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# Knowledge, Attitudes, and Practices of/towards Covid-19 among Cameroonians in the Bamenda Health District: A Cross-Sectional Study during the Second Wave of the Pandemic

Yayah Emerencia Ngah[1,2*], Frederick Nchang Cho[3,4,5], Bisong Shauna Etagha[6], Njimona Ibrahim[7], Peter Canisius Kuku Elad[8,9], Patrick Kofon Jokwi[9], Mondinde George Ikomey[10,11]

[1]*AIHC, District Health Service Bamenda, North West Regional Delegation of Health, Ministry of Health, Cameroon*

[2]*Department of Public Health, Faculty of Health Sciences, Texila American University, Zambia*

[2]*Global Health Systems Solutions, Cameroon*

[4]*Infectious Disease Laboratory, Faculty of Health Sciences, University of Buea, Cameroon*

[5]*Central African Network for Tuberculosis, HIV/AIDS and Malaria (CANTAM), University of Buea, Cameroon*

[6]*Department of Medical Laboratory Sciences, Faculty of Health Sciences, University of Bamenda, Cameroon*

[7]*Ministry of Scientific Research, Yaoundé, Republic of Cameroon*

[8]*Department of Microbiology and Parasitology, University of Buea, Cameroon*

[9]*Cameroon Baptist Convention Health Board (CBCHB) – HIV Free Project, Cameroon*

[10]*Centre for the Study and Control of Communicable Diseases, Faculty of Medicine and Biomedical Sciences, University of Yaoundé I, Yaoundé, Republic of Cameroon*

[11]*Department of Microbiology, Parasitology, Haematology and Infectious Diseases, Faculty of Medicine and Biomedical Sciences, University of Yaoundé 1, Yaoundé, Republic of Cameroon*

## *Abstract*

*The Coronavirus Disease 2019 (Covid-19) pandemic has and is greatly affecting the global community. This study aimed to assess knowledge, attitudes, and practices towards Covid-19 among a convenient sample of the general public in the Bamenda Health District (BHD) of Cameroon. A community-based cross-sectional study was conducted in the BHD, from 1st March to 30th April 2021. Participants were sampled from three Health Areas in Bamenda. Data collection was performed using a self-administered questionnaire. The Pearson Chi square ($\chi^2$) and regression analysis were used to determine associations between KAP and demographic characteristics. We studied 404 participants with the following demographic characteristics: 237 (58.7%) aged 25 – 49 years, 233 (57.7%) females, and 197 (48.8%) with tertiary level of education. Of the 404 participants, 182 (45.0%) were knowledgeable about Covid-19 (79 males and 103 females), 42.5% had positive attitudes towards Covid-19 (63 males and 109 females), and 122 (30.2%) were adherent to practicing public health preventive measures (48 males and 74 females). Compared to females, males were more adherent to practicing public health preventive measures (OR, 1. 3; 95% CI, 0.8 – 2.1), and had positive attitudes towards directives and guidelines (OR, 1.7; 95% CI, 1.1 – 2.8). This study shows that public health prevention efforts should be directed to closing the identified gaps in KAP among residents to halt the spread of Covid-19 in the health district as well as the Region.*

***Keywords****: Attitudes towards Covid-19, Coronavirus Disease 2019, Knowledge related to Covid-19, Practices towards Covid-19.*

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**** Corresponding Author: emerenciayaya@gmail.com***

## Introduction

The Coronavirus disease 2019 (Covid-19), is an infectious respiratory disease caused by novel coronavirus; Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) [1]. Since its emergence in Wuhan, China in December 2019 [2-4], SARS-CoV-2 has spread rapidly around the world and has been declared by the World Health Organisation (WHO) as a global pandemic [5].

The Coronavirus disease 2019 (Covid-19) is rapidly spreading across Africa, and available data indicates that it is on the rise in Uganda, Cameroon, and other African countries [6,7]. A third wave of the pandemic, characterised by the delta (δ) strain of the virus, has also reached parts of Africa. The first case of Covid-19 in Cameroon was identified on the 6th of March 2020 [8] and as of 6th July 2020, 320 deaths were recorded and almost 15,000 cases were confirmed [9-11].

