with soap and water immediately after sneezing or coughing

**Physical/Social distancing measures**

10. Avoiding crowded places

11. Social distancing - staying 1.5-2m from other people in public
12. Avoiding hugging or giving people handshakes.
13. Self-quarantining when sick

**Others**

14. Choosing open, well-ventilated spaces over closed ones. Opening windows if indoors.
15. Getting the COVID-19 vaccine. (WHO, 2021; CDC, 2021; GHS, 2021)

As of March 29, 2021, the confirmed global COVID-19 cases exceeded 128 million, with over 2.7 million deaths (Johns Hopkins University, 2021; WHO, 2021; Worldometer, 2021). Various countries have had varied experiences with the disease, with Europe, Asia and America being the worst hit, while Africa almost seems unscathed (Haider et al, 2020; Miyachi et al, 2020). Some theories for explaining this phenomenon include the higher climatic temperatures, the younger demography of Africa, the existence of seemingly higher levels of pre-existing immunity from childhood vaccinations in the EPI (Expanded programme on Immunization) among others (Njenga et al, 2020). There is however also the concern of under-reporting of cases in Africa, due to a myriad of reasons; from under-detection of cases due to inadequate testing capacity, only symptomatic cases being admitted to health facilities due to inadequate bed capacity, ineffective contact tracing etc. (WACCBIP, 2020; Mougeni & Mangaboula, 2020). Most African countries never experienced lockdowns, and even those that did only had partial lockdowns: only a few areas identified as hotspots for the spread of the infection were locked down, as opposed to the nationwide lockdowns observed in other regions.

The first case of the disease was detected in Ghana on 12 March, 2020 (WHO, 2020; GHS 2020) with the country being hailed for its swift response and control measures implemented, as the government seemed poised to dedicate all possible resources to mitigating the impact of the disease in the country (Quakyi et al, 2021; MOF, 2020) – a ban on all religious and social gatherings was enforced; a three-week partial lockdown of Accra and Kumasi (two of the most populous cities which were also the hotspots for the disease) was instituted; people were encouraged to stay at home, and workplaces either adopted a shift system of working or allowed their employees to work from home; all schools at every level of education were closed indefinitely; when in public, it was imperative to avoid crowds, handshakes and activities requiring close contact with others (ideally, 1m-2m distance between two people); compulsory wearing of correctly fitting face masks in public at all times; correct handwashing with soap and water for at least 20 seconds, or use of alcohol-based hand sanitizers often (businesses were mandated to provide handwashing facilities with soap and water at their entrances and ensure handwashing and face mask compliance before letting people into their premises); avoiding touching the eyes, nose and mouth; covering the mouth and nose when coughing, sneezing into a tissue which should be disposed of immediately and correctly washing hands right after (correct sneezing and coughing etiquette) (GHS, 2020).

Adherence to the preventive measures instituted by the government was at its highest in the early days of the pandemic in Ghana due to fear of contracting it and uncertainties about its course and outcomes once infected. However, over time there has been a sharp decline in adherence despite the increased case and death counts. Low usage of masks could have resulted from the initial inconsistency in information about the value of

mask use by the general population to prevent COVID-19 transmission, as well as the view that Africa was invincible to COVID-19 given the hot tropical climate, predominantly young population structure as well as purported protective African genes. Ultimately, many Africans and Ghanaians as such do not wear face masks due to the discomfort it causes in their hot environment, or because they just do not find it necessary to (Amodan et al., 2020). Stigmatization of recovered patients at some point posed a significant challenge, warranting a campaign to counter that. The refusal of many members of parliament to get tested for the virus in February 2021, and the refusal of those who tested positive to isolate, with a resultant transmission of the disease to their colleagues in parliament did little to increase the already dwindling trust of citizens in political leaders, who thought the preventive measures bothersome and unnecessary (Kokutse F., 2021).

After almost a year of being closed, schools reopened in January 2021 after campuses were disinfected and arrangements made to ensure the infection will not spread in schools. Universities held online lectures while the primary, basic, junior high and senior high school levels ran a shift system to ensure physical distancing was possible. Veronica buckets with gallons of handwashing soap, paper towels and alcohol-based hand sanitizers were distributed to several schools, with students expected to procure their own face masks (either cloth or disposable).

The SARS-CoV-2 genetic sequence was published in January 2020 and vaccine development began almost immediately. Though suitable vaccines were not expected in the short term, the rapidly mounting global infection rates inspired international alliances and government efforts to urgently free up resources to develop multiple vaccines within condensed timelines (WHO 2020). At least 9 different vaccine

technologies are currently being developed and refined with the four major ones being RNA (Moderna and Pfizer–BioNTech), Adenovirus vector (Oxford–AstraZeneca, Sputnik V COVID-19, Johnson & Johnson, and Convidecia), inactivated virus, and subunit virus vaccines (Le T. T. et al., 2020). Johnson & Johnson, and Convidecia are one-shot vaccines while the others require 2 doses. The first shot provides 76% protection for 90 days and second shot is expected to be taken within 8 to 12 weeks after the first, for maximum efficacy. Studies are still ongoing on whether subsequent shots will be required. The COVID-19 Vaccines Global Access (COVAX), (a facility managed by the Global Alliance for Vaccines and Immunizations [GAVI], Coalition for Epidemic Preparedness Innovations [CEPI], WHO and UNICEF) oversees procuring and distributing vaccines to low- and middle-income countries. Ghana, the first recipient of the COVAX vaccines, received the first batch of 600,000 vaccines on 24 February 2021 (WHO 2021); with an additional total of 360,000 vaccines also received from India and telecom giant MTN as donations. The vaccination exercise kicked off on 2 March 2021, starting from the Greater Accra region and spreading out to other regions covering 47 districts identified as hotspots. This batch was targeted at health workers, adults 60 years and over, people with underlying health conditions, frontline Executive, Legislature, Judiciary and their related staff, frontline security personnel, some religious leaders, and other personalities (Citi Newsroom 2021). Pregnant and lactating women, and children under 16 years are excluded due to limited data from vaccine trials. The second batch of 350,000 AstraZeneca doses arrived May 7 2021 with vaccination starting on 19 May 2021, and is expected to cover persons who had their first shots in the very first week of that phase. 300,000 doses of Sputnik V already approved by FDA are also expected (Xinhua 2021).

The Ghanaian government initially set a target of vaccinating the entire adult population (about 20 million people) by the end of 2021, but this is at risk given the current rate of vaccinations and supply challenges. Although historically vaccines have generally high acceptance in Ghana, there are high levels of anxiety and uncertainty about the safety of COVID-19 vaccines, with rampant misinformation on social media and irresponsible reportage in some traditional media aggravating the situation. The government has however developed and rolled out a robust information campaign in partnership with religious, traditional and opinion leaders as well as celebrities to encourage uptake. This has so far yielded positive results since very high patronage was reported during the first wave of vaccinations (GHS, 2021; MOI 2021).

No cure has yet been discovered for COVID-19, meanwhile the virus is constantly mutating, resulting in the rapid emergence of several deadly viral mutations and vaccine-resistant variants of concern in circulation, including (in order of discovery) Alpha, Beta, Gamma, Delta, Omicron. Vaccines have recently been developed against the disease, but their safety and efficacy profiles are not fully understood (CDC, 2021; European CDC, 2022; Johns Hopkins Medicine, 2022; Katella, 2022; WHO, 2021)

These factors therefore underscore the need for combined approaches for protection of the population against the disease

**1.2 Problem Statement**

All six continents have reported confirmed cases of COVID-19. As of 8th May 2021, the global case counts stood at 156,496,592 confirmed cases of COVID-19, with 3,264,143 deaths (WHO, 2021; Worldometer, 2021; Johns Hopkins University (JHU), 2021). From the Hubei province of China, the disease spread to other provinces in

China, then rapidly to countries in Europe, South and North America as people travelled outside China. Numerous European countries were among the earliest affected countries resulting in implementation of international travel bans across Europe, America, and Asia (WHO, 2020; Johns Hopkins University, 2020; Time Newspaper, 2020; Brookings, 2020). As of May 8, about 97.1% of all confirmed cases and deaths reported in Asia (28.4%), Europe (28.3%), North (24.1%) and South America (16.3%), with only 2.9% from Africa (Worldometer, 2021; Mougeni & Mangaboula, 2020).

Across Europe, Asia and America, nationwide lockdowns were enforced, constituting of bans on all public gatherings, the indefinite closure of workplaces and schools except essential services, bans on all air travel, eventually extending it to bans on all forms of public movement even in communities, and intensification of testing programmes to identify, isolate and treat infected people (World Bank, 2020; WHO, 2020). This resulted in negative socioeconomic impacts, and increased extreme poverty among vulnerable groups. Millions of people have lost their jobs, the cost of healthcare increased globally; school closures have forced students out of school, with the World Bank warning that the effect of the pandemic on education would linger for several years to come, as many, especially girls will permanently drop out of school. This has threatened to further increase the gender inequalities and could undo several years of success at promoting human capital and economic empowerment. Global hunger has increased, more conflicts and violence are being reported in several conflict prone regions like Iran, Sudan, Myanmar, etc. (World Bank, 2020).

Many European, Asian and American countries have taken turns to top the global case and death counts. Easing restrictions led to some countries experiencing second waves while worse still, a few others experienced third waves of infections, forcing these

countries to reinstitute the restrictions (WHO, 2021; Worldometer, 2021). Currently, the world's focus is on India which earlier this year had successfully reduced its daily cases from peaks of around 90,000 in September last year to under 20,000 (WHO, 2020). But they celebrated too soon: after many failed to adhere to the preventive protocols, participating in large overcrowded activities unmasked, India has recorded up to 150,000 cases daily in the last three weeks, with a pronounced oxygen shortage in the country worsening the death toll. The case counts as of May 8 stood at over 20 million, with over 200,000 deaths.

The first cases of the disease were reported in Sub-Saharan Africa (SSA) a few days after the WHO declared the disease a Public Health Emergency of International Concern (PHEIC) in February 2020 (WHO, 2020). The first African countries to record cases of the disease were Botswana, Burundi, and Sierra Leone (Time Newspaper, 2020; WHO, 2020). Almost all African countries have reported cases, with the top ten highest confirmed cases being recorded in South Africa, Morocco, Tunisia, Ethiopia, Egypt, Libya, Nigeria, Kenya and Algeria, and Ghana, in descending order (Worldometer, 2021, WHO, 2021).

As was the case in other continents, most African countries were forced to take drastic measures at curbing the further spread of the disease, but the poorly developed socioeconomic and health structures in the region meant complete lockdowns or strict enforcement of stay-at home orders could not be sustained for as long as was seen in the advanced world. School and border closures have however been implemented in many African countries, and with Africa's reliance on the global economy for trade of its mineral and key value chain exports, these interventions resulted in price drops. The economic effect of the pandemic on the continent is reportedly the worst since the 2008

global financial crisis (UNESCO, 2020; UNTAD, 2020). An estimated 1.4% decline in Africa's income was observed, worse in the least developed countries (LDCs), and a 16.7% decline in total exports estimated in the extreme case of a severe global recession across the region (UNCTAD, 2020). The most affected countries include Nigeria (11.4%), Egypt (10.6%), Malawi (10.2%), Eswatini (9.3%) and Ethiopia (8.5%). The pandemic has exposed and further weakened the already fragile health system, and the impact of not managing the disease in the region could in the long term result in the possibility of SSA reintroducing it to regions where control may have already been achieved (UNCTAD, 2020; Ditekemena et al., 2021). Despite these debilitating effects, adherence to the preventive measures is still low, and the case count is still soaring.

As of 8th May, 2021, (a little over a year since the first case was recorded in Ghana), 92,856 positive cases had been confirmed with 783 deaths. (WHO, 2021; GHS 2021). In Ghana, COVID-19 has significantly increased household poverty, worsened living standards and spotlighted the inadequacies in all our systems, especially the health and economic sectors. The government has had to realign its budgeted priorities and invest heavily in fighting the disease (MOI, 2020; MOF, 2020,2021).

A three-week partial lockdown in April 2020 (in Greater Accra region, Kasoa and Kumasi), was lifted due to the ineffable economic hardships it imposed on businesses and individuals, especially those who worked in the informal sector; the poor and the vulnerable who rely on daily trade to make ends meet, and for whom the lockdown meant the end to their means of livelihood (VOA, 2020; BBC, 2020; Myjoyonline, 2020). The already inadequate number of healthcare providers has been strained delivering care to the infected. (MOI, 2020; MOH, 2020). Over 3,000 health workers have been reported to have contracted the disease with over 15 losing their lives as a

result (GHS, 2021). About 26% of the country's workforce had their salaries slashed down and about 42,000 employees lost their jobs during the brief lockdown (Bukari et al., 2020, GSS, 2020). The Ghana Statistical Service (GSS) reports that over 22 million people had experienced the effects of reduced household income since March 2020 (GSS, 2020). School closures resulted in 110,000 cases of teenage pregnancy in 2020 (GHS DHIMS, 2020; Modern Ghana News, 2020). The lowest growth rate in Ghana's GDP in 37 years was predicted by the World Bank in 2020, with a reduction from an estimated 6.5% in 2019 to a forecasted 1.5% in 2020 and 3.4% in 2021 (World Bank, 2020). Meanwhile, among the general population,l adherence to the preventive measures has rather taken a nosedive over time, exemplified by the need for city authorities to enforce very harsh sanctions for traders and shoppers in several Ghanaian markets who repeatedly failed to comply with COVID-19 protocols (Asante & Mills, 2020).

Despite a high recovery rate from acute COVID-19 infections, scientists are yet to understand the virus, the disease and its high number of multi-organ and long-term sequelae reported so far (Nalbandian et al., 2021; Wang et al., 2020, CDC 2021; Willi et al., 2021). No cure has yet been discovered for COVID-19 while several deadly viral mutations and vaccine-resistant strains have rapidly emerged in circulation, causing reinfections in same populations. The closest to a cure has been the discovery of vaccines in late 2020, but they are still not fully understood (their safety profile, strength of immunity conferred, etc.), plus scientists do not know how many people will mount enough immunity to achieve the desired herd immunity (WHO, 2021; Johns Hopkins Medicine, 2021). Again, despite most developed countries vaccinating their citizens, there is still very high vaccination-hesitancy, especially in Ghana (and Africa), due to

widespread and deep-seated conspiracies and misinformation despite abysmal adherence to the COVID-19 preventive measures (Ditekemena et al., 2021; Amodan et al., 2020; Villela et al., 2021; Fodjo et al., 2020; VOA news, 2020; Quakyi et al, 2020; GHS 2020).

### 1.3 Justification

In Ghana, studies have been conducted on adherence behaviour to the prevention and control measures among senior secondary school students, pregnant women, healthcare workers, health trainees (Apanga & Kumbeni, 2021; Ashinyo et al., 2020; Apanga et al., 2020; Adu et al., 2020), but there is paucity of data on university students in this regard. University students are mostly adolescents and young adults, who have been identified from previous studies as being reluctant to adhere with COVID-19 preventive protocols, especially social distancing (Barari et al., 2020; Cohen et al., 2020; Park et al., 2020; Roy-Chowdhury et al., 2020). This group also tends to be either asymptomatic or have very mild disease when they catch COVID-19, although they remain very highly infectious (CDC, 2020; Pan et al., 2020). Due to their broad social networks and highly active social lives, they very easily spread the disease in their communities, posing a threat to the vulnerable and high-risk persons they interact with (Andrews et al., 2020; Cohen et al., 2020; Wrzus et al., 2013). In fact, cases have been reported of the elderly and people with co-morbidities dying after being infected by their youthful family and friends who ironically went ahead to make full recoveries from the disease.

University undergraduate students come from diverse socioeconomic backgrounds across the country, and are therefore representative of a cross-section of Ghanaian youth.

Although the discovery of vaccines presents a glimmer of hope in managing the pandemic, the vaccines are only complementary to the preventive measures in curbing the pandemic and returning life to normalcy, thus the need to understand the drivers of adherence to the COVID-19 protocols particularly those peculiar to the youth and young adults so as to aid policy formulation, implementation, efficient management of not just the current pandemic but the management of future disasters as well.

### 1.4 Conceptual Framework

**Narrative**

The conceptual framework below was developed based on the main drivers of adherence to COVID-19 preventive measures identified from literature review.

Socio-demographic factors like age, sex, educational level/qualifications, employment status, residence, number of dependents/children, marital/relationship status, living conditions (number of rooms in house, size of household, number of people sharing a room and basic amenities, etc.), occupation (being a student, a healthcare worker, other occupations that expose individual to COVID-19 infection more than others), income levels, etc. all influence an individual's ability to adhere to face masking, physical and social distancing, frequent hand washing/sanitizer use, and respiratory hygiene (Ashinyo et al., 2020; Apanga & Kumbeni, 2021; Fielmua et al., 2020; Adu et al., 2020; Ebrahimi et al., 2020; Nivette et al., 2020; Wang et al., 2021; Ditekemena et al., 2021; Ditekemena et al., 2020; Majam et al., 2021; Serwaa et al., 2020; Saba et al., 2020;

Ferdous et al., 2020; Carlucci et al., 2020; Ningsih et al., 2021; Pan et al., 2020; Cooper et al., 2020).

Knowledge of COVID-19 (cause, symptoms, risk factors, PM, etc.) was positively associated with adherence behaviour (Al-Hasan et al., 2020) as individuals with high knowledge of it demonstrated higher adherence to the PM than those who had either not heard of it or had very scanty knowledge of the disease (Ashinyo et al., 2020; Apanga & Kumbeni, 2021; Fielmua et al., 2020; Zhong et al, 2020). However, according to Ningsih et al., (2020), knowledge did not guarantee compliance to preventive measures in adolescents from their study. Age, occupation and educational level also influenced an individual's knowledge and their perception of risk or susceptibility to the disease, which in turn affected their adherence behaviour to the preventive measures (Zhong et al, 2020; Ferdous et al., 2020; Carlucci et al., 2020).

Other factors identified include the influence of personality/psychological characteristics such as trust in science, trust in authorities, sense of personal, social or moral obligation, antisocial behaviour and motivated adherence (community adherence, protection from the disease/ stopping its spread, fear of transmission to others, a clear understanding of need to comply with PM, etc.).

A graphical representation is shown below:

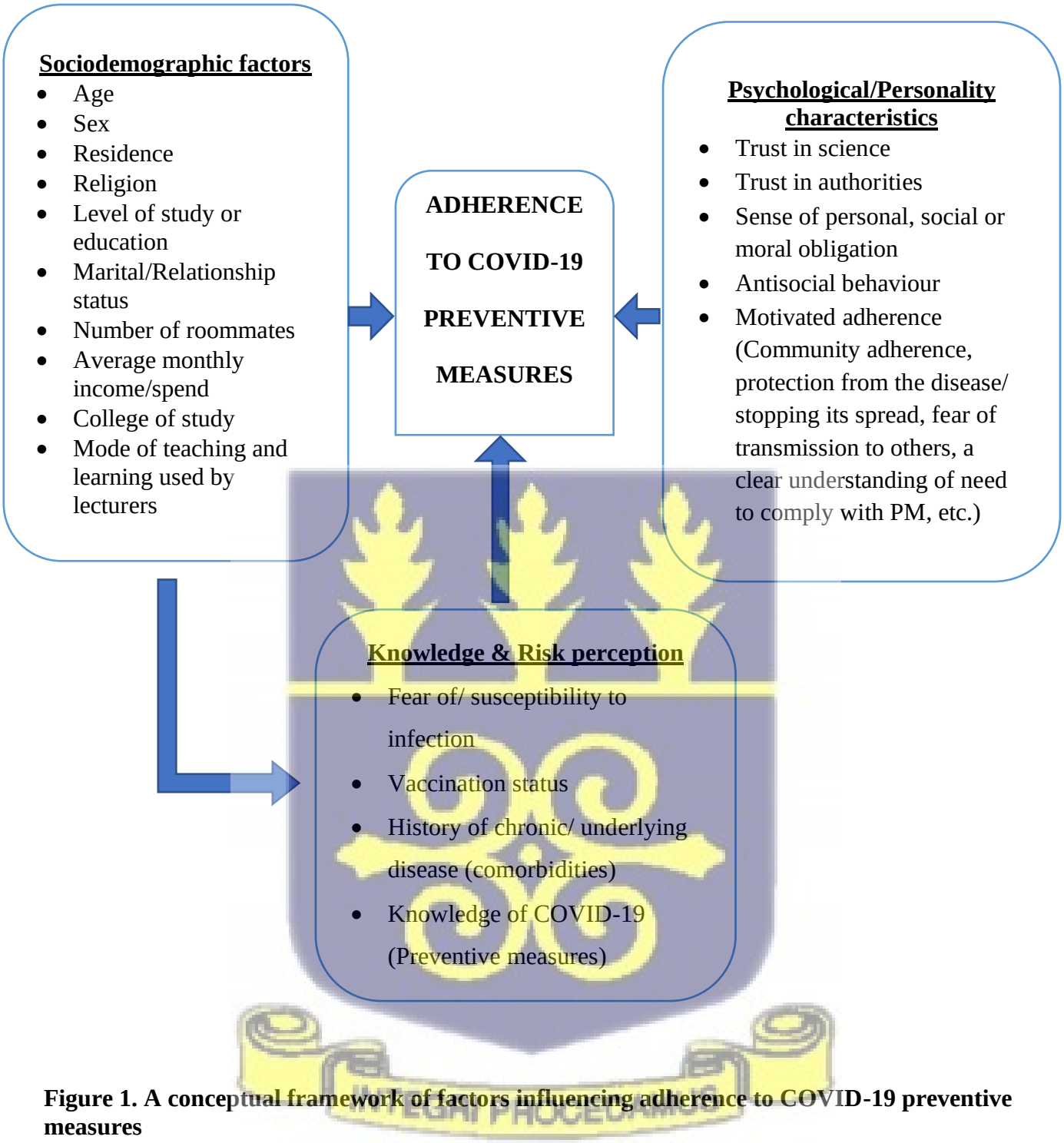


**Figure 1. A conceptual framework of factors influencing adherence to COVID-19 preventive measures**

## 1.5 Research Questions

1. What is the level of knowledge on COVID-19 preventive measures among resident undergraduate students of University of Ghana?
2. What is the level of adherence to hand hygiene, respiratory hygiene and physical distancing COVID-19 preventive measures among resident undergraduate students of University of Ghana?
3. What factors influence adherence to COVID-19 preventive measures among resident undergraduate students of University of Ghana?

## 1.6 Objectives

### 1.6.1 General Objective

To investigate adherence to COVID-19 preventive measures and associated factors among University of Ghana undergraduate students.