Coronaviruses have become the major pathogens of emerging respiratory disease outbreaks. They represent a large family of single-stranded ribonucleic acid (RNA) beta (β) viruses, which can cause illness ranging from a common cold to severe symptoms like the Middle East Respiratory Syndrome (MERS) and SARS [12]. The clinical symptoms of Covid-19 include fever, which is the most common symptom, cough, fatigue, malaise, and shortness of breath. Global concerns about the virus have risen due to its high transmission capabilities, which are with morbidity and mortality [13]. The elderly and patients with comorbidities are more likely to be infected and are additionally more prone to serious complications, which may be associated with acute respiratory distress syndrome (ARDS) and cytokine storm [13]. Till the moment, there is neither a proven nor approved treatment [14] but good enough, there are vaccines against SARS-CoV-2. The World Health Organisation has approved several Covid-19 vaccines for emergency use, amongst which are; Sinopharm BIBP, Oxford–AstraZeneca, and Johnson & Johnson, donated by the United States Government, and the African Union, were in Cameroon as of 8th July 2021 [15]. With the arrival of a consignment of 152,000 doses of the Pfizer BioNTech vaccine on 5th December 2021 from COVAX, the Cameroon's Ministry of Health launched the fourth vaccination campaign from the 16 – 20th of March 2022 [16]. All of these vaccines are administered free in all Health Districts Nationwide [15]. Vaccines remain an effective and reliable public health intervention against viral outbreaks and pandemics [17,18]. However, hesitancy regarding the Covid-19 vaccine is evident worldwide [17,18], in Egypt and Malaysia [19,20], as well as in Cameroon [21]. However, being vaccinated does not mean caution should be thrown into the wind and put ourselves and others at risk. Strong infection control measures are the primary intervention to minimize the spread of the virus in both health care settings and the community [22]. With the coming of Covid-19, vaccination hesitancy has become a precarious problem affecting other infections [21, 23].

This study aims to assess knowledge, attitudes, and practices towards Covid-19 among a convenient sample of the general public in the Bamenda Health District of Cameroon.

## Methods

### Study Area

This study was conducted in three out of the seven health areas (Figure 1) in the Bamenda Health District (BHD). Bamenda, also known as Abakwa or Mankon town, a cosmopolitan city in the North West Region of Cameroon, and has a population of about 850,000 inhabitants.

Health facilities are owned by the government, faith-based organisations as well as private individuals. Bamenda is the administrative and political capital of the Region, located at latitude 5.9597 and longitude

10.14597. Bamenda has several educational establishments, one of the latest being the University of Bamenda, which has attracted every population age group as well as professionals of diverse backgrounds. It is currently a haven for many of the internally displaced persons from the ongoing armed conflict.

## Study Population and Target Sample Size

This prospective cross-sectional study was conducted during the second wave of the Covid-19 pandemic in Cameroon. A two-stage clustered sampling technique was used, with the BHD being purposely selected based on accessibility, security, and population density.

*Stage one: selection of clusters*. A cluster was defined as a quarter in a Health Area (HA) which in turn is in the Health District and selection was carried out independently for each HA using a two-step procedure: first, seven HAs of the BHD were listed and three; Azire, Mulang and Ntahmbang were sampled by simple random sampling (SRS) with probability proportionate to size (PPS). Second, a list of six most populated quarters was compiled for each sampled HA and two quarters each were sampled again by SRS.

*Stage two; selection of respondents*. Within each quarter, respondents were sampled conveniently; in their homes/households, market places or streets.