### 1.6.2 Specific Objectives

1. To assess knowledge of COVID-19 preventive measures among resident undergraduate students of University of Ghana.
2. To determine level of adherence to COVID-19 preventive measures among resident undergraduate students of University of Ghana.
3. To identify factors influencing adherence to COVID-19 preventive measures among resident undergraduate students of University of Ghana.

# CHAPTER TWO

# LITERATURE REVIEW

## 2.1 Introduction

The COVID-19 pandemic has been ongoing for over a year now, and expectedly, several studies have been done regarding knowledge, attitudes and practice of adherence to the WHO recommended preventive measures in almost every country in the world, but more in Europe, Asia and America, where the devastating impact of the pandemic has been felt the most. These studies were conducted among varied populations, from health workers, factory workers, the elderly and high-risk groups to a small fraction of the youth and young adults with mixed results and insights that have laid the foundation for further work to be done.

In Ghana, studies have been conducted among secondary school and health trainee students, but not among university students who have highly variable socio-demographic characteristics that are better representative of the youth and young adults. In this chapter findings from previous studies done on adherence to the COVID-19 preventive measures among different populations using multiple study designs and strategies globally that are relevant to answering the research questions and objectives of this study are discussed.

## 2.2 Knowledge of COVID-19

Most studies that measured knowledge of COVID-19 specifically focused on respondents' knowledge of the cause, mode of transmission, symptoms, preventive measures and their risk perception of the disease. Globally, knowledge of the disease was quite widespread but varied significantly in different regions. However, most

studies did not directly measure knowledge levels, and instead assessed the relationship between knowledge of the disease and adherence to the preventive measures.

Similar to the global picture, knowledge of COVID-19 has been quite high among Ghanaians in all socio-demographic landscapes. The internet, social media, television, and radio were the main sources of information about the pandemic. Many songs were also produced to create awareness about the disease (Thompson et al., 2021) but there is also lots of false information in circulation online and through social media (Afrobarometer, 2020; Pedroncelli, 2020; Ghana News Agency, 2020). Adu et al., (2020) found 25% of Ghanaian health trainees knew a great deal about the disease, 69% had average levels of knowledge, and the knowledge levels of 6% of them left a lot to be desired. 8.5% thought alcohol intake was protective against contracting the disease (Adu et al., 2020). Knowledge level was 91.7% among residents of Northern Ghana, although 18% believed there was no COVID-19 in Ghana and 69.6% believed they will not contract the disease (Saba et al., 2020).

**2.3 Level of adherence to the preventive measures**

Five main interventions which were further categorized into two broad groups were assessed in studies done on this subject:

1. Hygienic Behavior (HB)
    i. Wearing of face masks in public - either fabric or surgical masks
    ii. Hand hygiene - Frequent hand washing with soap and water, especially if hands are visibly soiled; and use of alcohol-based hand sanitizer
    iii. Respiratory hygiene practices

- Covering the mouth and nose with tissue paper when coughing or sneezing, or sneezing or coughing into the elbow if tissue paper is unavailable
- Properly discarding the tissue immediately after use
- Washing/disinfecting hands immediately after coughing/sneezing.

iv. Avoidance of touching the face (eyes, nose and mouth) with hands

2. Social distancing protocols (SDP) / Physical Distancing (PD)
    - Avoiding crowded places
    - Maintaining a 1-to-2-meter distance between oneself and others in public

Adherence to the preventive measures was measured on individual as well as community levels, but this study focuses on individual adherence. Various studies measured different preventive measures in different regions, with some focusing on knowledge of the disease and preventive measures, while others focused on measuring adherence to a few or all the WHO recommended preventive measures, and still others assessed the factors influencing adherence to the interventions. Globally, overall adherence to SDPs was relatively higher than for HBs, and was consistent with what was reported by Nivette et al., (2020) from a longitudinal cohort study done to assess non-compliance with COVID-19-related public health measures among 734 young adults in Switzerland. From a 2020 online cross-sectional study among 2,017 Bangladeshi residents to assess their knowledge, attitude, and practices (KAP) regarding the COVID-19 outbreak in the country, only 55.1% participants adhered to all the COVID-19 prevention practices (Ferdous et al., 2020).

Generally, adherence rates were lower in Africa than in Europe and America. This is likely due to the higher infection and death rates reported in these regions compared to Africa.

### 2.3.1 Adherence to face mask wearing in public

Wearing of face mask in public was one of the two commonest preventive measures adopted globally (the second measure being hand hygiene), and the most popularly measured in several studies done to assess adherence to COVID-19 preventive measures. Adherence to this measure varied globally from as high as 99.5% from a 2020 descriptive cross-sectional online survey among 2,175 respondents on the preventive behavior of Vietnamese residents in response to the COVID-19 pandemic in Vietnam (Nguyen et al., 2020). It was 98.7% for Bangladeshi residents (Ferdous et al., 2020), 98.0% from a 2020 study among 6,910 residents of China (mostly in Hubei Province) on knowledge, attitudes, and practices (KAP) towards COVID-19 among Chinese residents during the period of rapid rise of the COVID-19 outbreak (Zhong et al, 2020).

A 97.8% adherence rate was reported from a 2020 web-based cross-sectional survey conducted in China among 3,035 factory workers, to assess their self-reported compliance with personal preventive measures against the disease upon resumption of work following the COVID-19 outbreak in the country (Pan et al., 2020). In Indonesia, a 2020 online cross-sectional survey done among 246 adolescents aged 13-19 years to assess factors predicting adolescents' compliance to COVID-19 prevention protocols found a 68.7% adherence rate to face mask use (Ningsih, et al., 2021). The rates were lower in Brazil: 45.5% from an online cross-sectional survey involving 23,896 residents

to assess nationwide adherence to COVID-19 national preventive measures (Faria de Moura Villela, et al., 2021).

A rate of 81.4% was found in a 2020 International Citizen Project (ICP) to assess early-stage adherence to public health measures for COVID-19 in South Africa (SA) among 951 SA residents (Majam et al., 2021). From two consecutive online surveys on adherence to COVID-19 preventive measures in the Democratic Republic of the Congo (DRC) in 2020 (among 3,268 participants in round 1 and 4,160 participants in round 2), wearing of face masks scored 41.4% and 69% respectively (Ditekemena et al., 2021).

The non-adherence rate for face masks in another cross-sectional population-based online survey in Democratic Republic of the Congo (DRC) among 3,268 residents in 2020 was 54.7% (Ditekemena et al., 2021). The rate fell to 33% in Uganda from an online cross-sectional survey in 2020 among 1,726 respondents from all over the country to determine the level and determinants of adherence to COVID-19 preventive measures in the first stage of the outbreak (Amodan et al., 2020).

In Ghana, a 2020 cross-sectional study that assessed factors associated with the practice of COVID-19 preventive measures among 624 final year senior high school students who were 18 years and above in the Bawku Municipality of Ghana found that only 31.5% of them adhered to wearing of face mask (Apanga et al., 2020).

Adherence was however higher among pregnant women at 92%, from a cross-sectional study conducted in the Upper East Region (UER) of Ghana to assess adherence to COVID-19 preventive measures and its associated factors among 527 pregnant women found (Apanga & Kumbeni, 2021); compared to 18% found from another study in the

same region that year in which the COVID-19 hand hygiene and safety behaviours of shoppers and shop keepers (751 customers of 50 shops) in Wa were observed (Fielmua et al., 2021). From a cross-sectional survey study in 2020 among 496 health students attending the College of Health and Well-Being at Kintampo to assess their Knowledge, Perception and Practice regarding COVID-19, it was found that 94.4% of them wore face masks in crowded places (Adu et al., 2020).

A descriptive observational study to assess the level of preparedness and compliance with hygiene and social distancing recommendations in 45 public transport stations in the Greater Accra Region (GAR) of Ghana found that face masks were either not worn or were only worn by a few passengers in over 90% of the stations (Bonful et al., 2020).

### 2.3.2 Adherence to frequent hand hygiene

Frequent hand hygiene, like wearing of face masks was very prevalent globally and one of the most popularly assessed in several studies done on adherence to COVID-19 preventive. Since hand washing and hand sanitizer use are meant to be supplementary unless hands are visibly soiled, most studies did not assess hand washing and hand sanitizer use separately.

Adherence rates for frequent handwashing with soap and water ranged from as high as 97.4% in Vietnam (Nguyen et al., 2020) and among Ghanaian health trainees (Adu et al., 2020). It was 96% in Uganda (Amodan et al., 2020), 95.8% in South African (Majam et al., 2020), 93.8% in Bangladesh (Ferdous et al., 2020), and 91.4% in a nationwide online cross-sectional survey of 350 Ghanaian residents in 2020 to assess their knowledge, risk perception and preparedness to-wards the COVID-19 outbreak (Serwaa et al., 2020). In DRC, adherence rates from two different studies were 85% &

77% respectively (Ditekemena et al., 2020). The rate fell below average to 54.5% in Indonesia (Ningsih et al., 2020), 49.5% among SHS students in Bawku, Ghana (Apanga et al., 2020), 31.7% among shoppers and shop keepers in the UER of Ghana (Fielmua et al., 2020) and 28.0% among Ghanaian internet users (Akuoko & Alando, 2020).

Frequency of hand sanitizer use was 72.3% among Ghanaian residents (Serwaa et al., 2020), 71.7% in South Africa (Majam et al., 2020), 70.9% for Chinese factory workers (Pan et al., 2020) and 27.7% among Indonesian adolescents (Ningsih et al., 2020). Correct handwashing was not practiced in 95% of public transportation stations in Ghana, and there were no alcohol hand rubs available for use in 93% of them. Despite 80% of these stations having a minimum of one handwashing unit, only 18% of them educated their patrons to frequently adhere to the preventive measures (Bonful et al., 2020).

### 2.3.3 Adherence to respiratory hygiene practices

Not many studies assessed this category of interventions, and the adherence level found in studies that assessed them are: 96. 6% among South African residents (Majam et al., 2020), 94.9% among Vietnamese residents (Nguyen et al., 2020), 86% among Ugandan residents (Amodan et al., 2020), and 69.5% for Brazilian residents (Faria de Moura Villela, et al., 2021).

### 2.3.4 Adherence to avoidance of touching the face with hands

This category too was not as popularly assessed, and results indicate: 6.0 % of Ghanaian residents (Serwaa et al., 2020) and 54.7% Ghanaian internet users (Akuoko & Alando,

2020) could not avoid touching their faces. However, 71.9% South African residents reported being able to avoid touching their faces (Majam et al., 2020).

### 2.3.5 Adherence to social distancing protocols (SDPs)

Adherence to avoidance of crowded places was as follows: 99.2% among Vietnamese residents (Nguyen et al., 2020), 98% among Ghanaian health trainees (Adu et al., 2020), 96.4% in Chinese residents (Zhong et al, 2020), and 69.6% % for Chinese factory workers (Pan et al., 2020).

For physical distancing, the rates were 97.8% among Ghanaian health trainees (Adu et al., 2020), 95.2% among South African residents (Majam et al., 2020), 90% among Ugandan residents (Amodan et al., 2020), 85.6% among residents of the USA, Kuwait and South Korea (Al-Hasan et al., 2020), 58%, and 43.4% for residents of the Democratic Republic of Congo (DRC) (Ditekemena et al., 2020), 46.2% among SHS students in Bawku, Ghana (Apanga et al., 2020), 44.5% among Ghanaian internet users (Akuoko & Alando, 2020), 41.5% among Indonesian adolescents (Ningsih et al., 2020), and 22% among shoppers and shop keepers in the UER of Ghanaian (Fielmua et al., 2020). In public transportation stations in Ghana, social distancing was only practiced in 2% of stations (Bonful et al., 2020).

## 2.4 Factors influencing adherence to the preventive measures

### 2.4.1 Knowledge and Risk Perception of COVID-19

In China it was found that over 90% of participants were knowledgeable of the COVID-19 disease, and that knowledge was significantly associated with compliance to the interventions instituted (Zhong et al, 2020). Knowledge levels were lower for younger

participants, males, younger age groups, those who had never-married, those with lower educational level, rural dwellers, students, and the unemployed, who in turn reported reduced adherence to HBs (Zhong et al, 2020). Higher knowledge level of COVID-19 positively influenced self-adherence in the United States, whereas it raised skepticism on community adherence in Kuwait (Al-Hasan et al., 2020). Higher knowledge of COVID-19 increased the odds for face masking, handwashing/hand sanitizing and social distancing among pregnant women (Apanga & Kumbeni, 2021). However, higher levels of COVID-19 knowledge did not guarantee adolescents' compliance to preventing Covid-19 transmission, as knowledge of disease was high among the adolescents, but their adherence behaviour was low (Ningsih, et al., 2021).

Increased perceived risk/susceptibility to COVID-19 infection, concern about one's health and fear of infection were significantly associated with increased adherence to preventive measures (and quarantine guidelines) (Amodan et al., 2020; Nguyen et al., 2020; Pan et al., 2020, Ebrahimi et al., 2020; Carlucci et al., 2020). Having comorbidities was independently associated with higher overall adherence scores (Faria de Moura Villela, et al., 2021). However, in adolescents, despite high-risk perceptions compliance with preventive measures was still low (Ningsih, et al., 2021).

### 2.4.2 Socio-demographic factors

#### 2.4.2.1 Age

From literature, the influence of age on adherence to the preventive measures has been inconsistent.

A 2020 online cross-sectional study among 4,158 Norwegian residents above age 18 years to assess the association between situational, cognitive, affective, behavioral, and

personality-based factors with adherence to SDPs and HB during the COVID-19 pandemic (Ebrahimi et al., 2020) found older age to be associated with adherence to SDP, and participants aged 18-30 reported lowest adherence to SDP and HB. Nivette et al., (2020) found that adherence to COVID-19 preventive measures was higher in younger adults in Switzerland. In Bangladesh, it was reported that younger age was associated with accurate knowledge of COVID-19, but adherence to the preventive measures was rather associated with older age (Ferdous et al., 2020).

A 2020 online cross-sectional survey study conducted in Italy among 3,672 participants aged 18- 85 years on their risk perception of contracting COVID-19 and their reported adherence to quarantine protocols showed that older age was more positively associated with adherence to quarantine guidelines (Carlucci et al., 2020). Higher adolescent age groups in Indonesia (16-18 years old) had sufficient knowledge of COVID-19 but were non-compliant to the preventive measures (Ningsih, et al., 2021). In Brazil older age was associated with higher overall adherence scores; adherence scores for the specific measures were all significantly lower between the18–25 age group, but respiratory hygiene and physical distancing adherence scores were significantly lower in those aged 26 to 65years old than in those over 65 years of age (Faria de Moura Villela, et al., 2021).

Age was not significantly associated with adherence in Vietnam (Nguyen et al., 2020). Older age reduced the odds of adherence in a DRC study (Ditekemena et al., 2020). Younger age was associated with non-adherence to protocols despite the provision of handwashing facilities and widespread advocacy to minimize disease transmission in Ghana (Fielmua et al., 2021).

#### 2.4.2.2 Sex

Of the studies I reviewed, one found no association between sex and adherence to SDP (Nguyen et al., 2020), and another found a significantly positive association between male sex and higher adherence i.e., more male students (54.6%) were engaged in good preventive practices compared to female students (43.8%) (Adu et al., 2020). Otherwise, female sex was significantly associated with increased adherence to both SDP and HB (Ebrahimi et al., 2020; Ferdous et al., 2020; Ningsih, et al., 2021; Faria de Moura Villela, et al., 2021; Majam et al., 2021).

#### 2.4.2.3 Employment Status

SDP adherence was higher in those who were employed, but HB was unaffected by employment status (Ebrahimi et al., 2020). Students and the unemployed had significantly lower over-all adherence scores (Faria de Moura Villela, et al., 2021; Ditekemena et al., 2020), but Ditekemena et al., (2020) also found that working in private and public organizations significantly increased the odds for better adherence.

#### 2.4.2.4 Income level

More frequent preventive measures practice was associated with higher family income (Ferdous et al., 2020).

#### 2.4.2.5 Residence

More frequent preventive measures practice and adherence to quarantine guidelines was associated with living in an urban area compared to residence in rural areas (Ferdous et al., 2020; Carlucci et al., 2020; Faria de Moura Villela, et al., 2021; Nguyen et al., 2020; Amodan et al., 2020).

#### 2.4.2.6 Occupation/ Field of study/ Being a Health professional/ Being a student

Health workers were more likely to adhere to quarantine guidelines (Carlucci et al., 2020), and being in the health sector (worker or student) was associated with higher levels of preparedness and adherence to COVID-19 preventive measures (Nguyen et al., 2020; Serwaa et al., 2020; Ditekemena et al., 2020; Faria de Moura Villela, et al., 2021).

#### 2.4.2.7 Educational level

Education was unrelated to SDPs (Nivette et al., 2020). Having at least an undergraduate degree was associated with higher overall adherence scores (Faria de Moura Villela, et al., 2021). More frequent prevention practice factors and adherence to quarantine guidelines were associated with higher education (Ferdous et al., 2020; Carlucci et al., 2020; Ditekemena et al., 2020; Serwaa et al., 2020). Women with tertiary or secondary level of education had higher odds for wearing face masks, practicing handwashing/hand sanitising and social distancing compared to women who had no formal education (Apanga & Kumbeni, 2021).

Level of education and cadre of healthcare qualification influenced PPE use and hand hygiene adherence, as compliance was significantly lower among non-clinical staff (cleaners and pharmacists) and clinical staff with secondary level qualifications, than among healthcare workers with certificate qualifications and clinical staff (Ashinyo et al., 2021). Cleaners, midwives and pharmacists' compliance with hand hygiene was significantly lower than that of registered nurses (Ashinyo et al., 2021), but Adu et al., (2020) found that students in level 100 adhered better to preventive measures practices than those in levels 200, 300 and 400.

#### 2.4.2.8 Marital/Relationship status

Adherence to both SDP and HB was higher for individuals in a relationship, cohabiting or legally married (Ebrahimi et al., 2020; Majam et al., 2021) and risk factors for lower compliance with PPE use among healthcare workers were being separated/divorced/widowed (Ashinyo et al., 2021).

#### 2.4.2.9 Living conditions (Currently living with spouse/partner/children/elderly)

Ebrahimi et al., (2020) found adherence to both SDP and HB to be higher for individuals with children, whereas Ditekemena et al., (2020) found living with other people or a sexual partner (either married or cohabiting) was associated with poor adherence. Living with younger siblings was significantly associated with reduced adherence to preventive measures (Amodan et al., 2020). Living in a single room or living in a studio and apartment reduced the odds of adherence (Ditekemena et al., 2020).

### 2.4.3 Sources of information on COVID-19

Getting information on COVID-19 from reliable sources (e.g., health workers or village leaders) was associated with higher levels of preparedness and or higher adherence scores (Nguyen et al., 2020; Amodan et al., 2020; Serwaa et al., 2020; Apanga & Kumbeni, 2021).

### 2.4.4 Lifestyle

Greater alcohol consumption was associated with decreased adherence to SDP and HB (Ebrahimi et al., 2020). Not smoking was independently associated with higher overall

adherence scores (Faria de Moura Villela, et al., 2021). Increased vitamin tablet intake was associated with increased adherence to preventative measures (Majam et al., 2021).

### 2.4.5 Personality/Psychological characteristics

Conscientious personality, and altruistic attitude was associated with greater adherence to SDPs and HB. Lower adherence to SDPs related to extroverted personality traits and fear of transmission to others. (Ebrahimi et al., 2020). Lower adherence to SDPs and HB was associated with antisocial potential; low acceptance of moral rules, legal cynicism, low shame or guilt, low self-control, high engagement in delinquent behaviours, and association with peers who exhibit social deviance (Nivette et al, 2020). A sense of moral obligation and trust in authorities was associated with higher adherence to both SDP and HB (Nivette et al., 2020). Wang et al., (2021) found that for the majority of people, the following motivated adherence: protection from disease (self & others), trust (in science and medicine), trust in government and authority, better clarity (clear understanding of need to comply, and common sense), social responsibility – societal obligation, stopping the spread, helping healthcare systems.

Higher personal and social responsibility value in adolescents tended to be more positively related to adherence behaviour compared to those with lower personal and social responsibility value (Ningsih, et al., 2021). A positive belief in the government's response to the pandemic was significantly associated with increased adherence scores (Nguyen et al., 2020).

According to Cooper et al., (2020), a review of factors that influence compliance by healthcare workers with infection prevention and control guidelines for COVID-19 and other respiratory infections in Africa showed that major influencers of healthcare

workers' adherence to preventive measures and guidelines include fear of infecting themselves or others, feelings of professional responsibility for effective control practices, and a high sense of value in importance of the guidelines.

Absence of coercion was associated with non-adherence to protocols despite the provision of handwashing facilities and widespread advocacy to minimize disease transmission (Fielmua et al., 2021).

### 2.4.6 Others

**Community support/ adherence behaviour:** Perceived adaptation of the community to the lockdown was associated with higher adherence scores (Nguyen et al., 2020).

**Personal comfort:** The physical discomfort of using masks and other equipment, increased workloads, and fatigue from implementing IPC strategies discouraged healthcare workers´ from application of IPC procedures (Cooper et al., 2020).

**Availability of resources and ease of use:** Availability of and access to resources were identified as critical to enabling the implementation of IPC guidelines (Cooper et al., 2020). Insufficiency of PPEs was also associated with lower odds of compliance with PPE usage (Ashinyo et al., 2021).

**Managerial Support:** Healthcare workers reported that their responses to IPC guidelines were influenced by the degree of support they felt they received from their management team, the workplace culture and influence of colleagues (e.g., culture of complacency, or social norm of wearing PPE) and whether there was mandatory and adequate training about the infection itself and how to use PPE (Cooper et al., 2020).

## 2.5 Conclusion

A review of literature on the novel COVID-19 pandemic found that generally, SSA had recorded the lowest number of cases and deaths compared to the other continents, probably due to higher climatic temperatures, the younger demography of Africa, seemingly higher levels of pre-existing immunity from childhood vaccinations in the EPI (Expanded Programme on Immunization), and under-reporting of cases arising from several challenges. Unlike the other continents, most African countries never experienced lockdowns, and those that did only had partial lockdowns of hotspot regions. Studies conducted earlier in the pandemic, which measured various preventive measures (categorized broadly into social distancing protocols - SDP, and hygienic behaviour - HB) found that globally, overall adherence to SDPs was relatively higher than for HBs, but the rates were lower in Africa than in Europe and America (likely due to the lower case and death counts in SSA).

Over time, there has been a sharp decline in adherence to the PM instituted by the Ghanaian government despite the increased case and death counts, mostly due to widespread misinformation and initial inconsistencies in information about the disease and its PM, the erroneous notion that Africa was immune to the disease due to purported protective African genes and hot tropical climate, as well as the predominantly young population structure. Vaccine uptake in SSA has also been extremely low in most African countries due to misinformation, mistrust of governments and foreign aid, and wild conspiracy theories and cultural beliefs.