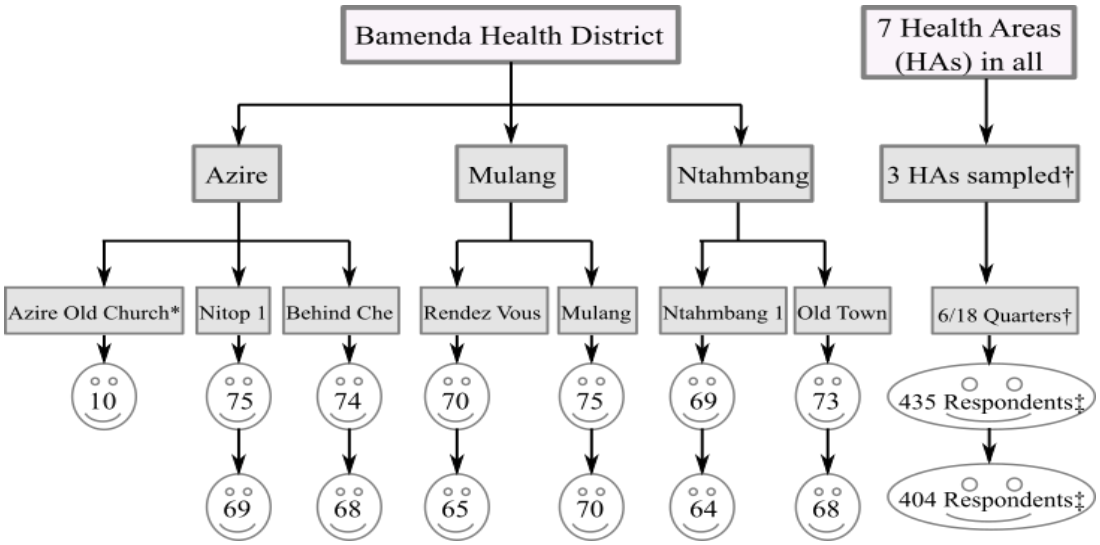


**Figure 1.** Sampling Method; †Simple random sampling, ‡ Convenient sampling; *Pilot quarter

The study population consisted of persons residing in the BHD at the time of the study. An estimated minimum sample size of 384 was calculated with the CDC-Epi Info™ 7.2.3.1 (Centre for Disease Control, Georgia, USA) StatCalc with the following characteristics: an estimated population size of Bamenda central of 307,620 in 2009 with an annual increase rate of 2% (6152.4) to 384,449 in 2020 [24], expected frequency of persons with knowledge and awareness of the novo coronavirus of 50%, accepted error margin of 5%, design effect of 1.0 and one cluster. Due to unforeseen nonresponse, 10% of the calculated sample size was added to give a minimum sample size of 423.

## Study Instrument

The survey questionnaire was adapted from a study with a similar research theme [25] and consisted of four parts; demographics, knowledge and attitudes, perception and stigmatisation, and practices and beliefs. Demographic variables included sex, age, residence, marital status, educational status, and occupation. The knowledge and attitudes section of the questionnaire comprised six questions (Q9 – 14). The assessment of practice

regarding Covid-19 was composed of eight questions (Q29 – 37); one point for each question with the correct answer. The cut-offs were similar to the knowledge and attitude scoring: good, moderate and poor.

All questions were developed by considering previous research done in other populations with a similar research theme [25]. These questions were in the form of yes or no; or, the 'select all that applies'. The right answer to each question has a score of 1 and the wrong answer 0. Modified Bloom's cut-off points were used to judge knowledge as good (80%–100%), moderate (50%–79%), or poor (≤ 50%) [26].

## Data Collection and Analysis

Data was collected from 1st March to 30th April 2021, with the use of anonymous self-administered questionnaires and then keyed into Microsoft Office Excel for analysis with Ri386 Statistics version 4.1.0 for windows (R Foundation for Statistical Computing, 2021). The survey instrument took approximately 15 minutes to complete. The validity of the questionnaire was confirmed by pretesting in 10 participants in the Traveller's quarter who were excluded from the study. Based on the pretest study, the format and wording of questions were adjusted. Data from the 10 participants was used to assess internal consistency reliability using Cronbach's alpha (α) [27,28]. The results showed adequate internal consistency reliability (with Cronbach's α = 0.72) [27,28]. To ensure data quality, the team supervisors reviewed all questionnaires daily for completeness and possible inconsistencies and ensured that missing information was corrected, or the entire questionnaire excluded from analysis.

The frequencies of categorical variables were scored in percentages while those of continuous variables were scored in means ± Standard Deviation (SD). Associations between covariates and KAP were evaluated using the Pearson Chi square ($\chi^2$) test. The odds ratio (OR) and $\chi^2$ tests were calculated by multinomial logistic regression (MNLR) for the establishment of associations or differences between KAP with socio-demographic characteristics. Confounders were controlled by using independent variables from a bivariate analysis whose $\chi^2$ values were statistically significant. Statistical significance was set at $p \leq 0.05$.

## Ethical Consideration

This study was conducted in accordance with the Helsinki Declaration [29], the principles of Personal Information Protection, and Electronic Documents Act [30] and cleared by the North West Regional Delegation of Public Health (Reference N°: 95/ATT/NWR//RDPH/BRIGAD). Only respondents who signed consent, were allowed to fill the anonymous questionnaires.