Factors identified to influence adherence to the disease's preventive measures include knowledge and risk perception of the disease, socio-demographic characteristics (such as age, sex, educational level, residence, employment status, income level,

occupation/field of study, marital/relationship status, types of living conditions and members of one's household), sources of information on the disease, personality traits, lifestyle, personal/political ideologies and sense of responsibility, community support/ adherence behaviour, availability of resources and ease of use/personal comfort, and the support from workplace management teams.

# CHAPTER THREE

# METHODS

## 3.1 Study Design

This was a quantitative cross-sectional study aimed at assessing UG undergraduate students' knowledge of COVID-19 preventive measures, their level of adherence to some selected preventive measures, and to determine the factors influencing adherence to these preventive measures among undergraduate students residing on the University of Ghana Legon campus during the 2020/2021 academic year. The study was conducted from July 2021 to February 2022.

## 3.2 Study Location

The study was conducted on the Legon campus of the University of Ghana, which is the oldest and biggest publicly owned national university in the country. It was established in the British colony of the Gold Coast in 1948 as the University College of the Gold Coast purposely for provision and promotion of university education, learning and research. Initially, the University of London supervised the University College of the Gold Coast's academic programs and awarded its degrees due to their affiliation with it, until the Ghanaian university gained full university status in 1961 and was able to award its own degrees, resulting in a name change to the University of Ghana (University of Ghana, 2021).

The University's main campus at Legon is located in the Greater Accra Region where the national capital Accra is, specifically in the Ayawaso West Municipal District, in the northeast area of Accra. The University also has two other campuses in Accra, and 11 more outside Accra where it runs several Distance Education programmes including

degree courses. It now has four colleges, five faculties, several schools, institutions, and departments, with over 40,000 students enrolled in a maximum of six levels of study (i.e., level 100 to 600) (University of Ghana, 2020).

The four colleges are: College of Basic and Applied Sciences, College of Humanities, College of Education, and College of Health Sciences, comprising of schools, institutes, centres, departments and units. The university also has a number of research centres including Noguchi Memorial Institute of Medical Research (NMIMR), Centre for Tropical, Clinical Pharmacology and Therapeutics, among others. The university's curriculum spans courses in liberal arts, social sciences, law, basic science, agriculture, medicine, technology-based and vocational courses under regular, sandwich, weekend, distant education and exchange programs; and awards certificate, diploma, undergraduate, masters, and PhD qualifications (University of Ghana, 2021).

The University has halls and hostels to cater for students' accommodation on campus, categorized into University Halls (Volta, Legon, Akuafo, Mensah Sarbah Commonwealth, Jubilee, International Students, Hilla Limann, Alexander Kwapong, Elizabeth Frances Sey and Jean Nelson Halls), and University Hostels (Bani, Evandy, TF/James Topp Nelson Yankah and Pentagon/African Union hostels, and for graduate students only, Valco Hostel).

As of June 2021, there were 33,763 undergraduate students enrolled in the university of Ghana, with 52% being females and 48% being males. Of this number, 22,465 were resident in the halls and hostels on the Legon and Korle Bu campuses, representing 67% of the undergraduate population. (University of Ghana IRPO, 2021).

As part of preventive measures against the spread of COVID-19, the university adopted an online system of learning for the 2021 academic year which started in January 2021, and ran a 9-week modular system for the undergraduate programs. The first cohort (freshmen and final year students) had their first semester of the academic year first, from January to March and. From March to June, while they were on went on vacation the second cohort (second- and third-year students) had their first semester. This was followed by the second semester for each cohort in same order, ending December 2021.

The Greater Accra Region is the largest epicenter for the infection in Ghana, having the highest case count of 51,131 (55%) out of the total 92,856 confirmed COVID-19 cases in the country, with the Ayawaso West Municipal District being one of the hotspots for the COVID-19 infection in the region (GHS, 2021; www.ghanadistricts.com, 2021).

### 3.3 Study Population

Students of the University come from all regions in Ghana and other countries outside Ghana; from varying socio-cultural, demographic and economic backgrounds, and are representative of the youth population of the country. There are currently 22,465 undergraduate students resident in the Legon/Korle Bu campuses; 10,800 males, 11,665 females.

**Inclusion criteria**

- Only students enrolled in undergraduate study at the university of Ghana.
- University of Ghana undergraduate students of both male and female sexes, 18 years and above, of any socio-demographic background or nationality.

- University of Ghana undergraduate students officially enrolled in the university under any of the four colleges at any level of undergraduate study.
- University of Ghana undergraduate students formally assigned to, and residing in an on-campus hall or hostel during either semester of the 2021 academic year (either Legon or Korle Bu campuses).

**Exclusion criteria**

- Undergraduate students enrolled in any other university other than the University of Ghana
- Students enrolled in the University of Ghana, but at levels other than the undergraduate level of study (Graduate, post-graduate, etc.)
- University of Ghana undergraduate students who did not reside on campus during either semesters/module of the 2021 academic year.
- University of Ghana undergraduate students who do not read, speak or write English.
- University of Ghana undergraduate students with visual impairment (the questionnaire will not be presented in Braille).
- University of Ghana undergraduate students without access to mobile phones, personal computers or internet connectivity.

### 3.4 Study Variables

**Dependent variables**

Three primary outcomes of interest were assessed: adherence to COVID-19 hand hygiene, respiratory hygiene and physical distancing measures among resident undergraduate students of University of Ghana on campus. Responses to each of the

ten PM assessed were transformed into a categorical variable of adherent and non-adherent groups. For each PM, those who responded "Yes, every time/Yes, consistently" were labelled "adherent", while those who responded "Yes, sometimes/Yes, but only sometimes", and "No, never/No, I never" do were merged into one category and labelled "non-adherent". For overall adherence to all the PM, those who practiced ≥75% of the COVID-19 PM consistently (i.e., those scoring ≥ 8 of 10) were categorized as having "good adherence".

**Table 1: Independent variables**

| Variable | Characteristics/ measurement scale | Operational definitions |
|---|---|---|
| Sociodemographic characteristics | | |
| Age | Discrete (Ratio) | Age in years (at last birthday) |
| Sex | Binary (Nominal) | Biologic makeup (Male/Female) |
| On-campus residence | Categorical (Nominal) | Either University Hall/ University hostel |
| Relationship or marital status | Categorical (Nominal) | Either single (Not dating/Unmarried/ Divorced/Widowed) or Dating/Married/Cohabitating |
| Religious affiliation | Categorical (Nominal) | Which religion respondents belong to (Christian Muslim, Others) |
| Level of study | Quantitative (Interval) | Level 100, 200, 300, 400, 500 or 600 |
| College of study | Categorical (Nominal) | Health Sciences, Humanities, Basic & Applied Sciences, Education |
| Average monthly upkeep amount (GHC) | Quantitative (continuous) - Ratio | Average total amount of money spent in a month |
| Number of roommates | Quantitative (discrete) - Ratio | Number of people respondent shares a room with on campus |
| Mode of teaching and learning employed by lecturers | Categorical (Nominal) | Whether respondents have virtual lectures via Zoom and other online meeting platforms, or meet lecturers in person for lectures. |
| | | |
| Risk perception (Vaccination | Categorical (Ordinal) | Respondents' view of their susceptibility to catching COVID-19 |
| Knowledge of COVID-19 preventive measures | Categorical (Ordinal) | Level of respondent's knowledge of COVID-19 preventive measures. (Low, adequate or excellent) |
| Personality/Psychological characteristics | Categorical (Ordinal) | How respondents' personality or psychological traits and characteristics perceive or relate to the preventive measures in place |

### 3.5 Sample Size Calculation

The minimum sample size for the study was calculated using the Cochrane formula $\boldsymbol{n = \frac{Z^2_{1-\frac{\alpha}{2}} P(1-P)}{MOE^2}}$ (Cochran, 1977). $\mathbf{Z^2_{1-\frac{\alpha}{2}}}$ is the critical value of the normal distribution at **α/2** (for a confidence level of 95%, α is 0.05 and the critical value is 1.96, MOE is the margin of error, P is the sample proportion).

The minimum adherence level to the preventive measures found from previous studies in Ghana was 18% (Fielmua et al., 2020), thus using a P of 18% (0.18) and a MOE of 0.05, the minimum sample size calculated was 227 students. Adding a 30% non-response rate as observed from Pan et al., (2020), resulted in a final minimum sample size of 296 students.

### 3.6 Sampling Procedure

In order to have a fair representation of all Colleges, a quantitative proportionate stratified random sampling approach was chosen to select the minimum sample size of 296 students from among the 22,465 resident undergraduate students in the four colleges. A sampling fraction (SF) was calculated as 0.0132 using 296/22465, and the breakdown presented in the table below:

**Table 2: Sampling technique**

| College | Male Residents | Female Residents | Total | Minimum sample size |
|---|---|---|---|---|
| College of Basic and Applied Sciences | 3,754 | 2,547 | 6,301 | 83 |
| College of Health Sciences | 586 | 731 | 1,317 | 18 |
| College of Education | 720 | 749 | 1,469 | 19 |
| College of Humanities | 5,740 | 7,638 | 13,378 | 176 |
| **Total** | **10,800** | **11,665** | **22,465** | **296** |

### 3.7 Data Collection Instrument and Tools

A questionnaire was developed by modifying the WHO/Europe COVID-19 survey tool and guidance for rapid, simple, flexible behavioural insights on COVID-19; and the questionnaire used by the International Citizen Project COVID-19 (ICP COVID-19) to assess adherence to public health measures and their impact on the COVID-19 outbreak in Ghana. A mix of questions were picked and modified from both documents to develop all sections of the well-designed questionnaire (Appendix 3) to answer each study objective. The structured questionnaire had forty-two questions in total, well designed and simplified to facilitate easy responses from participants and avoid ambiguity or confusing them. It was pre-tested with twenty (20) students randomly selected from the University of Professional Studies (UPSA) - a neighbouring university to UG, after which appropriate corrections were made and data collection began. The questionnaire was made up of four sections:

- The first section (made up of eleven questions) collected socio-demographic data of participants, i.e., age, sex, college of study, level of study, hall/hostel of residence, etc.

- The second section (made up of ten questions) measured participants' knowledge of COVID-19 preventive measures, and their risk perception. Two sets of five questions were used to assess knowledge and risk perception each, with eight requiring dichotomous/binary response (yes/no; severe/not severe; high likelihood/low likelihood), one having five-point Likert scale type of responses, while one was open-ended and required free text entry by participants. Studies which were cited in the literature review on knowledge of COVID-19 were done in the early stages of the pandemic, when information on the disease and preventive

measures was scanty and widely controversial. They also assessed participants' knowledge of the entire disease (causative organism, mode of transmission, the symptoms, prevention, among others), with some assessing their knowledge, attitudes and perception (KAP) of the disease instead of their knowledge of the PM only. It has now been almost two years since the onset of the COVID-19 outbreak in Ghana. Ghana has experienced a number of waves, prompting repeated and extensive education on all media platforms, with stricter enforcement of adherence to COVID-19 PM by government and UG authorities, making information on the disease common knowledge. Therefore, for objectivity, (i.e., considering the educational status of the participants, and to avoid guesswork) participants were asked to type in as many COVID-19 preventive measures as they knew, instead of giving them possible answers to choose from.

- The third section (made up of ten questions) measured participants' adherence levels and behaviours to ten (10) selected common PM under three broad categories of PM: hand hygiene (HH), respiratory hygiene (RH) and physical distancing (PD) PM; and also explored reasons for inconsistent adherence to individual PM using skip patterns where applicable. Three response options were available for adherence to PM: "yes, every time/yes, consistently"; "yes, sometimes/yes, but only sometimes", and "no, never/no, I never do". Multiple choice responses were used to determine the reasons for inconsistent adherence to PM. For each category of PM, the maximum achievable score was 8, 8 and 4 for HH, RH and PD respectively, and the maximum total attainable aggregated score for adherence to the preventive measures was 20.

- Section four (made up of ten questions) used three-point Likert scale type of questions to assess participants' personality/psychological characteristics in relation to the COVID-19 PM. These questions assessed the following:
    - Trust in authorities
    - Trust in science
    - A sense of personal/social/moral obligation
    - Antisocial behaviour (cynicism)
    - Motivated adherence (stopping the spread of the disease/protection from it (self & others), fear of transmission to others, a clear understanding of need to comply with PM, and community adherence).

### 3.8 Data Collection Approach and Technique

Data was collected online via Google Forms with a self-administered questionnaire. This online mode of data collection was chosen in line with the COVID-19 preventive measures to limit human contact, and reduce exposure and risk of data collectors to COVID-19. Permission was sought from the Dean of Students' office to authorize the Student Representative Council (SRC) of the University of Ghana to send the questionnaire to students via SMS and Whatsapp. These messages contained brief information about the study objectives, and a uniform resource identifier (URI) link which when clicked, opened to a Google Forms page in a web browser of their choice. The first page contained a summary of the participants' information (Appendix 1), and sought informed consent from participants (Appendix 2). Only after selecting the option that read "**Yes, I agree/consent**", to provide their consent to participate in the study were they be able to proceed to the beginning of the questionnaire on the next page.

With knowledge of the population of each college in hand, the total sample needed from each college was selected using a random generator, and the questionnaires were sent by the Student Representative Council (SRC) to the total sample. The response rate was however less than 1% two weeks after sending out the questionnaire, despite the SRC repeatedly sending students reminders to complete the questionnaire. Therefore, a convenient sampling approach was used eventually to get the minimum sample size required by moving around campus in-person and sharing the link with as many students as fit the inclusion criteria and were willing to fill the online questionnaire.

Data collection started on September 21 and ended on November 10, 2021, after which the digital link was deactivated, the questionnaire closed to responses, and data was retrieved and cleaned for analysis. Google Forms stored the responses on a different page that only I the principal investigator had access to, with responses numbered in order of receipt.

### 3.9 Data processing and statistical analysis

A total of 303 responses were received. The responses were automatically numbered by Google Forms in order of receipt, and this numbering was used as questionnaire IDs. An Excel sheet containing the data was downloaded on November 11, 2021 from Google Forms, and the data was checked for accuracy and missing information, cleaned, coded and exported to STATA 16 software for analysis.

Descriptive statistics including frequency, tables, means, standard deviations, confidence intervals, and proportions (percentages) were used to describe data. Age was modelled as a categorical variable into three five-year age groups. Average monthly allowance was also modelled into three groups. Graphical presentations were

made for proportions of dependent variables. Bivariate analysis using Chi-square was performed to test the associations between independent variables and adherence to COVID-19 Hand hygiene (HH), Respiratory hygiene (RH) & Physical distancing (PD) preventive measures (PM), and where one of the cell frequencies was less than 5, the Fisher's exact test was used. Logistic regression models were run for each DV against the IVs; Crude (cOR) and adjusted odds ratio (AOR) were computed, and statistical significance was set at $p < 0.05$.

### 3.9.1 Assessment of knowledge on COVID-19 PM, and risk perception

Over ten preventive measures were found in literature, with three universally common ones (especially in Ghana), one from each category of PM (HH, RH and PD), i.e., handwashing with soap and water under running water and/or use of hand sanitizers; wearing of face masks in public spaces; and physical/social distancing (Wikipedia, 2021; WHO, 2021; CDC, 2021; GHS, 2021). Thus, although not stated in the questionnaire, these three were used as a benchmark requirement for the PM participants were to list, with participants expected to list at a minimum, all three. Key words related to the PM, such as hand washing or washing of hands, masks, sanitizer or hand rub, physical/social distancing, etc., which showed that respondents had an idea of the preventive measures were accepted as correct answers.

Participants who either listed none, or listed only incorrect PM scored zero; those who listed less than the three benchmark PM listed above scored one; those listing less than the three benchmark PM plus any other correct ones scored two; those listing only the three scored three; while those listing all three plus any other correct ones scored four. Four other questions were used to assess knowledge, with responses scored as zero for "no" and one for "yes" respectively.

Together with the scores from listing the preventive measures, the maximum attainable aggregated score for knowledge of PM was 8, which was divided into three equal parts and knowledge of COVID-19 PM was categorized as follows: low/poor knowledge (0-2), average/adequate knowledge (3-5), and excellent/ high knowledge (6-8).

Responses to the five questions used to assess participants' risk perception were not aggregated into a categorical variable of high or low risk. Instead, each question was handled and used independently during statistical analysis.

### 3.9.2 Measurement of adherence to COVID-19 preventive measures

Participants' adherence levels and behaviours to ten (10) selected common PM under the three broad categories of PM; hand hygiene (HH), respiratory hygiene (RH) and physical distancing (PD) PM were measured.

Four HH measures were assessed:

- Frequent handwashing with water and soap for at least 20 seconds
- Use or an alcohol-based hand sanitizer when hands are not visibly soiled
- Avoiding touching the face with unwashed hands
- Daily disinfection of cell phones.

Similarly, four measures were assessed for RH:

- Wearing a face mask when in public places
- Covering one's nose and mouth with elbow crease or a disposable tissue when coughing or sneezing
- Correctly discarding used tissue paper in the bin after sneezing or coughing
- Handwashing with soap and water immediately after sneezing or coughing.

Two measures were assessed for PD:

- Avoiding crowded places
- Staying 1.5-2m from other people in public.

Similar to the methodology used by Bante et al. in a 2021 study on adherence with COVID-19 preventive measures and associated factors among residents of Dirashe District, Southern Ethiopia, adherence to the PM was transformed into a categorical variable of adherent and non-adherent. For each PM, those who responded "Yes, every time/Yes, consistently" were labelled "adherent", while those who responded "Yes, sometimes/Yes, but only sometimes", and "No, never/No, I never" do were merged into one category and labelled "non-adherent".

For each category of PM, the maximum achievable score was 4, 4 and 2 for HH, RH and PD respectively, and the maximum attainable aggregated score for adherence to all the preventive measures was 10. For overall adherence to each category, and for all the PM, those who practiced ≥75% of the COVID-19 PM consistently (i.e., those scoring 3 of 4 each for HH & RH; 2 for PD; ≥8 of 10 for total of all 10 PM) were categorized as "adherent", while those below these scores were categorized as "non-adherent".

### 3.9.3 Determination of factors influencing adherence to COVID-19 PM

Bivariate analysis (Chi square & Fischer's exact tests of association) was done to test associations between each independent variable (sociodemographic characteristics, knowledge of COVID-19 PM, risk perception, and personality/psychological characteristics) and adherence to each PM category, while multiple logistic regression models were run to determine independent variables significantly associated with adherence to the PM while controlling for covariates. A p value < 0.05 was considered

significant at 95% confidence level. The results of the study were presented in verbal quotations, tables, bar and column graphs, and a histogram.

### 3.10 Quality control

The four sections of the questionnaire were appropriately titled and put on different pages. Participants were required to click "Next" upon completion of one page to access the next. To reduce errors and missing data, participants were prompted at the end of the page and re-directed to questions they had left blank, and they could not proceed to the next page if they left any questions blank. To reduce errors and missing data, very few questions requiring free text entries were asked. To avoid multiple submissions per participants, they were informed on the introductory page that they were only allowed to submit one response each, and the number of responses permitted per question were clearly stated.

### 3.11 Ethical considerations

This study was done in line with the 1964 Helsinki declaration and its later amendments on research ethics. Ethical clearance was obtained from the Noguchi Memorial Institute for Medical Research Institutional Review Board (NMIMR-IRB) which was established in consultation with the College of Health Sciences, University of Ghana, under which the School of Public Health falls. The NMIMR-IRB was justified to review my proposal because it is mandated to review both internal and external collaborative research protocols in biomedical, social or behavioural research received from NMIMR, Schools and Colleges within University of Ghana, Medical Schools, Private organizations, individual bodies with affiliations with University of Ghana.

### 3.11.1 Consent procedures

A detailed participant information sheet adequately informing the participants of the study objectives, what was expected of them, assuring them of confidentiality and anonymity, and guaranteeing their autonomy was provided. Participants were only able to proceed to the questionnaire if they provided their consent by clicking an acceptance button provided on the consent page.

### 3.11.2 Privacy

Personal information like names, email addresses, telephone numbers, etc., of participants were not collected. My email address and telephone number were provided for respondents who wished to have further correspondence to reach out to me on.

### 3.11.3 Confidentiality

All data collected have been saved to a password protected Google drive folder for storage, and will be deleted permanently after three years as required by law.

### 3.11.4 Risks

There was very minimal potential risk foreseen in association to students' participation in this study, aside the use of less than 20mb of data to answer the questionnaire online.

### 3.11.5 Benefits

Participants were not rewarded/compensated directly for their participation in the study.

### 3.11.6 Conflict of interest

There are no conflicts of interest to declare in this study.

### 3.11.7 Funding

Funding for this study was from my personal accounts and no external sources.

# CHAPTER FOUR

# RESULTS

## 4.0 Introduction

This chapter presents the results of the online self-administered questionnaire filled by 303 on-campus resident undergraduate students of the University of Ghana students of the University of Ghana. The results are presented as follows:

## 4.1 Socio-demographic characteristics of respondents

The sociodemographic data of the students are shown in Table 5 below. The results showed majority of the respondents were female (63.0%). Most respondents were between the ages of 18-22 years (69.3%), with mean age of 22.5±3.80 years (95% CI: 22.0-22.9), and modal age of 21 years (28.3%). Over three quarters of the respondents were Christians (86.5%); single/not currently involved in a romantic relationship/unmarried/divorced (76.6%), and belonged to the College of Humanities (86.5%). More than half were in level 200 (65.0%), resided in University Halls on campus (63.7%), had between one to three roommates (77.6%) and spent on average, less than GHC 500 monthly (57.1%). The mean monthly spend for the students was GHC 531.33 ± GHC 663.20 (95% CI: 456.36-606.30), and a mode of GHC 500 (20.1%). Almost all of them said their mode of lectures were online only (96.04%). Similarly, 92.7% of them had no comorbidities.

**Table 3. Socio-demographic characteristics of respondents (N=303)**

| Variable | Frequency | Percentage (%) |
|---|---|---|
| **Age of respondents (Yrs)** | | |
| 18 - 22 | 210 | 69.3 |
| 23 - 27 | 74 | 24.4 |
| >28 | 19 | 6.3 |
| **Mean ± SD** | **22.5 ± 3.80 (95% CI: 22.0 - 22.9)** | |
| **Sex** | | |
| Male | 112 | 37 |
| Female | 191 | 63 |
| **Religious affiliation** | | |
| Christian | 262 | 86.5 |
| Others | 41 | 13.5 |
| **College of study** | | |
| Humanities | 262 | 86.5 |
| Basic and Applied Sciences | 19 | 6.3 |
| Education | 22 | 7.3 |
| **Level of study** | | |
| 200 | 197 | 65 |
| 300 | 82 | 27.1 |
| 400 | 24 | 7.9 |
| **Relationship/marital status** | | |
| Single (Not dating/ unmarried/ divorced/ separated) | 232 | 76.6 |
| Dating/Married/Cohabitating | 71 | 23.4 |
| **Residence on campus** | | |
| University Halls | 193 | 63.7 |
| University Hostels | 110 | 36.3 |
| **Number of roommates** | | |
| 0 | 48 | 15.8 |
| 1-3 | 235 | 77.6 |
| >3 | 20 | 6.6 |
| **Average monthly upkeep amount (GHC)** | | |
| <500 | 173 | 57.1 |
| 500-1000 | 114 | 37.6 |
| >1000 | 16 | 5.3 |
| **Mean ± SD** | **531.33 ± 663.20 (95% CI: 456.36-606.30)** | |
| **Mode of teaching and learning used by lecturers** | | |
| Online only | 10 | 3.3 |
| Both online and in-person | 293 | 96.7 |

## 4.2 Knowledge of COVID-19 preventive measures (PM)

All 303 said they had heard of COVID-19. 97.7% said they thought COVID-19 was real. 71.9% thought the COVID-19 pandemic was extremely serious on a global scale. 59.4 % incorrectly stated that the likelihood of contracting COVID-19 was low if they failed to adhere to the recommended preventive measures**,** while only a third correctly said there was a high likelihood (40.6%). When asked to list as many COVID-19 PM as they knew of, 1.0% gave incorrect answers, 55.8% listed less than three of the

benchmark PM, 19.8% listed less than the three plus any others, 15.2% listed only the three, and only 8.25% were able to list all three plus any others. After transforming the total knowledge score, only 1.3% had poor knowledge of COVID-19 PM (score of 0-2), majority (72.9%) had adequate knowledge (3-5) while a quarter (25.7%) had excellent knowledge (6-8) of COVID-19 PM. Respondents' knowledge of COVID-19 PM is shown in Table 6:

**Table 4. Respondents' knowledge of COVID-19 Preventive Measures (N=303)**

| Variable | Frequency | Percentage (%) |
|---|---|---|
| **Heard of COVID-19?** | | |
| No | 0 | 0 |
| Yes | 303 | 100 |
| **Is COVID-19 real?** | | |
| No | 8 | 2.6 |
| Yes | 295 | 97.4 |
| **Severity of pandemic on global scale** | | |
| Severe | 85 | 28.1 |
| Not severe | 218 | 71.9 |
| **Likelihood of contracting COVID-19 if you do not adhere to the PM** | | |
| Low likelihood | 180 | 59.4 |
| High Likelihood | 123 | 40.6 |
| **PMs listed by respondents** | | |
| None at all | 3 | 1 |
| < 3 benchmark PM only | 169 | 55.8 |
| 3 benchmark PM plus any others | 60 | 19.8 |
| All 3 benchmark PM only | 46 | 15.2 |
| All 3 benchmark PM plus any others | 25 | 8.3 |
| **Knowledge score for PM (Highest score = 8)** | | |
| Poor Knowledge (0-2) | 4 | 1.3 |
| Adequate knowledge (3-5) | 221 | 72.9 |
| Excellent knowledge (6-8) | 78 | 25.7 |

### 4.3 Respondents' COVID-19 risk perception

More than half of the respondents said they did not know people in their immediate social environment who have been infected with COVID-19 (68.3%), while almost all of them had neither been infected with COVID-19 before (92.1%) nor knew someone who died from COVID-19 (82.5%). When asked how worried (anxious) they were about contracting COVID-19, a third (33.3%) said they were worried at the beginning

of the outbreak in the country but currently worried no more, while almost all of them had not been vaccinated against COVID-19 (91.7%).

**Table 5: Respondents' COVID-19 risk perception (N=303)**

| Variable | Frequency | Percentage (%) |
|---|---|---|
| **History of comorbidities** | | |
| No | 281 | 92.7 |
| Yes | 22 | 7.3 |
| **History of previous infection with COVID-19** | | |
| No | 279 | 92.1 |
| Yes | 24 | 7.9 |
| **Knowing people in immediate social environment who have been infected with COVID-19** | | |
| No | 207 | 68.3 |
| Yes | 96 | 31.7 |
| **Knowing someone who died from COVID-19** | | |
| No | 250 | 82.5 |
| Yes | 53 | 17.5 |
| **Anxiety about getting COVID-19** | | |
| Extremely worried | 78 | 25.7 |
| Slightly worried | 44 | 14.5 |
| I am neutral | 43 | 14.2 |
| I was worried initially, but no more | 101 | 33.3 |
| I have never been worried | 37 | 12.2 |
| **Respondent's vaccination status** | | |
| Unvaccinated | 278 | 91.7 |
| Fully vaccinated | 25 | 8.3 |

### 4.4 Respondents' personality/psychological characteristics in relation to adherence to preventive measures (PM)

When asked to rank their agreement to items assessing their personality/psychological characteristics in relation to the COVID-19 PM, almost half the students agreed that they adhered because they did not want problems with the law, as authorities recommended them (46.2%). Only a handful (23.4%) agreed that community adherence was exemplary, and positively influenced their own adherence, while almost half (44.6%) disagreed. 65.7% said they trusted that the preventive measures were helpful in ending the pandemic.

70.3% agreed to adhering in order to prevent the spread of COVID-19 to people close to them/ high risk persons, while 44.2% agreed to adhering due to the fear of contracting

the disease/dying from it. Majority agreed to adhering due to a desire for a return to normal life (71.6%), because they felt responsible for their health (72.9%), and that they felt it was their civic responsibility as citizens to adhere (63.0%). Only 14.9% thought the PM were unnecessary for preventing the disease transmission, while 66.7% disagreed with this belief. 52.2% agreed education on the PM was adequate in their home and school communities. Respondents' personality/psychological characteristics are presented in Figure 2 below:

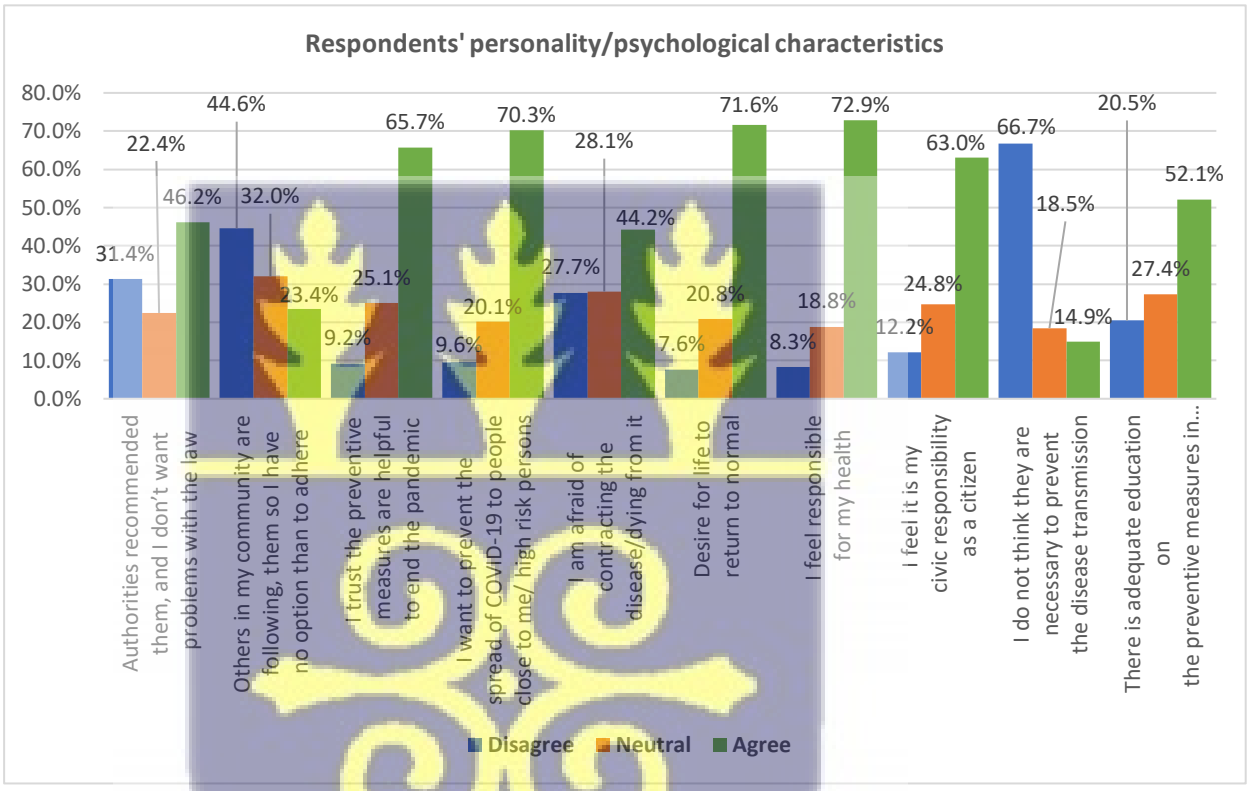


**Figure 2: Respondents' personality/psychological characteristics**

### 4.5 Adherence to the COVID-19 preventive measures (PM)

Over three quarters of the respondents were non-adherent to HH and PD measures (91.1% and 78.7% respectively), while over half of them adhered to RH measures

(59.1%). Overall, almost a quarter were non-adherent to ≥ 75% the PM (71.0%).

Figures 3 and 4 show the results of adherence to the PM:

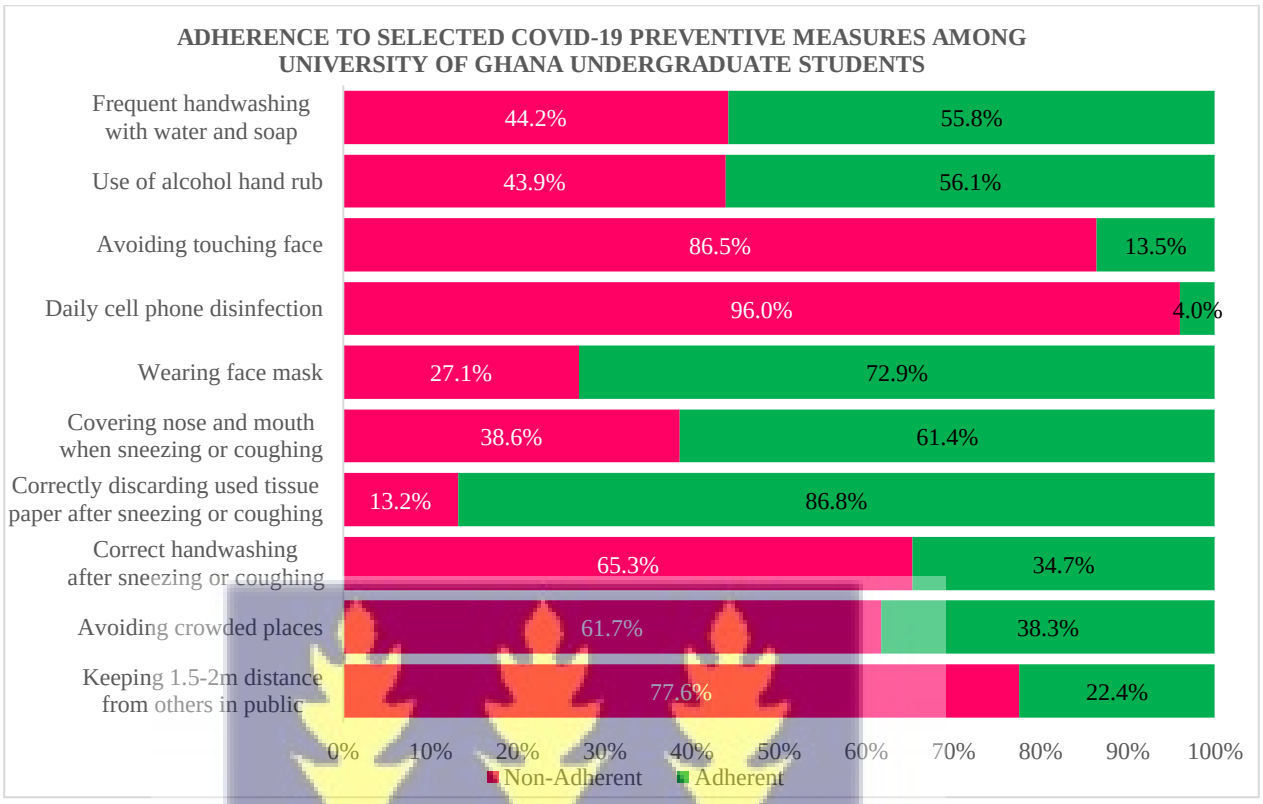


**Figure 3: Adherence to selected COVID-19 preventive measures among University of Ghana undergraduate students**

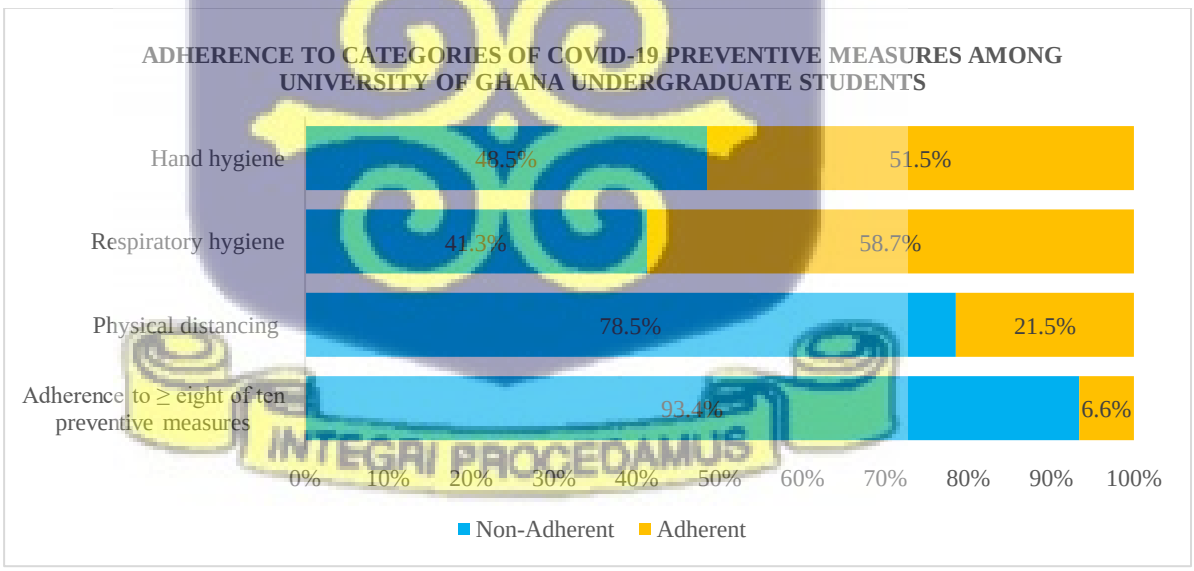


**Figure 4: Adherence to categories of COVID-19 preventive measures among University of Ghana undergraduate students**

### 4.6 Bivariate association between independent variables and adherence to PM

Bivariate analysis using Chi-square and Fischer's exact T-tests was conducted at 95% confidence level to determine any statistically significant associations between socio-demographic characteristics, knowledge, risk perception, personality/psychological characteristics, and adherence to HH, RH, and PD measures.

#### 4.6.1 Adherence to Hand Hygiene (HH) measures

Two of the risk perception items: "knowing someone who had died from COVID-19 ($\chi 2$ = 4.126, p = 0.042), and anxiety about getting the disease ($\chi 2$ = 9.895, p = 0.042)", were the only factors significantly associated with HH adherence at 5% level of significance. All other factors were not significant. The results are tabulated below:

**Table 6: Association between sociodemographic variables and adherence to HH measures**

| Variable | N | Non-adherent n (%) | Adherent n (%) | $\chi 2$ value | P-value |
|---|---|---|---|---|---|
| **Age** | | | | **2.195** | **0.334** |
| 18 - 22 | 210 | 96 (45.7) | 114 (54.3) | | |
| 23 - 27 | 74 | 41 (55.4) | 33 (44.6) | | |
| >27 | 19 | 10 (52.6) | 9 (47.4) | | |
| **Sex** | | | | **0.761** | **0.383** |
| Male | 112 | 58 (51.8) | 54 (48.2) | | |
| Female | 191 | 89 (46.6) | 102 (53.4) | | |
| **Religious affiliation** | | | | **0.001** | **0.971** |
| Christian | 262 | 127 (48.5) | 135 (51.5) | | |
| Others | 41 | 20 (48.8) | 21 (51.2) | | |
| **College of study** | | | | **1.179** | **0.555** |
| Humanities | 262 | 127 (48.5) | 135 (51.5) | | |
| Basic and Applied Sciences | 19 | 11 (57.9) | 8 (42.1) | | |
| Education | 22 | 9 (40.9) | 13 (59.1) | | |
| **Level of study** | | | | **0.527** | **0.768** |
| 200 | 197 | 96 (48.7) | 101 (51.3) | | |
| 300 | 82 | 41 (50) | 41 (50) | | |
| 400 | 24 | 10 (41.7) | 14 (58.3) | | |
| **Relationship/marital status** | | | | **0.015** | **0.904** |
| Single | 232 | 113 (48.7) | 119 (51.3) | | |
| Dating/Married/Cohabitating | 71 | 34 (47.9) | 37 (52.1) | | |
| **Residence on campus** | | | | **1.089** | **0.297** |
| University Halls | 193 | 98 (50.8) | 95 (49.2) | | |
| University Hostels | 110 | 49 (44.5) | 61 (55.5) | | |

**Table 6 cont'd: Association between sociodemographic variables and adherence to HH measures**

| | | | | | |
|---|---|---|---|---|---|
| **Number of roommates** | | | | **0.305** | **0.859** |
| 0 | 48 | 22 (45.8) | 26 (54.2) | | |
| 1-3 | 235 | 116 (49.4) | 119 (50.6) | | |
| >3 | 20 | 9 (45) | 11 (55) | | |
| **Average monthly upkeep amount (GHC)** | | | | **0.597** | **0.742** |
| <500 | 173 | 85 (49.1) | 88 (50.9) | | |
| 500-1000 | 114 | 53 (46.5) | 61 (53.5) | | |
| >1000 | 16 | 9 (56.3) | 7 (43.8) | | |
| **Mode of teaching and learning used by lecturers** | | | | **0.009** | **0.924** |
| Online only | 10 | 5 (50) | 5 (50) | | |
| Both online and in-person | 293 | 142 (48.5) | 151 (51.5) | | |

**Table 7: Association between risk perception and adherence to HH measures**

| Variable | N | Non-adherent n (%) | Adherent n (%) | χ2 value | P-value |
|---|---|---|---|---|---|
| **History of comorbidities** | | | | **0.021** | **0.885** |
| No | 281 | 136 (48.4) | 145 (51.6) | | |
| Yes | 22 | 11 (50) | 11 (50) | | |
| **History of previous infection with COVID-19** | | | | **0.333** | **0.564** |
| No | 279 | 134 (48) | 145 (52) | | |
| Yes | 24 | 13 (54.2) | 11 (45.8) | | |
| **Knowing people in immediate social environment who have been infected with COVID-19** | | | | **0.78** | **0.377** |
| No | 207 | 104 (50.2) | 103 (49.8) | | |
| Yes | 96 | 43 (44.8) | 53 (55.2) | | |
| **Knowing someone who died from COVID-19** | | | | **4.126** | **0.042*** |
| No | 250 | 128 (51.2) | 122 (48.8) | | |
| Yes | 53 | 19 (35.8) | 34 (64.2) | | |
| **Anxiety about getting COVID-19** | | | | **9.895** | **0.042*** |
| I have never been worried | 37 | 24 (64.9) | 13 (35.1) | | |
| I was worried initially, but no more | 101 | 53 (52.5) | 48 (47.5) | | |
| I am neutral | 43 | 23 (53.5) | 20 (46.5) | | |
| Slightly worried | 44 | 17 (38.6) | 27 (61.4) | | |
| Extremely worried | 78 | 30 (38.5) | 48 (61.5) | | |
| **Vaccination status** | | | | **0.133** | **0.716** |
| Unvaccinated | 278 | 134 (48.2) | 144 (51.8) | | |
| Fully vaccinated | 25 | 13 (52) | 12 (48) | | |

**Table 8: Association between knowledge of COVID-19 PM and adherence to HH measures**

| Variable | N | Non-adherent n (%) | Adherent n (%) | χ2 value | P-value |
|---|---|---|---|---|---|
| **Knowledge of COVID-19 Preventive Measures** | | | | | **0.705 Ψ** |
| Poor Knowledge (0-2) | 4 | 3 (75) | 1 (25) | | |
| Adequate knowledge (3-5) | 221 | 105 (47.5) | 116 (52.5) | | |
| Excellent knowledge (6-8) | 78 | 39 (50) | 39 (50) | | |

**Ψ- Fisher's exact test**

**Table 9: Association between personality/psychological characteristics and adherence to HH**

| Variable | N | Non-adherent | Adherent | χ2 value | P-value |
|---|---|---|---|---|---|
| | | n (%) | n (%) | | |
| **Authorities recommended them, and I don't want problems with the law** | | | | **0.857** | **0.652** |
| Disagree | 95 | 49 (51.6) | 46 (48.4) | | |
| Neutral | 68 | 34 (50) | 34 (50) | | |
| Agree | 140 | 64 (45.7) | 76 (54.3) | | |
| **Others in my community are following, them so I have no option than to adhere** | | | | **0.892** | **0.64** |
| Disagree | 135 | 68 (50.4) | 67 (49.6) | | |
| Neutral | 97 | 48 (49.5) | 49 (50.5) | | |
| Agree | 71 | 31 (43.7) | 40 (56.3) | | |
| **I trust the preventive measures are helpful to end the pandemic** | | | | **2.526** | **0.283** |
| Disagree | 28 | 17 (60.7) | 11 (39.3) | | |
| Neutral | 76 | 39 (51.3) | 37 (48.7) | | |
| Agree | 199 | 91 (45.7) | 108 (54.3) | | |
| **I want to prevent the spread of COVID-19 to people close to me/ high risk persons** | | | | **3.472** | **0.176** |
| Disagree | 29 | 17 (58.6) | 12 (41.4) | | |
| Neutral | 61 | 34 (55.7) | 27 (44.3) | | |
| Agree | 213 | 96 (45.1) | 117 (54.9) | | |
| **I am afraid of contracting the disease/dying from it** | | | | **2.577** | **0.276** |
| Disagree | 84 | 47 (56) | 37 (44) | | |
| Neutral | 85 | 39 (45.9) | 46 (54.1) | | |
| Agree | 134 | 61 (45.5) | 73 (54.5) | | |
| **Desire for life to return to normal** | | | | **0.165** | **0.921** |
| Disagree | 23 | 12 (52.2) | 11 (47.8) | | |
| Neutral | 63 | 31 (49.2) | 32 (50.8) | | |
| Agree | 217 | 104 (47.9) | 113 (52.1) | | |
| **I feel responsible for my health** | | | | **2.83** | **0.243** |
| Disagree | 25 | 13 (52) | 12 (48) | | |
| Neutral | 57 | 33 (57.9) | 24 (42.1) | | |
| Agree | 221 | 101 (45.7) | 120 (54.3) | | |
| **I feel it is my civic responsibility as a citizen to adhere** | | | | **2.25** | **0.325** |
| Disagree | 37 | 22 (59.5) | 15 (40.5) | | |
| Neutral | 75 | 37 (49.3) | 38 (50.7) | | |
| Agree | 191 | 88 (46.1) | 103 (53.9) | | |
| **I do not think they are necessary to prevent the disease transmission** | | | | **3.146** | **0.207** |
| Disagree | 202 | 99 (49) | 103 (51) | | |
| Neutral | 56 | 31 (55.4) | 25 (44.6) | | |
| Agree | 45 | 17 (37.8) | 28 (62.2) | | |
| **There is adequate education on the preventive measures in my home and school communities** | | | | **0.215** | **0.898** |
| Disagree | 62 | 30 (48.4) | 32 (51.6) | | |
| Neutral | 83 | 42 (50.6) | 41 (49.4) | | |
| Agree | 158 | 75 (47.5) | 83 (52.5) | | |