# Results

## Socio-demographic Characteristics of Participants

A total of 435 respondents were enrolled into the study. After excluding 31 (7.1%) for poorly filled or unfilled pages, the final sample size consisted of 404 (92.9%) respondents (Figure 1). The demographic characteristics of the participants are presented in Table 1. Of all 404 respondents, mean age (±SD) was 36.58 ± 13.98 years; 57.7% were females, 48.8% were secondary school leavers, and 211 (52.2%) were from the rural communities. About the working environment, 46.4% of the respondents work outdoors (in offices and markets), 29.8% spend most of their time at home, and 23.8% are mostly office workers.

**Table 1.** Participants' Characteristics

| Variable | Subclass | Frequency | Percent |
|---|---|---|---|
| Sex | Male | 171 | 42.3 |
| | Female | 233 | 57.7 |
| Age (years) | < 25 | 85 | 21.0 |
| | 25 – 49 | 237 | 58.7 |
| | ≥ 50 | 82 | 20.3 |
| Education | Tertiary | 48 | 11.9 |
| | Secondary | 197 | 48.8 |
| | Primary | 159 | 39.4 |
| Occupation | Unemployed | 30 | 7.4 |
| | Farming | 40 | 9.9 |
| | Business | 73 | 18.1 |
| | Skilled | 93 | 23.0 |
| | Unskilled | 168 | 41.6 |
| Work environment (*n* = 386)‡ | Home | 115 | 29.8 |
| | Office | 92 | 23.8 |
| | Outdoor | 179 | 46.4 |
| Residence | Rural | 211 | 52.2 |
| | Urban | 193 | 47.8 |
| Family size (persons in household) | 0 – 4 | 198 | 49.0 |
| | 5 – 10 | 206 | 51.0 |
| House size (rooms in household) (*n* = 394)‡ | 1 room | 45 | 11.1 |
| | 2 rooms | 170 | 42.1 |
| | > 2 rooms | 179 | 44.3 |

‡: Not all participants responded to this question

## Knowledge related to, and Attitudes towards Covid-19

Knowledge and attitude were categorised based on five questions; source of information, mode of transmission, preventive measures, hand washing, and availability of running water (Table 2).

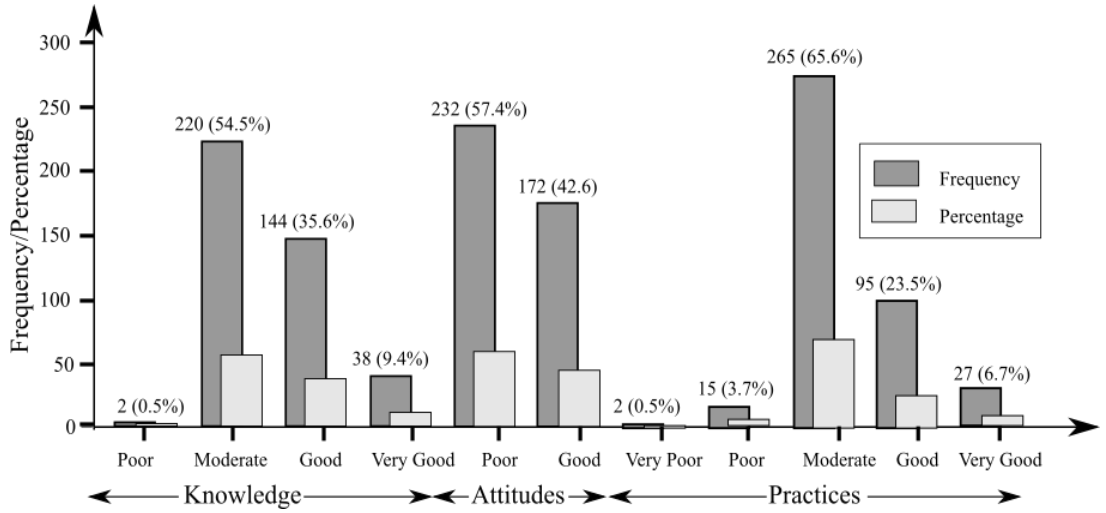


**Figure 2.** Graded KAP scores of Covid-19

For the source of information, the majority of the respondents got information on Covid-19 from the social media 363 (89.9%), followed by television 339 (83.9%), and mouth-to-mouth 253 (62.6%) conversations (Table 2).