### 4.6.2 Adherence to Respiratory Hygiene (RH) measures

For this category, only two respondents' personality/psychological characteristics were significantly associated with adherence. i.e., "I want to prevent the spread of COVID-19 to people close to me/ high risk persons" ($\chi2 = 9.499$, $p = 0.009$) and "I feel it is my

civic responsibility as a citizen" ($\chi 2$ = 6.926, p = 0.031). There was no significant association between sociodemographic factors, knowledge, risk perception and adherence to RH. The results are tabulated below:

**Table 10: Association between sociodemographic variables and adherence to RH measures**

| Variable | N | Non-adherent n (%) | Adherent n (%) | $\chi 2$ value | P-value |
|---|---|---|---|---|---|
| **Age group** | | | | **3.504** | **0.173** |
| 18 - 22 | 210 | 94 (44.8) | 116 (55.2) | | |
| 23 - 27 | 74 | 25 (33.8) | 49 (66.2) | | |
| >27 | 19 | 6 (31.6) | 13 (68.4) | | |
| **Sex** | | | | **1.033** | **0.309** |
| Male | 112 | 42 (37.5) | 70 (62.5) | | |
| Female | 191 | 83 (43.5) | 108 (56.5) | | |
| **Religious affiliation** | | | | **1.783** | **0.182** |
| Christian | 262 | 112 (42.7) | 150 (57.3) | | |
| Others | 41 | 13 (31.7) | 28 (68.3) | | |
| **College of study** | | | | **5.618** | **0.06** |
| Humanities | 262 | 115 (43.9) | 147 (56.1) | | |
| Basic and Applied Sciences | 19 | 5 (26.3) | 14 (73.7) | | |
| Education | 22 | 5 (22.7) | 17 (77.3) | | |
| **Level of study** | | | | **3.133** | **0.209** |
| 200 | 197 | 88 (44.7) | 109 (55.3) | | |
| 300 | 82 | 30 (36.6) | 52 (63.4) | | |
| 400 | 24 | 7 (29.2) | 17 (70.8) | | |
| **Relationship/marital status** | | | | **1.397** | **0.237** |
| Single | 232 | 100 (43.1) | 132 (56.9) | | |
| Dating/Married/Cohabitating | 71 | 25 (35.2) | 46 (64.8) | | |
| **Residence on campus** | | | | **0.673** | **0.412** |
| University Halls | 193 | 83 (43) | 110 (57) | | |
| University Hostels | 110 | 42 (38.2) | 68 (61.8) | | |
| **Number of roommates** | | | | **3.813** | **0.149** |
| 0 | 48 | 14 (29.2) | 34 (70.8) | | |
| 1-3 | 235 | 101 (43) | 134 (57) | | |
| >3 | 20 | 10 (50) | 10 (50) | | |
| **Average monthly upkeep amount (GHC)** | | | | **0.901** | **0.637** |
| <500 | 173 | 73 (42.2) | 100 (57.8) | | |
| 500-1000 | 114 | 44 (38.6) | 70 (61.4) | | |
| >1000 | 16 | 8 (50) | 8 (50) | | |
| **Mode of teaching and learning used by lecturers** | | | | **1.500** | **0.221** |
| Online only | 10 | 6 (60) | 4 (40) | | |
| Both online and in-person | 293 | 119 (40.6) | 174 (59.4) | | |

**Table 11: Association between knowledge of PM and RH adherence**

| Variable | N | Non-adherent n (%) | Adherent n (%) | $\chi 2$ value | P-value |
|---|---|---|---|---|---|
| **Knowledge Of COVID-19 Preventive Measures** | | | | | **0.451** Ψ |
| Poor Knowledge (0-2) | 4 | 3 (75) | 1 (25) | | |
| Adequate knowledge (3-5) | 221 | 91 (41.2) | 130 (58.8) | | |
| Excellent knowledge (6-8) | 78 | 31 (39.7) | 47 (60.3) | | |

**Ψ- Fisher's exact test**

**Table 12: Association between risk perception and adherence to RH measures**

| Variable | N | Non-adherent n (%) | Adherent n (%) | χ2 value | P-value |
|---|---|---|---|---|---|
| **History of comorbidities** | | | | **0.749** | **0.387** |
| No | 281 | 114 (40.6) | 167 (59.4) | | |
| Yes | 22 | 11 (50) | 11 (50) | | |
| **History of previous infection with COVID-19** | | | | **0.226** | **0.635** |
| No | 279 | 114 (40.9) | 165 (59.1) | | |
| Yes | 24 | 11 (45.8) | 13 (54.2) | | |
| **Knowing people in immediate social environment who have been infected with COVID-19** | | | | **0.427** | **0.514** |
| No | 207 | 88 (42.5) | 119 (57.5) | | |
| Yes | 96 | 37 (38.5) | 59 (61.5) | | |
| **Knowing someone who died from COVID-19** | | | | **3.245** | **0.072** |
| No | 250 | 109 (43.6) | 141 (56.4) | | |
| Yes | 53 | 16 (30.2) | 37 (69.8) | | |
| **Anxiety about getting COVID-19** | | | | **3.526** | **0.474** |
| I have never been worried at all | 37 | 12 (32.4) | 25 (67.6) | | |
| I was worried initially, but no more | 101 | 47 (46.5) | 54 (53.5) | | |
| I am neutral | 43 | 20 (46.5) | 23 (53.5) | | |
| Slightly worried | 44 | 16 (36.4) | 28 (63.6) | | |
| Extremely worried | 78 | 30 (38.5) | 48 (61.5) | | |
| **Vaccination status** | | | | **0.31** | **0.577** |
| Unvaccinated | 278 | 116 (41.7) | 162 (58.3) | | |
| Fully vaccinated | 25 | 9 (36) | 16 (64) | | |

**Table 13: Association between personality/psychological characteristics and RH adherence**

| Variable | N | Non-adherent n (%) | Adherent n (%) | χ2 value | P-value |
|---|---|---|---|---|---|
| **Authorities recommended them, and I don't want problems with the law** | | | | **1.509** | **0.47** |
| Disagree | 95 | 36 (37.9) | 59 (62.1) | | |
| Neutral | 68 | 26 (38.2) | 42 (61.8) | | |
| Agree | 140 | 63 (45) | 77 (55) | | |
| **Others in my community are following, them so I have no option than to adhere** | | | | **0.563** | **0.755** |
| Disagree | 135 | 54 (40) | 81 (60) | | |
| Neutral | 97 | 43 (44.3) | 54 (55.7) | | |
| Agree | 71 | 28 (39.4) | 43 (60.6) | | |
| **I trust the preventive measures are helpful to end the pandemic** | | | | **2.123** | **0.346** |
| Disagree | 28 | 15 (53.6) | 13 (46.4) | | |
| Neutral | 76 | 32 (42.1) | 44 (57.9) | | |
| Agree | 199 | 78 (39.2) | 121 (60.8) | | |
| **I want to prevent the spread of COVID-19 to people close to me/ high risk persons** | | | | **9.499** | **0.009*** |
| Disagree | 29 | 17 (58.6) | 12 (41.4) | | |
| Neutral | 61 | 32 (52.5) | 29 (47.5) | | |
| Agree | 213 | 76 (35.7) | 137 (64.3) | | |
| **I am afraid of contracting the disease/dying from it** | | | | **3.244** | **0.197** |
| Disagree | 84 | 32 (38.1) | 52 (61.9) | | |
| Neutral | 85 | 42 (49.4) | 43 (50.6) | | |
| Agree | 134 | 51 (38.1) | 83 (61.9) | | |

**Table 13 cont'd: Association between personality/psychological characteristics and RH adherence**

| | | | | | |
|---|---|---|---|---|---|
| **Desire for life to return to normal** | | | | **1.392** | **0.499** |
| Disagree | 23 | 11 (47.8) | 12 (52.2) | | |
| Neutral | 63 | 29 (46) | 34 (54) | | |
| Agree | 217 | 85 (39.2) | 132 (60.8) | | |
| **I feel responsible for my health** | | | | **2.45** | **0.294** |
| Disagree | 25 | 14 (56) | 11 (44) | | |
| Neutral | 57 | 23 (40.4) | 34 (59.6) | | |
| Agree | 221 | 88 (39.8) | 133 (60.2) | | |
| **I feel it is my civic responsibility as a citizen** | | | | **6.926** | **0.031*** |
| Disagree | 37 | 18 (48.6) | 19 (51.4) | | |
| Neutral | 75 | 39 (52) | 36 (48) | | |
| Agree | 191 | 68 (35.6) | 123 (64.4) | | |
| **I do not think they are necessary to prevent the disease transmission** | | | | **0.176** | **0.916** |
| Disagree | 202 | 85 (42.1) | 117 (57.9) | | |
| Neutral | 56 | 22 (39.3) | 34 (60.7) | | |
| Agree | 45 | 18 (40) | 27 (60) | | |
| **There is adequate education on the preventive measures in my home and school communities** | | | | **1.538** | **0.463** |
| Disagree | 62 | 27 (43.5) | 35 (56.5) | | |
| Neutral | 83 | 38 (45.8) | 45 (54.2) | | |
| Agree | 158 | 60 (38) | 98 (62) | | |

***Significant (p <0.05)**

### 4.6.3 Adherence to physical distancing measures

Sex ($\chi 2$ =4.15, p = 0.042), and history of previous infection with COVID-19 ($\chi 2$ = 3.984, p = 0.046) were the only factors significantly associated with PD adherence at 5% level of significance at the bivariate level. All other variables showed no significant association. The results are presented in the table below:

**Table 14: Association between sociodemographic variables and PD adherence**

| Variable | N | Non-adherent n (%) | Adherent n (%) | $\chi 2$ value | P-value |
|---|---|---|---|---|---|
| **Age** | | | | **0.299** | **0.861** |
| 18 - 22 | 210 | 166 (79) | 44 (21) | | |
| 23 - 27 | 74 | 58 (78.4) | 16 (21.6) | | |
| >27 | 19 | 14 (73.7) | 5 (26.3) | | |
| **Sex** | | | | **4.15** | **0.042*** |
| Male | 112 | 95 (84.8) | 17 (15.2) | | |
| Female | 191 | 143 (74.9) | 48 (25.1) | | |
| **Religious affiliation** | | | | **0.54** | **0.463** |
| Christian | 262 | 204 (77.9) | 58 (22.1) | | |
| Others | 41 | 34 (82.9) | 7 (17.1) | | |
| **College of study** | | | | **0.024** | **0.988** |
| Humanities | 262 | 206 (78.6) | 56 (21.4) | | |
| Basic and Applied Sciences | 19 | 15 (78.9) | 4 (21.1) | | |
| Education | 22 | 17 (77.3) | 5 (22.7) | | |

**Table 14 cont'd: Association between sociodemographic variables and PD adherence**

| | | | | | |
|---|---|---|---|---|---|
| **Level of study** | | | | **3.26** | **0.196** |
| 200 | 197 | 149 (75.6) | 48 (24.4) | | |
| 300 | 82 | 70 (85.4) | 12 (14.6) | | |
| 400 | 24 | 19 (79.2) | 5 (20.8) | | |
| **Relationship/marital status** | | | | **0.065** | **0.799** |
| Single | 232 | 183 (78.9) | 49 (21.1) | | |
| Dating/Married/Cohabitating | 71 | 55 (77.5) | 16 (22.5) | | |
| **Residence on campus** | | | | **0.014** | **0.907** |
| University Halls | 193 | 152 (78.8) | 41 (21.2) | | |
| University Hostels | 110 | 86 (78.2) | 24 (21.8) | | |
| **Number of roommates** | | | | **0.857** | **0.651** |
| 0 | 48 | 36 (75) | 12 (25) | | |
| 1-3 | 235 | 185 (78.7) | 50 (21.3) | | |
| >3 | 20 | 17 (85) | 3 (15) | | |
| **Average monthly upkeep amount (GHC)** | | | | **0.177** | **0.915** |
| <500 | 173 | 137 (79.2) | 36 (20.8) | | |
| 500-1000 | 114 | 89 (78.1) | 25 (21.9) | | |
| >1000 | 16 | 12 (75) | 4 (25) | | |
| **Mode of teaching and learning used by lecturers** | | | | **0.448** | **0.503** |
| Online only | 10 | 7 (70) | 3 (30) | | |
| Both online and in-person | 293 | 231 (78.8) | 62 (21.2) | | |
| **History of comorbidities** | | | | **0.023** | **0.88** |
| No | 281 | 221 (78.6) | 60 (21.4) | | |
| Yes | 22 | 17 (77.3) | 5 (22.7) | | |

**Table 15: Association between knowledge, risk perception and PD adherence**

| **Variable** | **N** | **Non-adherent n (%)** | **Adherent n (%)** | **$\chi$2 value** | **P-value** |
|---|---|---|---|---|---|
| **Knowledge Of COVID-19 Preventive Measures** | | | | | **0.705 Ψ** |
| Poor Knowledge (0-2) | 4 | 4 (100) | 0 (0) | | |
| Adequate knowledge (3-5) | 221 | 174 (78.7) | 47 (21.3) | | |
| Excellent knowledge (6-8) | 78 | 60 (76.9) | 18 (23.1) | | |
| **History of previous infection with COVID-19** | | | | **3.984** | **0.046*** |
| No | 279 | 223 (79.9) | 56 (20.1) | | |
| Yes | 24 | 15 (62.5) | 9 (37.5) | | |
| **Knowing people in immediate social environment who have been infected with COVID-19** | | | | **0.032** | **0.858** |
| No | 207 | 162 (78.3) | 45 (21.7) | | |
| Yes | 96 | 76 (79.2) | 20 (20.8) | | |
| **Do you know someone who died from COVID-19?** | | | | **0.019** | **0.892** |
| No | 250 | 196 (78.4) | 54 (21.6) | | |
| Yes | 53 | 42 (79.2) | 11 (20.8) | | |
| **Anxiety about getting COVID-19** | | | | **5.028** | **0.284** |
| I have never been worried | 37 | 33 (89.2) | 4 (10.8) | | |
| I was worried initially, but no more | 101 | 77 (76.2) | 24 (23.8) | | |
| I am neutral | 43 | 30 (69.8) | 13 (30.2) | | |
| Slightly worried | 44 | 35 (79.5) | 9 (20.5) | | |
| Extremely worried | 78 | 63 (80.8) | 15 (19.2) | | |
| **Vaccination status** | | | | **3.422** | **0.064** |
| Unvaccinated | 278 | 222 (79.9) | 56 (20.1) | | |
| Fully vaccinated | 25 | 16 (64) | 9 (36) | | |

***Significant (p <0.05); Ψ- Fisher's exact test**

**Table 16: Association between personality/psychological characteristics and PD adherence**

| Variable | N | Non-adherent n (%) | Adherent n (%) | χ2 value | P-value |
|---|---|---|---|---|---|
| **Authorities recommended them, and I don't want problems with the law** | | | | **0.692** | **0.707** |
| Disagree | 95 | 75 (78.9) | 20 (21.1) | | |
| Neutral | 68 | 51 (75) | 17 (25) | | |
| Agree | 140 | 112 (80) | 28 (20) | | |
| **Others in my community are following, them so I have no option than to adhere** | | | | **2.898** | **0.235** |
| Disagree | 135 | 112 (83) | 23 (17) | | |
| Neutral | 97 | 72 (74.2) | 25 (25.8) | | |
| Agree | 71 | 54 (76.1) | 17 (23.9) | | |
| **I trust the preventive measures are helpful to end the pandemic** | | | | **3.499** | **0.174** |
| Disagree | 28 | 22 (78.6) | 6 (21.4) | | |
| Neutral | 76 | 54 (71.1) | 22 (28.9) | | |
| Agree | 199 | 162 (81.4) | 37 (18.6) | | |
| **I want to prevent the spread of COVID-19 to people close to me/high risk persons** | | | | **4.245** | **0.12** |
| Disagree | 29 | 21 (72.4) | 8 (27.6) | | |
| Neutral | 61 | 43 (70.5) | 18 (29.5) | | |
| Agree | 213 | 174 (81.7) | 39 (18.3) | | |
| **I am afraid of contracting the disease/dying from it** | | | | **4.216** | **0.122** |
| Disagree | 84 | 72 (85.7) | 12 (14.3) | | |
| Neutral | 85 | 62 (72.9) | 23 (27.1) | | |
| Agree | 134 | 104 (77.6) | 30 (22.4) | | |
| **Desire for life to return to normal** | | | | **0.327** | **0.849** |
| Disagree | 23 | 17 (73.9) | 6 (26.1) | | |
| Neutral | 63 | 50 (79.4) | 13 (20.6) | | |
| Agree | 217 | 171 (78.8) | 46 (21.2) | | |
| **I feel responsible for my health** | | | | **3.237** | **0.198** |
| Disagree | 25 | 17 (68) | 8 (32) | | |
| Neutral | 57 | 42 (73.7) | 15 (26.3) | | |
| Agree | 221 | 179 (81) | 42 (19) | | |
| **I feel it is my civic responsibility as a citizen** | | | | **0.73** | **0.694** |
| Disagree | 37 | 31 (83.8) | 6 (16.2) | | |
| Neutral | 75 | 59 (78.7) | 16 (21.3) | | |
| Agree | 191 | 148 (77.5) | 43 (22.5) | | |
| **I do not think they are necessary to prevent the disease transmission** | | | | **4.993** | **0.082** |
| Disagree | 202 | 165 (81.7) | 37 (18.3) | | |
| Neutral | 56 | 38 (67.9) | 18 (32.1) | | |
| Agree | 45 | 35 (77.8) | 10 (22.2) | | |
| **There is adequate education on the preventive measures in my home and school communities** | | | | **1.671** | **0.434** |
| Disagree | 62 | 45 (72.6) | 17 (27.4) | | |
| Neutral | 83 | 66 (79.5) | 17 (20.5) | | |
| Agree | 158 | 127 (80.4) | 31 (19.6) | | |

### 4.7 Logistic regression models of factors associated with adherence to PM

#### 4.7.1 Factors associated with adherence to Hand Hygiene (HH) measures

When multiple logistic regression models were run, one risk perception item (anxiety about contracting COVID-19) was found to significantly influence adherence to HH measures. Those who said they were slightly worried about contracting the disease were 3.8 times more likely to adhere to HH than those who said they had never been worried about contracting the disease (AOR = 3.8, 95% CI = 1.28-11.00, p = 0.016). Also, those who said they were extremely worried about contracting the disease were 4.4 times more likely to adhere to HH than those who said they had never been worried about contracting the disease (AOR = 4.4, 95% CI = 1.44-13.59, p = 0.009).

In contrast to the results from bivariate analysis, there was no significant association between knowing someone who died from COVID-19, and adherence to HH. All the other IV assessed did had no significant associations with adherence to HH measures. The results are presented in the tables below:

**Table 17: Multiple logistic regression for sociodemographic variables and adherence to HH measures**

| Variable | Adherent n (%) | Non-adherent n (%) | cOR (95% CI) | AOR (95% CI) | p-value |
|---|---|---|---|---|---|
| **Age group** | | | | | |
| 18 - 22 | 94 (44.8) | 116 (55.2) | ref | ref | |
| 23 - 27 | 25 (33.8) | 49 (66.2) | 0.7 (0.4-1.2) | 0.6 (0.3-1.1) | 0.434 |
| >27 | 6 (31.6) | 13 (68.4) | 0.8 (0.3-1.9) | 0.7 (0.2-2.7) | 0.600 |
| **Sex** | | | | | |
| Male | 42 (37.5) | 70 (62.5) | ref | ref | |
| Female | 83 (43.5) | 108 (56.5) | 1.2 (0.8-2) | 1.3 (0.7-2.2) | 0.271 |
| **Religious affiliation** | | | | | |
| Christian | 112 (42.7) | 150 (57.3) | ref | ref | |
| Others | 13 (31.7) | 28 (68.3) | 1 (0.5-1.9) | 1.2 (0.6-2.7) | 0.322 |
| **College of study** | | | | | |
| Humanities | 115 (43.9) | 147 (56.1) | ref | ref | |
| Basic and Applied Sciences | 5 (26.3) | 14 (73.7) | 0.7 (0.3-1.8) | 0.5 (0.2-1.6) | 0.631 |
| Education | 5 (22.7) | 17 (77.3) | 1.4 (0.6-3.3) | 1.7 (0.6-4.9) | 0.229 |
| **Level of study** | | | | | |
| 200 | 88 (44.7) | 109 (55.3) | ref | ref | |
| 300 | 30 (36.6) | 52 (63.4) | 1 (0.6-1.6) | 1.2 (0.6-2.1) | 0.801 |
| 400 | 7 (29.2) | 17 (70.8) | 1.3 (0.6-3.1) | 2 (0.7-5.8) | 0.303 |

**Table 17 cont'd: Multiple logistic regression for sociodemographic variables and adherence to HH measures**

| | | | | | |
|---|---|---|---|---|---|
| **Relationship/marital status** | | | | | |
| Single | 100 (43.1) | 132 (56.9) | ref | ref | |
| Dating/Married/Cohabitating | 25 (35.2) | 46 (64.8) | 1 (0.6-1.8) | 1.1 (0.6-2.1) | 0.694 |
| **Residence on campus** | | | | | |
| University Halls | 83 (43) | 110 (57) | ref | ref | |
| University Hostels | 42 (38.2) | 68 (61.8) | 1.3 (0.8-2.1) | 1.5 (0.7-3) | 0.394 |
| **Number of roommates** | | | | | |
| 0 | 14 (29.2) | 34 (70.8) | ref | ref | |
| 1-3 | 101 (43) | 134 (57) | 0.9 (0.5-1.6) | 1.2 (0.5-2.9) | 0.636 |
| >3 | 10 (50) | 10 (50) | 1 (0.4-2.9) | 1.8 (0.5-7.3) | 0.33 |
| **Average monthly upkeep amount (GHC)** | | | | | |
| <500 | 73 (42.2) | 100 (57.8) | ref | ref | |
| 500-1000 | 44 (38.6) | 70 (61.4) | 1.1 (0.7-1.8) | 1.2 (0.6-2.2) | 0.916 |
| >1000 | 8 (50) | 8 (50) | 0.8 (0.3-2.1) | 0.5 (0.1-2.1) | 0.825 |
| **Mode of teaching and learning used by lecturers** | | | | | |
| Online only | 6 (60) | 4 (40) | ref | ref | |
| Both online and in-person | 119 (40.6) | 174 (59.4) | 1.1 (0.3-3.8) | 1.1 (0.2-5.1) | 0.761 |

**Table 18: Multiple logistic regression for knowledge of COVID-19 PM, risk perception and adherence to HH measures**

| Variable | Adherent n (%) | Non-adherent n (%) | cOR (95% CI) | AOR (95% CI) | p-value |
|---|---|---|---|---|---|
| **Knowledge of COVID-19 Preventive Measures** | | | | | |
| Poor Knowledge (0-2) | 3 (75) | 1 (25) | ref | ref | |
| Adequate knowledge (3-5) | 91 (41.2) | 130 (58.8) | 3.3 (0.3-32.4) | 1.5 (0.1-20.5) | 0.761 |
| Excellent knowledge (6-8) | 31 (39.7) | 47 (60.3) | 3 (0.3-30.1) | 1.4 (0.1-19.6) | 0.804 |
| **History of comorbidities** | | | | | |
| No | 114 (40.6) | 167 (59.4) | ref | ref | |
| Yes | 11 (50) | 11 (50) | 0.9 (0.4-2.2) | 1.1 (0.4-3) | 0.825 |
| **History of previous infection with COVID-19** | | | | | |
| No | 114 (40.9) | 165 (59.1) | ref | ref | |
| Yes | 11 (45.8) | 13 (54.2) | 0.8 (0.3-1.8) | 0.7 (0.2-1.9) | 0.462 |
| **Knowing people in immediate social environment who have been infected with COVID-19** | | | | | |
| No | 88 (42.5) | 119 (57.5) | ref | ref | |
| Yes | 37 (38.5) | 59 (61.5) | 1.2 (0.8-2) | 1.3 (0.7-2.4) | 0.363 |
| **Do you know someone who died from COVID-19?** | | | | | |
| No | 109 (43.6) | 141 (56.4) | ref | ref | |
| Yes | 16 (30.2) | 37 (69.8) | 1.9 (1-3.5) | 1.6 (0.8-3.4) | 0.213 |
| **Anxiety about getting COVID-19** | | | | | |
| I have never been worried | 12 (32.4) | 25 (67.6) | ref | ref | |
| I was worried initially, but no more | 47 (46.5) | 54 (53.5) | 1.7 (0.8-3.6) | 1.9 (0.7-5.2) | 0.199 |
| I am neutral | 20 (46.5) | 23 (53.5) | 1.6 (0.7-4) | 1.4 (0.4-4.5) | 0.604 |
| Slightly worried | 16 (36.4) | 28 (63.6) | 2.9 (1.2-7.3) | 3.8 (1.3-11) | 0.016* |
| Extremely worried | 30 (38.5) | 48 (61.5) | 3 (1.3-6.7) | 4.4 (1.4-13.6) | 0.009* |
| **Vaccination status** | | | | | |
| Unvaccinated | 116 (41.7) | 162 (58.3) | ref | ref | |
| Fully vaccinated | 9 (36) | 16 (64) | 0.9 (0.4-1.9) | 0.9 (0.4-2.5) | 0.918 |

***Significant (p <0.05)**

**Table 19: Multiple logistic regression for knowledge of COVID-19 PM, risk perception and adherence to HH measures**

| Variable | Adherent n (%) | Non-adherent n (%) | cOR (95% CI) | AOR (95% CI) | p-value |
|---|---|---|---|---|---|
| **Authorities recommended them, and I don't want problems with the law** | | | | | |
| Disagree | 36 (37.9) | 59 (62.1) | ref | ref | |
| Neutral | 26 (38.2) | 42 (61.8) | 1.1 (0.6-2) | 1.9 (0.7-5.3) | 0.195 |
| Agree | 63 (45) | 77 (55) | 1.3 (0.8-2.1) | 1.1 (0.6-2.2) | 0.740 |
| **Others in my community are following, them so I have no option than to adhere** | | | | | |
| Disagree | 54 (40) | 81 (60) | ref | ref | |
| Neutral | 43 (44.3) | 54 (55.7) | 1 (0.6-1.7) | 0.8 (0.4-1.7) | 0.545 |
| Agree | 28 (39.4) | 43 (60.6) | 1.3 (0.7-2.3) | 1 (0.4-2.1) | 0.926 |
| **I trust the preventive measures are helpful to end the pandemic** | | | | | |
| Disagree | 15 (53.6) | 13 (46.4) | ref | ref | |
| Neutral | 32 (42.1) | 44 (57.9) | 1.5 (0.6-3.5) | 4.2 (0.9-20.7) | 0.077 |
| Agree | 78 (39.2) | 121 (60.8) | 1.8 (0.8-4.1) | 5.2 (1-27.1) | 0.051 |
| **I want to prevent the spread of COVID-19 to people close to me/ high risk persons** | | | | | |
| Disagree | 17 (58.6) | 12 (41.4) | ref | ref | |
| Neutral | 32 (52.5) | 29 (47.5) | 1.1 (0.5-2.8) | 0.7 (0.1-3.4) | 0.669 |
| Agree | 76 (35.7) | 137 (64.3) | 1.7 (0.8-3.8) | 1.4 (0.4-5.5) | 0.600 |
| **I am afraid of contracting the disease/dying from it** | | | | | |
| Disagree | 32 (38.1) | 52 (61.9) | ref | ref | |
| Neutral | 42 (49.4) | 43 (50.6) | 1.5 (0.8-2.7) | 1.6 (0.6-4.2) | 0.349 |
| Agree | 51 (38.1) | 83 (61.9) | 1.5 (0.9-2.6) | 0.7 (0.3-1.8) | 0.518 |
| **Desire for life to return to normal** | | | | | |
| Disagree | 11 (47.8) | 12 (52.2) | ref | ref | |
| Neutral | 29 (46) | 34 (54) | 1.1 (0.4-2.9) | 0.5 (0.1-2.7) | 0.428 |
| Agree | 85 (39.2) | 132 (60.8) | 1.2 (0.5-2.8) | 0.4 (0.1-1.8) | 0.218 |
| **I feel responsible for my health** | | | | | |
| Disagree | 14 (56) | 11 (44) | ref | ref | |
| Neutral | 23 (40.4) | 34 (59.6) | 0.8 (0.3-2) | 0.3 (0.1-1.6) | 0.161 |
| Agree | 88 (39.8) | 133 (60.2) | 1.3 (0.6-2.9) | 0.5 (0.1-2.6) | 0.426 |
| **I feel it is my civic responsibility as a citizen** | | | | | |
| Disagree | 18 (48.6) | 19 (51.4) | ref | ref | |
| Neutral | 39 (52) | 36 (48) | 1.5 (0.7-3.3) | 2.2 (0.6-7.7) | 0.214 |
| Agree | 68 (35.6) | 123 (64.4) | 1.7 (0.8-3.5) | 1.9 (0.7-5.7) | 0.231 |
| **I do not think they are necessary to prevent the disease transmission** | | | | | |
| Disagree | 85 (42.1) | 117 (57.9) | ref | ref | |
| Neutral | 22 (39.3) | 34 (60.7) | 0.8 (0.4-1.4) | 1 (0.3-3.1) | 0.989 |
| Agree | 18 (40) | 27 (60) | 1.6 (0.8-3.1) | 2.4 (0.9-6.3) | 0.071 |
| **There is adequate education on the preventive measures in my home and school communities** | | | | | |
| Disagree | 27 (43.5) | 35 (56.5) | ref | ref | |
| Neutral | 38 (45.8) | 45 (54.2) | 0.9 (0.5-1.8) | 0.8 (0.3-2) | 0.669 |
| Agree | 60 (38) | 98 (62) | 1 (0.6-1.9) | 0.8 (0.4-1.8) | 0.634 |

### 4.7.2 Factors associated with adherence to respiratory hygiene (RH) measures

For RH, none of respondents' sociodemographic characteristics, risk perception, knowledge of PM nor personality/psychological characteristics significantly influenced adherence when multiple logistic regression models were run. The results are tabulated below:

**Table 20: Multiple logistic regression for sociodemographic variables and adherence to RH measures**

| Variable | Adherent n (%) | Non-adherent n (%) | cOR (95% CI) | AOR (95% CI) | P-value |
|---|---|---|---|---|---|
| **Age group** | | | | | |
| 18 - 22 | 94 (44.8) | 116 (55.2) | ref | ref | |
| 23 - 27 | 25 (33.8) | 49 (66.2) | 1.6 (0.91-2.76) | 1.3 (0.69-2.58) | 0.399 |
| >27 | 6 (31.6) | 13 (68.4) | 1.8 (0.64-4.8) | 2.4 (0.51-11.34) | 0.264 |
| **Sex** | | | | | |
| Male | 42 (37.5) | 70 (62.5) | ref | ref | |
| Female | 83 (43.5) | 108 (56.5) | 0.8 (0.48-1.26) | 0.8 (0.47-1.54) | 0.586 |
| **Religious affiliation** | | | | | |
| Christian | 112 (42.7) | 150 (57.3) | ref | ref | |
| Others | 13 (31.7) | 28 (68.3) | 1.6 (0.8-3.24) | 1.6 (0.69-3.82) | 0.263 |
| **College of study** | | | | | |
| Humanities | 115 (43.9) | 147 (56.1) | ref | ref | |
| Basic and Applied Sciences | 5 (26.3) | 14 (73.7) | 2.2 (0.77-6.26) | 2.9 (0.77-10.66) | 0.116 |
| Education | 5 (22.7) | 17 (77.3) | 2.7 (0.95-7.42) | 2.6 (0.75-9.23) | 0.129 |
| **Level of study** | | | | | |
| 200 | 88 (44.7) | 109 (55.3) | ref | ref | |
| 300 | 30 (36.6) | 52 (63.4) | 1.4 (0.82-2.38) | 1.3 (0.7-2.52) | 0.39 |
| 400 | 7 (29.2) | 17 (70.8) | 2 .0 (0.78-4.94) | 1.9 (0.61-6.12) | 0.265 |
| **Relationship/marital status** | | | | | |
| Single | 100 (43.1) | 132 (56.9) | ref | ref | |
| Dating/Married/Cohabitating | 25 (35.2) | 46 (64.8) | 1.4 (0.8-2.42) | 1.4 (0.73-2.85) | 0.287 |
| **Residence on campus** | | | | | |
| University Halls | 83 (43) | 110 (57) | ref | ref | |
| University Hostels | 42 (38.2) | 68 (61.8) | 1.2 (0.76-1.97) | 1.3 (0.6-2.71) | 0.524 |
| **Number of roommates** | | | | | |
| 0 | 14 (29.2) | 34 (70.8) | ref | ref | |
| 1-3 | 101 (43) | 134 (57) | 0.5 (0.28-1.07) | 0.5 (0.2-1.34) | 0.173 |
| >3 | 10 (50) | 10 (50) | 0.4 (0.14-1.21) | 0.5 (0.11-1.85) | 0.27 |
| **Average monthly upkeep amount (GHC)** | | | | | |
| <500 | 73 (42.2) | 100 (57.8) | ref | ref | |
| 500-1000 | 44 (38.6) | 70 (61.4) | 1.2 (0.72-1.88) | 0.9 (0.49-1.81) | 0.863 |
| >1000 | 8 (50) | 8 (50) | 0.7 (0.26-2.04) | 0.2 (0.04-1.11) | 0.066 |
| **Mode of teaching and learning used by lecturers** | | | | | |
| Online only | 6 (60) | 4 (40) | ref | ref | |
| Both online and in-person | 119 (40.6) | 174 (59.4) | 2.2 (0.61-7.94) | 2.9 (0.54-15.74) | 0.214 |

**Table 21: Multiple logistic regression for knowledge of COVID-19 PM, risk perception and adherence to RH measures**

| Variable | Adherent n (%) | Non-adherent n (%) | cOR (95% CI) | AOR (95% CI) | P-value |
|---|---|---|---|---|---|
| **Knowledge of COVID-19 Preventive Measures** | | | | | |
| Poor Knowledge (0-2) | 3 (75) | 1 (25) | ref | ref | |
| Adequate knowledge (3-5) | 91 (41.2) | 130 (58.8) | 4.3 (0.44-41.86) | 6 (0.4-90) | 0.196 |
| Excellent knowledge (6-8) | 31 (39.7) | 47 (60.3) | 4.5 (0.45-45.74) | 6.8 (0.44-105.99) | 0.172 |

**Table 22: Multiple logistic regression for risk perception and adherence to RH measures**

| Variable | Adherent n (%) | Non-adherent n (%) | cOR (95% CI) | AOR (95% CI) | P-value |
|---|---|---|---|---|---|
| **History of comorbidities** | | | | | |
| No | 114 (40.6) | 167 (59.4) | ref | ref | |
| Yes | 11 (50) | 11 (50) | 0.7 (0.29-1.63) | 0.6 (0.21-1.67) | 0.318 |
| **History of previous infection with COVID-19** | | | | | |
| No | 114 (40.9) | 165 (59.1) | ref | ref | |
| Yes | 11 (45.8) | 13 (54.2) | 0.8 (0.35-1.89) | 0.9 (0.3-2.65) | 0.831 |
| **Knowing people in immediate social environment who have been infected with COVID-19** | | | | | |
| No | 88 (42.5) | 119 (57.5) | ref | ref | |
| Yes | 37 (38.5) | 59 (61.5) | 1.2 (0.72-1.93) | 1.1 (0.58-1.98) | 0.836 |
| **Do you know someone who died from COVID-19?** | | | | | |
| No | 109 (43.6) | 141 (56.4) | ref | ref | |
| Yes | 16 (30.2) | 37 (69.8) | 1.8 (0.94-3.38) | 1.5 (0.69-3.36) | 0.299 |
| **Anxiety about getting COVID-19** | | | | | |
| I have never been worried | 12 (32.4) | 25 (67.6) | ref | ref | |
| I was worried initially, but no more | 47 (46.5) | 54 (53.5) | 0.6 (0.25-1.22) | 0.4 (0.15-1.31) | 0.144 |
| I am neutral | 20 (46.5) | 23 (53.5) | 0.6 (0.22-1.37) | 0.4 (0.12-1.51) | 0.188 |
| Slightly worried | 16 (36.4) | 28 (63.6) | 0.8 (0.33-2.11) | 0.8 (0.26-2.69) | 0.77 |
| Extremely worried | 30 (38.5) | 48 (61.5) | 0.8 (0.34-1.75) | 0.6 (0.19-2.04) | 0.436 |
| **Vaccination status** | | | | | |
| Unvaccinated | 116 (41.7) | 162 (58.3) | ref | ref | |
| Fully vaccinated | 9 (36) | 16 (64) | 1.3 (0.54-2.98) | 1 (0.34-3.2) | 0.935 |

**Table 23: Multiple logistic regression for risk perception and adherence to RH measures**

| Variable | Adherent n (%) | Non-adherent n (%) | cOR (95% CI) | AOR (95% CI) | P-value |
|---|---|---|---|---|---|
| **Authorities recommended them, and I don't want problems with the law** | | | | | |
| Disagree | 36 (37.9) | 59 (62.1) | ref | ref | |
| Neutral | 26 (38.2) | 42 (61.8) | 1 (0.52-1.87) | 1 (0.33-2.76) | 0.927 |
| Agree | 63 (45) | 77 (55) | 0.7 (0.44-1.27) | 0.6 (0.3-1.2) | 0.127 |
| **Others in my community are following, them so I have no option than to adhere** | | | | | |
| Disagree | 54 (40) | 81 (60) | ref | ref | |
| Neutral | 43 (44.3) | 54 (55.7) | 0.8 (0.49-1.42) | 1.1 (0.48-2.48) | 0.84 |
| Agree | 28 (39.4) | 43 (60.6) | 1 (0.57-1.84) | 0.9 (0.4-2.14) | 0.853 |
| **I trust the preventive measures are helpful to end the pandemic** | | | | | |
| Disagree | 15 (53.6) | 13 (46.4) | ref | ref | |
| Neutral | 32 (42.1) | 44 (57.9) | 1.6 (0.66-3.79) | 1.7 (0.34-8.21) | 0.527 |
| Agree | 78 (39.2) | 121 (60.8) | 1.8 (0.81-3.97) | 1.8 (0.34-9.1) | 0.503 |
| **I want to prevent the spread of COVID-19 to people close to me/ high risk persons** | | | | | |
| Disagree | 17 (58.6) | 12 (41.4) | ref | ref | |
| Neutral | 32 (52.5) | 29 (47.5) | 1.3 (0.53-3.14) | 0.5 (0.1-2.55) | 0.406 |
| Agree | 76 (35.7) | 137 (64.3) | 2.6 (1.16-5.63) | 1.9 (0.49-7.43) | 0.355 |
| **I am afraid of contracting the disease/dying from it** | | | | | |
| Disagree | 32 (38.1) | 52 (61.9) | ref | ref | |
| Neutral | 42 (49.4) | 43 (50.6) | 0.6 (0.34-1.16) | 0.8 (0.27-2.06) | 0.579 |
| Agree | 51 (38.1) | 83 (61.9) | 1 (0.57-1.76) | 1 (0.38-2.54) | 0.965 |
| **Desire for life to return to normal** | | | | | |
| Disagree | 11 (47.8) | 12 (52.2) | ref | ref | |
| Neutral | 29 (46) | 34 (54) | 1.1 (0.41-2.8) | 0.8 (0.15-4.44) | 0.812 |
| Agree | 85 (39.2) | 132 (60.8) | 1.4 (0.6-3.37) | 0.7 (0.15-3.13) | 0.618 |

**Table 23 cont'd: Multiple logistic regression for personality/psychological characteristics and adherence to RH measures**

| | | | | | |
|---|---|---|---|---|---|
| **I feel responsible for my health** | | | | | |
| Disagree | 14 (56) | 11 (44) | ref | ref | |
| Neutral | 23 (40.4) | 34 (59.6) | 1.9 (0.73-4.87) | 2.1 (0.4-11.2) | 0.376 |
| Agree | 88 (39.8) | 133 (60.2) | 1.9 (0.84-4.43) | 1.2 (0.25-5.51) | 0.846 |
| **I feel it is my civic responsibility as a citizen** | | | | | |
| Disagree | 18 (48.6) | 19 (51.4) | ref | ref | |
| Neutral | 39 (52) | 36 (48) | 0.9 (0.4-1.92) | 1.1 (0.3-4.05) | 0.832 |
| Agree | 68 (35.6) | 123 (64.4) | 1.7 (0.84-3.48) | 2.3 (0.77-6.59) | 0.139 |
| **I do not think they are necessary to prevent the disease transmission** | | | | | |
| Disagree | 85 (42.1) | 117 (57.9) | ref | ref | |
| Neutral | 22 (39.3) | 34 (60.7) | 1.1 (0.61-2.06) | 2.2 (0.63-7.4) | 0.223 |
| Agree | 18 (40) | 27 (60) | 1.1 (0.56-2.11) | 1 (0.38-2.66) | 0.982 |
| **There is adequate education on the preventive measures in my home and school communities** | | | | | |
| Disagree | 27 (43.5) | 35 (56.5) | ref | ref | |
| Neutral | 38 (45.8) | 45 (54.2) | 0.9 (0.47-1.77) | 0.8 (0.33-2.02) | 0.667 |
| Agree | 60 (38) | 98 (62) | 1.3 (0.69-2.29) | 1.3 (0.56-2.88) | 0.575 |

***Significant (p <0.05)**

### 4.7.3 Factors associated with adherence to physical distancing (PD) measures

Due to a knowledge category frequency of zero, a penalized binary logistic regression model instead of multiple logistic regression was run at the multivariate level to determine factors associated with adherence to PD. This found no significant associations between any of the independent variables and adherence to PD. The results are tabulated below:

**Table 24: Penalized binary logistic regression for sociodemographic variables and adherence to PD measures**

| Variable | Adherent n (%) | Non-adherent n (%) | cOR (95% CI) | AOR (95% CI) | P-value |
|---|---|---|---|---|---|
| **Age group** | | | | | |
| 18 - 22 | 94 (44.8) | 116 (55.2) | ref | ref | |
| 23 - 27 | 25 (33.8) | 49 (66.2) | 1.1 (0.56-2) | 1.2 (0.61-2.49) | 0.552 |
| >27 | 6 (31.6) | 13 (68.4) | 1.4 (0.5-4) | 1.4 (0.31-6.79) | 0.638 |
| **Sex** | | | | | |
| Male | 42 (37.5) | 70 (62.5) | ref | ref | |
| Female | 83 (43.5) | 108 (56.5) | 1.8 (1.01-3.38) | 1.7 (0.87-3.38) | 0.121 |
| **Religious affiliation** | | | | | |
| Christian | 112 (42.7) | 150 (57.3) | ref | ref | |
| Others | 13 (31.7) | 28 (68.3) | 0.8 (0.33-1.76) | 0.7 (0.27-1.69) | 0.401 |
| **College of study** | | | | | |
| Humanities | 115 (43.9) | 147 (56.1) | ref | ref | |
| Basic and Applied Sciences | 5 (26.3) | 14 (73.7) | 1.1 (0.36-3.16) | 1.3 (0.38-4.36) | 0.694 |
| Education | 5 (22.7) | 17 (77.3) | 1.1 (0.42-3.13) | 0.9 (0.3-2.72) | 0.860 |

**Table 24 cont'd: Penalized binary logistic regression for sociodemographic variables and adherence to PD measures**

| | | | | | |
|---|---|---|---|---|---|
| **Level of study** | | | | | |
| 200 | 88 (44.7) | 109 (55.3) | ref | ref | |
| 300 | 30 (36.6) | 52 (63.4) | 0.5 (0.28-1.08) | 0.6 (0.32-1.34) | 0.241 |
| 400 | 7 (29.2) | 17 (70.8) | 0.9 (0.32-2.36) | 1 (0.31-3.44) | 0.963 |
| **Relationship/marital status** | | | | | |
| Single | 100 (43.1) | 132 (56.9) | ref | ref | |
| Dating/Married/Cohabitating | 25 (35.2) | 46 (64.8) | 1.1 (0.59-2.08) | 0.8 (0.38-1.71) | 0.580 |
| **Residence on campus** | | | | | |
| University Halls | 83 (43) | 110 (57) | ref | ref | |
| University Hostels | 42 (38.2) | 68 (61.8) | 1 (0.59-1.83) | 1 (0.33-1.63) | 0.445 |
| **Number of roommates** | | | | | |
| 0 | 14 (29.2) | 34 (70.8) | ref | ref | |
| 1-3 | 101 (43) | 134 (57) | 0.8 (0.39-1.62) | 0.8 (0.31-2.09) | 0.653 |
| >3 | 10 (50) | 10 (50) | 0.6 (0.16-2.18) | 0.6 (0.14-2.94) | 0.562 |
| **Average monthly upkeep amount (GHC)** | | | | | |
| <500 | 73 (42.2) | 100 (57.8) | ref | ref | |
| 500-1000 | 44 (38.6) | 70 (61.4) | 1.1 (0.61-1.9) | 1.1 (0.53-2.11) | 0.869 |
| >1000 | 8 (50) | 8 (50) | 1.4 (0.43-4.23) | 0.9 (0.2-5.15) | 0.945 |
| **Mode of teaching and learning used by lecturers** | | | | | |
| Online only | 6 (60) | 4 (40) | ref | ref | |
| Both online and in-person | 119 (40.6) | 174 (59.4) | 0.6 (0.16-2.12) | 0.9 (0.17-4) | 0.867 |

**Table 25: Penalized binary logistic regression for Knowledge of PM, risk perception and adherence to PD measures**

| Variable | Adherent n (%) | Non-adherent n (%) | cOR (95% CI) | AOR (95% CI) | P-value |
|---|---|---|---|---|---|
| **Knowledge of COVID-19 Preventive measures** | | | | | |
| Poor Knowledge (0-2) | 3 (75) | 1 (25) | ref | ref | ref |
| Adequate knowledge (3-5) | 91 (41.2) | 130 (58.8) | 2.4 (0.13-46.31) | 4.6 (0.19-111.21) | 0.351 |
| Excellent knowledge (6-8) | 31 (39.7) | 47 (60.3) | 2.8 (0.14-53.5) | 5.34 (0.21-136.09) | 0.309 |
| **History of comorbidities** | | | | | |
| No | 114 (40.6) | 167 (59.4) | ref | ref | |
| Yes | 11 (50) | 11 (50) | 1.2 (0.42-3.13) | 1 (0.33-3.33) | 0.938 |
| **History of previous infection with COVID-19** | | | | | |
| No | 114 (40.9) | 165 (59.1) | ref | ref | |
| Yes | 11 (45.8) | 13 (54.2) | 2.4 (1.03-5.72) | 3 (0.98-8.99) | 0.055 |
| **Knowing people in immediate social environment who have been infected with COVID-19** | | | | | |
| No | 88 (42.5) | 119 (57.5) | ref | ref | |
| Yes | 37 (38.5) | 59 (61.5) | 1 (0.53-1.72) | 0.8 (0.39-1.52) | 0.449 |
| **Do you know someone who died from COVID-19?** | | | | | |
| No | 109 (43.6) | 141 (56.4) | ref | ref | |
| Yes | 16 (30.2) | 37 (69.8) | 1 (0.48-2) | 1.1 (0.48-2.46) | 0.837 |
| **Anxiety about getting COVID-19** | | | | | |
| I have never been worried | 12 (32.4) | 25 (67.6) | ref | ref | |
| I was worried initially, but no more | 47 (46.5) | 54 (53.5) | 2.4 (0.8-6.96) | 1.2 (0.35-4.12) | 0.764 |
| I am neutral | 20 (46.5) | 23 (53.5) | 3.3 (1.02-10.66) | 2.2 (0.58-8.69) | 0.243 |
| Slightly worried | 16 (36.4) | 28 (63.6) | 2 (0.59-6.73) | 1.2 (0.31-4.62) | 0.786 |
| Extremely worried | 30 (38.5) | 48 (61.5) | 1.8 (0.59-5.62) | 0.8 (0.22-3.26) | 0.807 |
| **Vaccination status** | | | | | |
| Unvaccinated | 116 (41.7) | 162 (58.3) | ref | ref | |
| Fully vaccinated | 9 (36) | 16 (64) | 2.3 (0.97-5.3) | 2.2 (0.8-6.1) | 0.127 |

**Table 26: Penalized binary logistic regression for personality/psychological characteristics and adherence to PD measures**

| Variable | Adherent n (%) | Non-adherent n (%) | cOR (95% CI) | AOR (95% CI) | P-value |
|---|---|---|---|---|---|
| **Authorities recommended them, and I don't want problems with the law** | | | | | |
| Disagree | 36 (37.9) | 59 (62.1) | ref | ref | |
| Neutral | 26 (38.2) | 42 (61.8) | 1.3 (0.6-2.6) | 1.1 (0.35-3.37) | 0.895 |
| Agree | 63 (45) | 77 (55) | 0.9 (0.49-1.77) | 1 (0.46-2.31) | 0.943 |
| **Others in my community are following, them so I have no option than to adhere** | | | | | |
| Disagree | 54 (40) | 81 (60) | ref | ref | |
| Neutral | 43 (44.3) | **54 (55.7)** | 1.7 (0.89-3.17) | 1.7 (0.7-4) | 0.212 |
| Agree | 28 (39.4) | 43 (60.6) | 1.5 (0.76-3.11) | 1.2 (0.48-2.93) | 0.708 |
| **I trust the preventive measures are helpful to end the pandemic** | | | | | |
| Disagree | 15 (53.6) | 13 (46.4) | ref | ref | |
| Neutral | 32 (42.1) | 44 (57.9) | 1.5 (0.53-4.18) | 1.7 (0.3-11) | 0.558 |
| Agree | 78 (39.2) | 121 (60.8) | 0.8 (0.32-2.21) | 1.7 (0.24-12.18) | 0.589 |
| **I want to prevent the spread of COVID-19 to people close to me/ high risk persons** | | | | | |
| Disagree | 17 (58.6) | 12 (41.4) | ref | ref | |
| Neutral | 32 (52.5) | 29 (47.5) | 1.1 (0.41-2.94) | 1.5 (0.26-8.42) | 0.665 |
| Agree | 76 (35.7) | 137 (64.3) | 0.6 (0.24-1.43) | 0.9 (0.21-4.37) | 0.946 |
| **I am afraid of contracting the disease/dying from it** | | | | | |
| Disagree | 32 (38.1) | 52 (61.9) | ref | ref | |
| Neutral | 42 (49.4) | **43 (50.6)** | 2.2 (1.02-4.84) | 1.6 (0.55-4.61) | 0.386 |
| Agree | 51 (38.1) | 83 (61.9) | 1.7 (0.83-3.61) | 1.8 (0.62-5.11) | 0.282 |
| **Desire for life to return to normal** | | | | | |
| Disagree | 11 (47.8) | 12 (52.2) | ref | ref | |
| Neutral | 29 (46) | 34 (54) | 0.7 (0.24-2.24) | 0.4 (0.07-2.2) | 0.287 |
| Agree | 85 (39.2) | 132 (60.8) | 0.8 (0.28-2.04) | 0.8 (0.17-3.52) | 0.728 |
| **I feel responsible for my health** | | | | | |
| Disagree | 14 (56) | 11 (44) | ref | ref | |
| Neutral | 23 (40.4) | 34 (59.6) | 0.8 (0.27-2.12) | 0.3 (0-1.8) | 0.181 |
| Agree | 88 (39.8) | 133 (60.2) | 0.5 (0.2-1.23) | #REF! | 0.188 |
| **I feel it is my civic responsibility as a citizen** | | | | | |
| Disagree | 18 (48.6) | 19 (51.4) | ref | ref | |
| Neutral | 39 (52) | **36 (48)** | 1.4 (0.5-3.94) | 1 (0.23-4.66) | 0.965 |
| Agree | 68 (35.6) | 123 (64.4) | 1.5 (0.59-3.83) | 0.3 (0.06-1.75) | 0.734 |
| **I do not think they are necessary to prevent the disease transmission** | | | | | |
| Disagree | 85 (42.1) | 117 (57.9) | ref | ref | |
| Neutral | 22 (39.3) | 34 (60.7) | 2.1 (1.09-4.11) | 2.7 (0.82-9.18) | 0.101 |
| Agree | 18 (40) | 27 (60) | 1.3 (0.58-2.8) | 1.5 (0.54-3.98) | 0.448 |
| **There is adequate education on the preventive measures in my home and school communities** | | | | | |
| Disagree | 27 (43.5) | 35 (56.5) | ref | ref | |
| Neutral | 38 (45.8) | 45 (54.2) | 0.7 (0.32-1.48) | 0.7 (0.25-1.76) | 0.416 |
| Agree | 60 (38) | 98 (62) | 0.6 (0.33-1.28) | 0.9 (0.4-2.17) | 0.863 |

# CHAPTER 5

# DISCUSSION

## 5.1 Knowledge of COVID-19 preventive measures among undergraduate students of University of Ghana

The results of this study showed that almost three quarters of UG undergraduate students had adequate/average knowledge of the common COVID-19 preventive measures. This is much lower than over 90% found from a study among residents of Northern Ghana by Saba et al in 2020, and in China (Zhong et al, 2020), but slightly higher than the findings from Adu et al., (2020), where 69% of Ghanaian health trainees had average levels of knowledge of the disease, albeit measuring their knowledge of the cause, mode of transmission, symptoms, preventive measures, and their risk perception of the disease.

This high level of adequate knowledge of the COVID-19 preventive measures among UG undergraduate students could be due to repeated education on the PM as the pandemic has raged on for almost two years now. Prior to data collection, Ghana had already experienced two waves of the disease, the latest in May/June 2021. This saw the government and the University of Ghana re-iterating and reinforcing the preventive measures. The University of Ghana also intensified stricter enforcement of the preventive measures on campus. Thus gradually, as the disease has become common knowledge, so have the preventive measures.

### 5.2 Adherence to COVID-19 preventive measures among undergraduate students of University of Ghana

In this study, less than three out of ten students were adhering to over 75% the preventive measures assessed. This is much lower than the 55.1% adherence level found in a 2020 Bangladeshi study among 2,017 residents by Ferdous et al., which assessed residents' knowledge, attitude, and practices (KAP) regarding the COVID-19 outbreak in the country. Again, this study found an adherence level of 8.9% and 21.5% respectively to hand hygiene and physical distancing measures, and a 59.1% adherence rate to respiratory hygiene measures. Compared to HH and PD, adherence was highest for RH probably due to the "No mask, No entry" policy adopted by the university and various commercial entities across the country. Notwithstanding, these low adherence levels to the PM were unsurprising from the mostly youthful UG undergraduate sample aged between 18-25 years, as various studies have found adherence to the COVID-19 PM to be low among adolescents and younger adults (Ebrahimi, et al., 2020; Ningsih, et al., 2021, Faria de Moura Villela, et al., 2021, Nguyen et al., 2020, Fielmua, et al., 2021).

Furthermore, anecdotal evidence from around the country reveals that adherence to the PM has waned significantly across the country (and on UG campus), especially physical distancing measures. This is further worsened as the citizenry see the older generation and authorities who they expect to lead by example, flagrantly disregard the PM instead. Currently, many commercial and business places have eased up on enforcement of the PM, and many Ghanaians have come to believe that COVID-19 is here to stay. Coupled with that is the erroneous perception of being invincible to COVID-19 post-vaccination, as vaccination rates have appreciated significantly especially among the educated

community. GHS reports that as of February 10, 2022 it had achieved 23.4% of its twenty million fully vaccinated target, while 43% had received at least one dose. (GHS, 2022).

Also, in most of Europe and North America where the PM were strictly enforced for a long time, restrictions have gradually been eased as vaccination rates have increased, with many governments accepting that COVID-19 is here to stay.

There is also a flood of deep-seated misinformation and conspiracy theories spewed all over social media platforms, which coincidentally have a very high adolescent and youthful audience, nullifying the university's periodic reminders and efforts at promoting adherence to the PM.

### 5.2.1 Adherence to Hand hygiene

Adherence was higher for frequent handwashing with soap and water and the use of alcohol hand rub, while avoidance of face touching with unwashed hands was and daily cell phone disinfection were the least adhered to.

For individual preventive measures, only a little over half the students were adherent to frequent handwashing with soap and running water. These are much lower than the rates found from previous studies; 97.4% in Vietnam (Nguyen et al., 2020), 97% among Ghanaian health trainees (Adu et al., 2020), 96% in Uganda (Amodan et al., 2020), 95.8% in South African (Majam et al., 2020), 93.8% in Bangladesh (Ferdous et al., 2020), 91.4% in a nationwide online cross-sectional survey of 350 Ghanaian residents in 2020 to assess their knowledge, risk perception and preparedness towards the COVID-19 outbreak (Serwaa et al., 2020). In DRC, adherence was 85% & 77%

respectively for two different studies (Ditekemena et al., 2020). However, this rate was higher than those found in Indonesia (54.5%) by Ningsih et al., 2020; 49.5% among SHS students in Bawku, Ghana (Apanga et al., 2020), 31.7% among shoppers and shop keepers in the UER of Ghana (Fielmua et al., 2020) and 28.0% among Ghanaian internet users (Akuoko & Alando, 2020).

Reasons respondents gave for such low adherence were unavailability of handwashing units in their lecture halls (44.8%), and having handwashing units available but no soap and water (44.0%). A handful said they preferred using alcohol hand rub despite availability of handwashing facilities (2.1%), they often forgot to (4.9%), or that they just felt lazy to wash their hands or didn't think it was necessary (12.0%).

For frequent use of alcohol hand rub, only 56.1% were adherent., which was still lower than a 72.3% rate among Ghanaian residents (Serwaa et al., 2020), 71.7% in South Africa (Majam et al., 2020), 70.9% for Chinese factory workers (Pan et al., 2020), but higher than a 27.7% rate among Indonesian adolescents (Ningsih et al., 2020). Here again, forgetting to use them despite their availability (60.9%) and unavailability of alcohol hand rub in public places (51.1%) on campus were the commonest reasons given for infrequent use.

Adherence to avoidance of face touching with unwashed hands was 13.2%, while that for daily cell phone disinfection was 4.0%. The reasons given for such low levels were that it was just very difficult to avoid face touching as it was mostly involuntary (88.6%), while daily cell phone disinfection was so low because they kept forgetting to (74%) or did not know it was necessary (18.5%).

### 5.2.2 Adherence to respiratory hygiene practices

This study found an overall adherence rate of just shy of 60% to the four selected respiratory hygiene PM. As with the other PM, this rate is still lower than a 96.6% rate found among South African residents (Majam et al., 2020), 94.9% among Vietnamese residents (Nguyen et al., 2020) and 86% among Ugandan residents (Amodan et al., 2020), and 69.5% for Brazilian residents (Faria de Moura Villela, et al., 2021).

Unsurprisingly, adherence to wearing of face masks in public was the highest at 72.9% from this study, despite still being lower than the rates found from previous studies; 99.5% in Vietnamese residents (Nguyen et al., 2020); 98.7% in Bangladeshi residents (Ferdous et al., 2020), 98.0% in mostly Hubei Province, China (Zhong et al, 2020); 97.8% in China among factory workers (Pan et al., 2020); 94.4% among students of the College of Health and Well-Being at Kintampo (Adu et al., 2020); 92% in pregnant women in UER of Ghana (Apanga & Kumbeni, 2021); 81.4% in South African residents (Majam et al., 2021), but higher than 68.7% in Indonesia (Ningsih, et al., 2021) and 45.5% in Brazil (Faria de Moura Villela, et al., 2021); 33% among Ugandan residents (Amodan et al., 2020); 31.5% among SHS students in Bawku (Apanga et al., 2020) and 18% among shoppers and shop keepers in Wa (Fielmua et al., 2021). The reason for such relatively high adherence to face mask wearing in public could be due to increased enforcement of the "No mask, No entry" policy by the University authorities, and criminalization of non-adherence by the government of Ghana. The major reason stated by many for inconsistent adherence was the discomfort associated with wearing it, especially in a hot tropical climate like ours (86.6%).

Adherence to covering mouth and nose with elbow crease or disposable tissue when sneezing or coughing was 61.7%; correctly discarding used tissue paper in the bin after

sneezing or coughing 86.8%, while handwashing with soap and water immediately after sneezing or coughing was 34.7%. The major reasons stated for not covering their mouths/noses when coughing or sneezing, not correctly discarding used tissue paper in the bin after sneezing or coughing, and not handwashing with soap and water immediately after coughing or sneezing include using cloth handkerchief instead of disposable tissue (49.8%), forgetfulness (40.2%), not knowing they were necessary or not being in the habit of doing so (10.0%), and unavailability of handwashing units and waste bins when necessary (34.8%).

### 5.2.3 Adherence to physical distancing (PD) measures

Overall adherence to social distancing protocols in this study among UG undergraduate students was 21.5%. This is consistent with other studies that identified that adolescents and young adults were reluctant to adhere with COVID-19 preventive protocols, especially social distancing (Barari et al., 2020; Cohen et al., 2020; Park et al., 2020; Roy-Chowdhury et al., 2020). Adherence to avoidance of crowded places from this study was 38.3%, which is comparatively lower than 99.2% found among Vietnamese residents (Nguyen et al., 2020); 98% among Ghanaian health trainees (Adu et al., 2020), 96.4% in Chinese residents (Zhong et al, 2020), and 69.6% % for Chinese factory workers (Pan et al., 2020).

That for staying 1.5-2m from other people in public was 22.4%, even lower than 97.8% found among Ghanaian health trainees (Adu et al., 2020); 95.2% among South African residents (Majam et al., 2020), 90% among Ugandan residents (Amodan et al., 2020), 85.6% among residents of the USA, Kuwait and South Korea (Al-Hasan et al., 2020), 58%, and 43.4% for residents of the Democratic Republic of Congo (DRC)

(Ditekemena et al., 2020), 46.2% among SHS students in Bawku, Ghana (Apanga et al., 2020), 44.5% among Ghanaian internet users (Akuoko & Alando, 2020), 41.5% among Indonesian adolescents (Ningsih et al., 2020), but only slightly higher than a rate of 22% found among shoppers and shop keepers in the UER of Ghanaian (Fielmua et al., 2020). Reasons for this low rate given by respondents include difficulty due to humans being inherently social beings (89.4%), inadequate space in hostels and lecture halls to enhance social distancing (67.2%), forgetfulness (29.8%), ignorance of the need for adherence (18.1%), or simply deeming them unnecessary (6.0%). Also, a cursory look suggests this is arguably the most difficult preventive measure to adhere to in the country due to the communal way of life in Ghana, and the poor building /housing infrastructure in the country which stifles the practice of social distancing.

### 5.3 Factors influencing adherence to COVID-19 PM

#### 5.3.1 Sociodemographic factors

In contrast to previous studies (Adu et al., 2020; Nguyen et al., 2020; Ebrahimi et al., 2020; Ferdous et al., 2020; Ningsih, et al., 2021; Faria de Moura Villela, et al., 2021; Majam et al., 2021), this study did not find significant association between age, sex, program of study, on-campus residence, relationship or marital status, religious affiliation, level of study, average monthly upkeep amount, number of roommates; and adherence to HH, RH and PD measures at a 5% significance level at the multivariate level. This could be explained by the small and disproportionate sample size, as majority of those studies used a minimum of 500 participants. The small and disproportionate sample was a challenge arising from the modular system run by the university for this academic year, in line with COVID-19 preventive measures.

### 5.3.2 Risk Perception

This study found that those who were (slightly and extremely) worried about getting the disease (fear of infection) had 3.8 and 4.4 times respectively, the odds of adherence to HH than those who said they had never been worried about contracting the disease. This is consistent with studies which found that increased fear of infection was significantly associated with increased adherence to preventive measures (and quarantine guidelines) (Amodan et al., 2020; Nguyen et al., 2020; Pan et al., 2020, Ebrahimi et al., 2020; Carlucci et al., 2020).

Regardless, the low adherence to HH measures from this study agreed with findings from Ningsih, et al (2021) that in adolescents, despite a high-risk perception, compliance with preventive measures was still low (Faria de Moura Villela, et al., 2021). This study unsurprisingly did not find any association between having comorbidities and adherence to HH, as majority of the students were very young (<25 years old), and only a handful had co-morbidities.

For RH and PD, risk perception was not significantly associated with adherence which is unsurprising, as previous studies found that adolescents and young adults have very low risk perception of the disease, due to its mild or asymptomatic manifestations in them when infected. (CDC, 2020; Pan, et al., 2020; Andrews, et al., 2020; Cohen et al., 2020; Wrzus, et al., 2013).

### 5.3.3 Knowledge of COVID-19 Preventive measures

Although previous studies found knowledge to be significantly associated with adherence to the PM (Zhong et al, 2020; Apanga & Kumbeni, 2021), no association was found between UG undergraduate students' knowledge levels and their adherence

to hand hygiene, respiratory hygiene and physical distancing in this study. Instead, this study's result resonates with the 2021 study done by Ningsih, et al., which found that higher levels of COVID-19 knowledge did not guarantee adolescents' compliance to preventing COVID-19 transmission, as knowledge of disease was high among the adolescents, but their adherence behaviour was low. Also, UG students' knowledge levels were not as high as found in previous studies, where younger age was found to be associated with higher/more accurate knowledge of COVID-19 (Ferdous, et al., 2020; Ningsih, et al., 2021). Regardless, this could be because contrary to what was done by Zhong, et al. (2020), this study did not seek to assess the association between sociodemographic characteristics and knowledge of UG undergraduate students.

### 5.3.4 Respondents' psychological/personal characteristics

Respondents' personality/psychological characteristics did not significantly influence their adherence to HH, RH and PD measures at the multivariate level.

This contradicts findings from previous studies on adherence to the COVID-19 PM that a sense of moral and social obligation, conscientious personality, and altruistic attitude were associated with adherence to hygienic behaviour while antisocial potential was associated with lower adherence. (Nivette et al., 2020; Wang et al., 2021; Ningsih, et al., 2021; Ebrahimi et al., 2020). Again, this could be explained by the small and disproportionate sample used for this study. Also, only ten items were used to assess respondents' personality/psychological characteristics, and perhaps, if more questions were used to assess more characteristics, the results might have been different.

# CHAPTER SIX

# CONCLUSION AND RECOMMENDATIONS

## 6.1 Conclusion

Knowledge among UG undergraduate students on COVID-19 preventive measures (PM) was adequate but this did not translate to their adherence to the PM. Being mostly youthful with only a handful having comorbidities, it was unsurprising that their risk perception of the disease was low. Also, almost all of them had not vaccinated against the disease, which is worrying as it sets back the goal of achieving herd immunity to mitigate the pandemic.

Adherence to the PM was also discouraging, with only 8.9%, 59.1% and 21.5% of the students adhering to hand hygiene (HH), respiratory hygiene (RH) and physical distancing (PD) respectively. Only 29.0% were adherent to ≥75% of all the ten PM assessed. These low adherence levels need to be addressed if the fight to end the pandemic is to be won.

Despite the low-risk perception among these students, some level of risk perception was significantly associated with HH adherence; anxiety about contracting COVID-19 (fear of infection).

The low adherence among these students could have been influenced by the low overall community adherence observed all over the country, due to the relatively lower infection and death rates in the country compared to other parts of the world, and not necessarily peculiar to UG students only.

### 6.2 Study Limitations

- This study's most notable strength lies in its provision of novel data on adherence to COVID-19 PM among university students in Ghana. This study also ensured anonymity and confidentiality of participants.
- Limitations include a small and disproportionate sample which is not necessarily representative of all undergraduate students of UG and the use of non-probability sampling, stemming from the modular system of learning adopted by the school at the time of the study.
- Participation was limited to only educated individuals who have smartphones or computers and access to internet connectivity, but the results might have differed if data was collected in-person.
- Self-reports may be influenced by social desirability, and results might have differed if data was collected in-person, or participants were observed directly for adherence to the PM. However, the study's assurance of participants' anonymity and confidentiality could have minimized this limitation.
- The objective of this study was to determine knowledge levels and factors that influence UG undergraduate students' adherence to COVID-19 PM, but their knowledge levels and adherence to the PM might have changed severally over time since this was a cross-sectional survey, obscuring the true picture. Subsequent studies could assess how UG undergraduate students' COVID-19 knowledge level and adherence behaviours change over time.
- There might be recall bias especially as participants might have resided in the halls/hostels at a different time from the time of filling the questionnaires.
- Also, since the magnitude of the pandemic in Ghana has not been as much as most of the countries in which previous studies on adherence to the COVID-19 PM were

conducted, adherence may differ across board, thus comparison may not be very objective.

### 6.3 Recommendations

Webster et al. (2020) found that understanding the peculiarities of young people regarding their adherence to the COVID-19 PM is vital to developing effective public health interventions for mitigating the current pandemic, as well as future ones, and in the past, public health interventions have aimed to appeal to social force and moral duty to spur compliance. The results from this study support this reasoning, and might be helpful if adopted by UG authorities, as although being able to change an individual's personality characteristics is very unlikely in the short term (more so during periods such as this pandemic), the effects of certain antisocial characteristics may be managed through targeted interventions.

Also, the results suggest that hygienic behaviour and social distancing protocols are influenced by very different factors, having consequences on campaigns aimed at motivating adherence to the PM, which should factor in the special requirements and extra attention needed for their effectiveness. For example, adherence to SDP warrants a bigger amount of change in attitude and behaviour to limit contact with others, which produces an almost immediate effect on the individual's psychological, social, and economic well-being (Barari et al., 2020; Baum et al., 2009). But since adolescents and young adults are used to keeping large social circles, they are highly likely to disregard these, viewing them as too stiff or unpleasant if they are not adequately convinced on the need to comply with such restrictive directives (as is clear from the major reason they stated for non-adherence as "difficulty due humans being inherently social

beings"). It is also clear from the results that there is a lot of scepticism among the students regarding the pandemic and its PM.

Again, most of the students cited unavailability of handwashing units, soap and water, hand sanitizers, forgetfulness/ignorance, and inadequate space in their hostels and lecture rooms as the reasons for their non-adherence to the PM.

Thus, for the University, building and reinforcing students' trust and belief in authorities and science, ensuring constant supply/availability of pro-adherent resources, and intensifying education efforts may positively influence their adherence, with a ripple effect on ending the pandemic.

At the national level, having authorities lead by example is one of the easiest, most feasible, and sustainable means to drive up adherence among not just the youth, but the entire population.

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# APPENDICES

## APPENDIX 1: PARTICIPANTS INFORMATION SHEET

**Title of Study**

Adherence to COVID-19 preventive measures among University of Ghana undergraduate students.

**Principal investigator**

Dr. Akpene Aku Nyamadi,

MPH Student of the University of Ghana School of Public health, and a Senior Medical Officer.

Contact information - Tel: 0276990104, Email: akpene.nyamadi@gmail.com

**Background**

COVID-19 is a highly infectious novel viral disease discovered in Wuhan City, China in 2019 and is the cause of the currently ongoing global pandemic which has done severe damage to the global and Ghanaian economy, and impacted the world negatively. There is currently no cure for the disease yet, and scientists are still trying to understand how the vaccines that have been developed work (their safety and adverse effects, etc). Also, the virus keeps mutating, resulting in multiple, more infective and deadlier variants identified globally so far, and the global vaccination rates are disproportionately unencouraging. With no cure in sight, adherence to the World health Organization's (WHO) recommended preventive measures are our only hope for mitigating this pandemic and bringing life back to normal as we know it. This research aims to determine University of Ghana students' knowledge of COVID-19 preventive measures, their adherence levels to some selected COVID-19 preventive measures, and the factors influencing their adherence /non-adherence to them. The results of this study

will guide in policy formulation, implementation and promotion of efficient management strategies and targeted interventions for similar future disasters.

**Nature of Study**

This is a quantitative, cross-sectional online study aimed to assess the knowledge of on-campus residential undergraduate students of the University of Ghana (UG) on COVID-19, its preventive measures, their level of adherence to the preventive measures, and the factors influencing their adherence to the instituted COVID-19 preventive measures. The study will be conducted between September and November 2021, and a minimum of 296 students will be required to participate in the study.

**Participant Involvement**

The study is designed to interview undergraduate students 18 years of age and above, and resident in any of the Legon or Korle Bu campus halls/hostels of the University of Ghana during either module of the 2021 academic year, using a structured online questionnaire. The survey can be taken directly on your computer or smart phone. You are required to complete the survey and fill the questionnaire as honestly as possible within an average period of 15 minutes, and do not feel inclined to fit the narrative. No personal information will be required, and the information you will provide will not be used anywhere against you or for any other purpose than this study. While fully completed surveys are most helpful, you have the right to skip or decline answering any question with no resultant penalty or ill-effect to you. Only undergraduate students above age 18 years at their last birthday, and those who reside(d) in any halls or hostels on the Legon or Korle Bu campus of UG during any of the modules for the 2021 academic year are eligible for this study, therefore do not participate if you do not fit these criteria. You are only permitted to submit one response.

**Potential Risks**

No direct risk is expected to you in this study aside the use of less than 50mb of internet data to answer the questionnaire online. You are free to skip providing any information you are uncomfortable disclosing, and should you feel uncomfortable and want to leave the study, you are free to do so without consequences to you. Because you are submitting anonymous data, it will not be possible to withdraw your answers after they have been submitted.

**Benefits**

There is no direct monetary or physical reward to participants, but you may benefit from taking part in the survey by being motivated to look up information about the coronavirus pandemic. Also, information obtained from this study may be useful to guide policy formulation, implementation and promotion of efficient management strategies and targeted interventions for similar future disasters. If you think you have been exposed to COVID 19 and have any symptoms, report to the nearest health centre for medical attention, or call the COVID-19 helplines on 055 843 9868 / 0509497700 / 112.

**Cost**

This study is self-sponsored. The cost to be incurred will be from the use of data and transportation for follow-up during proposal development, the purchase of the STATA 16 software license for data analysis, the proposal processing fees and other miscellaneous costs.

**Compensation**

There will be no monetary compensation for your participation in this study.

**Confidentiality**

Your name, personal identity or any details that can be traced back to you are not required in this study. If, for any reason your private information is collected, it will be removed from the responses provided, after which the data will be used solely for its intended purpose. The information you will provide will be coded and handled with strict confidentiality, and your confidentiality will always be protected to the maximum extent allowable by law. The data generated from your responses will be stored securely on the cloud during analysis, and will be destroyed permanently after a minimum of three years as per research protocol. Apart from the researcher, research assistants, my academic supervisor and anyone examining me on my work, no one else will have access to information provided whether in part or whole.

**Voluntary Participation/Withdrawal**

You have the right to decline participation in this research. While fully completed surveys are most helpful, you have the right to skip or decline answering any question if you are uncomfortable or do not know have answers for them, with no resultant penalty or ill-effect to you. You can stop participation in the survey at any time with no consequences to you, and you will not lose any benefits or rights you normally have. Only participants aged 18years and above at their last birthday are eligible for this study.

**Outcome and Feedback**

The data given will be used solely for the purpose of this study. No personal data will be published as part of the final academic thesis document I will submit to the University of Ghana which would eventually be available at the School of Public Health Library.

**Funding**

This research is self-sponsored.

**Conflict of interest**

I have no conflicting interest to declare in this study.

**Sharing of Participants information**

Apart from the researcher, research assistants, my academic supervisor and anyone examining me on my work, no one else will have access to information provided whether in part or in whole.

PLEASE NOTE: You can only proceed to complete the questionnaire after providing your voluntary consent to participate in the study. You can print and keep a copy of the consent page after consenting.

If you have any concerns or would like further correspondence, please contact me directly on: Akpene Aku Nyamadi

MPH Student of the University of Ghana, Legon

Contact: Tel: 027699010 or akpene.nyamadi@gmail.com

Alternatively, for any ethics-related concerns, you could contact:

The Administrator

Noguchi Memorial Institute for Medical Research Institutional Review Board (NMIMR-IRB)

P. O. Box LG581, Legon, Ghana

Contacts: nirb@noguchi.ug.edu.gh, +233 302 916438

## APPENDIX 2: CONSENT FORM

CONSENT FORM

ADHERENCE TO COVID-19 PREVENTIVE MEASURES AMONG UNIVERSITY OF GHANA UNDERGRADUATE STUDENTS

PARTICIPANTS' STATEMENT

By ticking the "I ACCEPT" button, I am agreeing that I am at least 18 years old, that I have read the information and fully understood the purpose and contents of the Participants' Information Sheet in a language I can read and understand (English), I understand the contents and any potential implications, my right to change my mind or withdraw from the research even after consenting, and that I voluntarily agree to participate in this study.

[ ] I ACCEPT

## APPENDIX 3: QUESTIONNAIRE

QUESTIONNAIRE ON "ADHERENCE TO COVID-19 PREVENTIVE MEASURES AMONG UNIVERSITY OF GHANA UNDERGRADUATE STUDENTS"

******You are only permitted to submit one response. However, you can go back and forth between pages to edit your responses prior to submission. Once submitted, you can neither retrieve nor edit your response******

### SECTION 1

### SOCIO-DEMOGRAPHIC INFORMATION

1. **Age at last birthday (in years)?** (Free text entry)
2. **What is your sex?** [ ] Male [ ] Female
3. **Religious affiliation?** [ ] Christian [ ] Muslim [ ] Traditional African [ ] Others…please specify
4. **Which College does your programme of study fall under? College of**

   [ ] Humanities [ ] Basic and Applied Sciences [ ] Education [ ] Health Sciences
5. **Level of study?** [ ] 100 [ ] 200 [ ] 300 [ ] 400 [ ] 500 [ ] 600
6. **Relationship/marital status**

   [ ] Single/Not dating or in a romantic relationship/Unmarried/Divorced

   [ ] Dating/Involved in a romantic relationship/Married/Cohabitating

7. **On campus, where do you reside?**

   [ ] University Halls (Volta, Legon, Akuafo, Mensah Sarbah Commonwealth, Jubilee, International Students, Hilla Limann, Alexander Kwapong, Elizabeth Frances Sey or Jean Nelson Halls)

   [ ] University Hostels and (Bani, Evandy, Pentagon/African Union or TF/James Topp Nelson Yankah hostels).

8. **Excluding yourself, how many roommates do you have in school?**

   [ ]1 [ ] 2 [ ] 3 [ ] 4 [ ] 5 or more

9. **What mode of teaching and learning is used by your lecturers?**

   [ ] Online only [ ] Both online and in-person

10. **On average, how much money do you spend in a month? (GHC) (Free text entry)**

11. **Do you have any of the following chronic/underlying disease?** (e.g., Heart disease, Hypertension, Diabetes, Cancer of any type/form, HIV, Tuberculosis, Asthma, Sickle cell disease, etc.) [ ] Yes [ ] No

## SECTION 2

## KNOWLEDGE ON COVID-19 & RISK PERCEPTION

1. **Have you heard of COVID-19?**

   [ ] Yes, I have heard of the disease [ ] No, this is my first time hearing about it

   ***** If yes, proceed to Q2.***

   ***If no, the interview ends here for you. Thank you for your time***

2. **Is COVID-19 real?** [ ] Yes, it is real [ ] No, it is not

3. **On a global scale, how bad is the coronavirus pandemic?**

   [ ] Severe [ ] Not severe at all

4. **What is the likelihood of contracting COVID-19 from non-adherence to the recommended preventive measures?** [ ] High likelihood [ ] Low likelihood

5. **List the COVID-19 prevention measures you know of (as many as possible).** (Free text entry)

6. **To the best of your knowledge, have you been infected with COVID-19?**

   [ ] No [ ] Yes

7. **Do you know people in your immediate social environment who have been infected with COVID-19 (suspected or confirmed)?** [ ] No [ ] Yes

8. **Do you know someone who died from COVID-19?** [ ] No [ ] Yes

9. **How worried/anxious are you about contracting COVID-19?**

   [ ] Extremely worried [ ] Slightly worried [ ] I am neutral

   [ ] I was worried initially, but no more [ ] I have never been worried

10. **Have you been vaccinated against COVID-19?**

    [ ] No, not at all/Yes, I have received only one of two shots

    [ ] Yes, I have received the full dose (either single-shot dose or two-shot dose)

## SECTION 3

## ADHERENCE BEHAVIOUR

**For each of the following COVID-19 preventive measures, indicate your level of adherence during your stay on university campus this year**

| No. | Question | Responses | | |
|---|---|---|---|---|
| | | **Yes, consistently** | **Yes, but only sometimes** | **No, I never do** |
| | **HAND HYGIENE** | | | |
| **22.** | Frequent handwashing with soap under running water for at least 20 seconds | | | |
| **23.** | Use of alcohol hand rub | | | |
| | | **Yes, every time** | **Yes, sometimes** | **No, never** |
| **23.** | Disinfecting your cell phone daily | | | |
| **25.** | Do you touch your face with unwashed hands? | | | |
| | **RESPIRATORY HYGIENE** | | | |
| **26.** | Wearing a face mask when in public? | | | |
| **27.** | Covering mouth and nose with elbow crease or disposable tissue when sneezing or coughing | | | |
| **28.** | Correctly discarding used tissue paper in the bin after sneezing or coughing | | | |
| **29.** | Handwashing with soap and water immediately after sneezing or coughing | | | |
| | **PHYSICAL DISTANCING** | | | |
| **30.** | Avoiding crowded places | | | |
| **31.** | Staying 1.5-2m from other people in public | | | |

**Please give reasons for inconsistent adherence** (Select all that apply)

**22b. Inconsistent washing of hands with soap under running water**

[ ] No handwashing units in my hall/hostel/lecture halls

[ ] Water available, but no soap [ ] I do not think it is necessary/I just do not care

[ ] I do not have money to buy handwashing soap [ ] Others (please specify)

**23b. Inconsistent use of alcohol hand rub**

[ ] No alcohol hand rub provided in my hall/hostel/lecture halls

[ ] I do not have money to buy alcohol hand rub [ ] I often forget to use it

[ ] I just do not care or think I need to sanitize my hands [ ] Others (please specify)

**24b. Inconsistent avoidance of touching face with unwashed hands**

[ ] I try, but it is very difficult as it is involuntary

[ ] I just do not care [ ] Others (please specify)

**25b. Inconsistent daily phone disinfection**

[ ] I forget to [ ] I did not know this was necessary

[ ] I do not have money to buy disinfectant [ ] I do not think it is necessary

[ ] I just do not care [ ] Others (please specify)

**26b. Inconsistent wearing of face mask in public**

[ ] I do not have (a) face mask(s) [ ] I don't have money to buy face masks

[ ] I don't know where to get face masks [ ] I don't think it is necessary

[ ] Wearing masks is uncomfortable [ ] Others (please specify)

**27b. Inconsistent covering of mouth/nose when coughing or sneezing**

[ ] I usually forget to [ ] I do not have money to buy disposable paper towels

[ ] I am not used to covering my mouth and nose when sneezing

[ ] I cover my mouth and nose, but I use cloth handkerchief instead of disposable tissue

[ ] I did not know this was necessary [ ] I know it is necessary, but I do not care

[ ] Others (please specify)

**28b. Not consistently discarding used tissue after coughing or sneezing**

[ ] I use cloth handkerchiefs, so I cannot discard them

[ ] I am not used to covering my mouth and nose when sneezing

[ ] I do not have money to buy disposable tissue paper

[ ] There is no waste bin available when I need it

[ ] I did not know this was necessary [ ] I usually forget to

[ ] I know it is necessary, but I do not care [ ] Others (please specify)

**29b. Inconsistent handwashing with soap and water after sneezing or coughing**

[ ] I usually forget to [ ] I am not used to covering my mouth and nose when sneezing

[ ] Water available but no soap [ ] I do not have money to buy handwashing soap

[ ] Soap available, but no water [ ] I did not know this was necessary

[ ] I know it is necessary to, but I do not care [ ] Others (please specify)

**30b. Inconsistent avoidance of crowded places**

[ ] I forget to [ ] It is impossible for me to avoid crowds (give reasons)

[ ] I did not know this was necessary [ ] It is just too difficult to do

[ ] I know it is necessary, but I do not care [ ] Others (please specify)

**31b. Inconsistently staying 1.5-2cm from other people in public**

[ ] Inadequate space in my lecture halls/hall/hostel room to enhance social distancing

[ ] I did not know this was necessary [ ] It is just too difficult to do

[ ] I know it is necessary, but I do not care [ ] Others (please specify)

## SECTION 4

## PERSONALITY/PSYCHOLOGICAL CHARCTERISTICS

**Please indicate the extent to which you relate with each of the following statements**

| No. | Statement | Agree | Neutral | Disagree |
|---|---|---|---|---|
| 32. | Authorities recommended them, and I do not want problems with the law | | | |
| 33. | Others in my community are following them, so I have no option than to adhere | | | |
| 34. | I trust that the preventive measures are helpful to end the pandemic | | | |
| 35. | I want to prevent the spread of COVID-19 to people close to me/ high risk persons | | | |
| 36. | I am afraid of contracting the disease/dying from it | | | |
| 37. | Desire for life to return to normal | | | |
| 38. | I feel responsible for my health | | | |
| 39. | I feel it is my civic responsibility as a citizen | | | |
| 40. | I do not think they are necessary to prevent the disease transmission | | | |
| 41. | There is adequate education on the right use of preventive measures in my home and school communities | | | |

**42. How has your institution contributed to promoting your adherence to the preventive measures?** (Select all that apply)

[ ] Provision of face masks/hand sanitizers for staff and students

[ ] Handwashing units with soap and water [ ] Online lectures

[ ] Constant flow of water in your halls/hostels, lecture rooms and all over campus

[ ] Well ventilated lecture rooms and examination halls for in-person sessions

[ ] Physical distancing during in-person lectures/ exams

[ ] Reducing the number of occupants per room in the halls and hostels of residence

[ ] None of the above [ ] Others (please specify)

***THANK YOU. YOUR TIME AND PARTICIPATION ARE GREATLY APPRECIATED.***

## APPENDIX 4: ETHICAL APPROVAL FOR STUDY

NOGUCHI MEMORIAL INSTITUTE FOR MEDICAL RESEARCH
Established 1979A Constituent of the College of Health Sciences
University of Ghana

INSTITUTIONAL REVIEW BOARD

Phone: +233-302-916438 (Direct)
E-mail: nirb@noguchi.ug.edu.gh
Telex No: 2556 UGL GH

Post Office Box LG 581
Legon, Accra
Ghana

My Ref No: DF22
Your Ref. No:

1st September 2021

**ETHICAL CLEARANCE**

**FEDERALWIDE ASSURANCE FWA 00001824** **IRB 00001276**

**NMIMR-IRB CPN 001/21-22** **IORG 0000908**

On 1st September 2021, the Noguchi Memorial Institute for Medical Research (NMIMR) Institutional Review Board (IRB) at a full board meeting reviewed and approved your protocol titled:

**TITLE OF PROTOCOL** : **Knowledge of COVID-19 preventive measures, and the factors influencing adherence to these measures among undergraduate students of the University of Ghana**

**PRINCIPAL INVESTIGATOR** : **Nyamadi Akpene Aku, MPH Cand.**

Please note that a final review report must be submitted to the Board at the completion of the study. Your research records may be audited at any time during or after the implementation.

Any modification of this research project must be submitted to the IRB for review and approval prior to implementation.

Please report all serious adverse events related to this study to NMIMR-IRB within seven days verbally and fourteen days in writing.

This certificate is valid till 31st August, 2022. You are to submit annual reports for continuing review.

Signature of Chair: .....

Dr. Abraham Hodgson
(NMIMR – IRB CHAIR)

INTEGRI PROCEDAMUS

UNIVERSITY OF GHANA

NOGUCHI MEMORIAL INSTITUTE FOR MEDICAL RESEARCH (NMIMR)
COLLEGE OF HEALTH SCIENCES
INSTITUTIONAL REVIEW BOARD

6th April 2022

**ETHICAL CLEARANCE**

**FEDERALWIDE ASSURANCE FWA 00001824** **IRB 00001276**

**NMIMR-IRB CPN 001/21-22 *amend. 2022*** **IORG 0000908**

On 6th April 2022, the Noguchi Memorial Institute for Medical Research (NMIMR) Institutional Review Board (IRB) at a full board meeting amended your protocol titled:

**TITLE OF PROTOCOL** : **Adherence to COVID-19 Preventive Measures Among University of Ghana Undergraduate students**

**PRINCIPAL INVESTIGATOR** : **Nyamadi Akpene Aku, MPh Cand.**

Please note that a final review report must be submitted to the Board at the completion of the study. Your research records may be audited at any time during or after the implementation.

Any modification of this research project must be submitted to the IRB for review and approval prior to implementation.

Please report all serious adverse events related to this study to NMIMR-IRB within seven days verbally and fourteen days in writing.

This certificate is valid till 31st August, 2022. You are to submit annual reports for continuing review.

Signature of Chair: .....

Dr. Abraham Hodgson
(NMIMR – IRB CHAIR)

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