The mean knowledge (±SD) score among all respondents was 58.4 ± 11.6 (Moderate) (Figure 3). Of the 404 respondents, majority 220 (54.5%) had moderate knowledge, while [144 (35.6%)] had good knowledge, [2 (0.5%)] had poor knowledge related to Covid-19 (Figure 2).

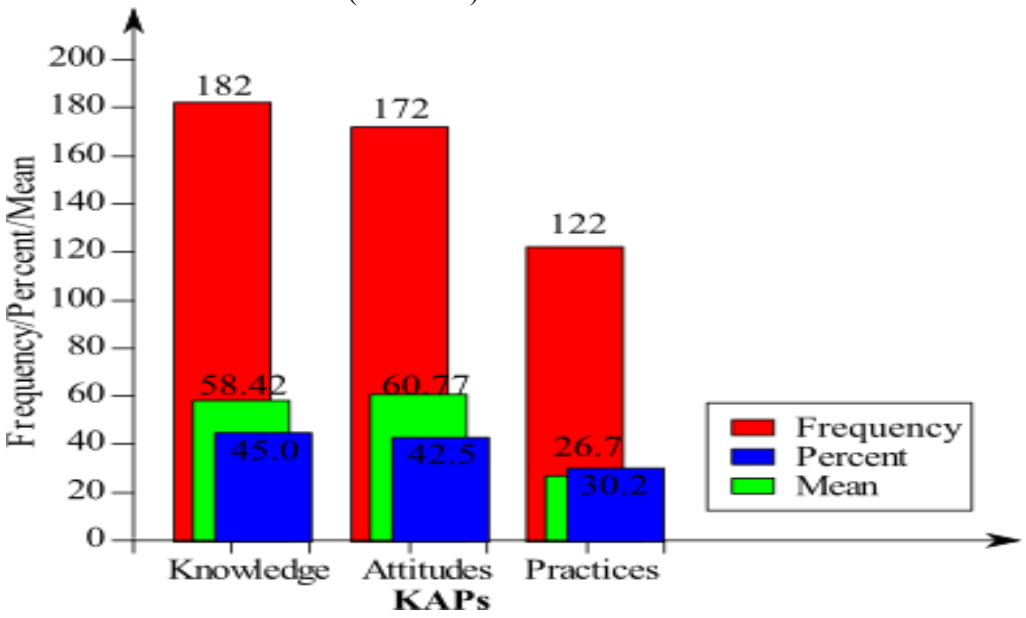


**Figure 3.** Overall KAP regarding the Covid-19 Pandemic in Bamenda

Two hundred and eighteen (54.0%) of the respondents correctly identified droplet transmission as the mode of transmission; 282 (69.8%) correctly identified hand-washing/use of sanitizers as a preventive measure against Covid-19 infection (Table 2). However, we detected some critical knowledge gaps, for example, 17 (4.2%) were ignorant about preventive measures.

**Table 2:.** Knowledge and Attitudes of Respondents

| Variable | Subclass | Frequency | Percent |
|---|---|---|---|
| Source of information | Mouth-to-mouth | 253 | 62.6 |
| | Newspaper | 59 | 14.6 |
| | Social media | 363 | 89.9 |
| | Television | 339 | 83.9 |
| Mode of Covid-19 transmission | Droplet spread | 218 | 54.0 |
| | Coughing/Sneezing/Speaking | 08 | 2.0 |
| | Kissing infected persons | 136 | 33.7 |
| | Hand shaking | 170 | 42.1 |
| | Superstition | 11 | 2.7 |
| | Touching contaminated surfaces | 170 | 42.1 |
| Preventive measures | Social distancing | 197 | 48.8 |
| | Hand washing/use of sanitizers | 282 | 69.8 |

| | | | |
|---|---|---|---|
| | Wearing of facemasks | 85 | 21.0 |
| | Prayers | 65 | 16.1 |
| | Frequent baths | 30 | 7.4 |
| Hand washing frequency ($n$ = 402) ‡ | After touching objects | 216 | 53.7 |
| | Less than 10 times/day | 91 | 22.6 |
| | When I have access to water | 95 | 23.6 |
| Access to running water? | Access to running water? | 328 | 81.2 |

‡: Not all respondents answered this question

The mean attitude (±SD) score towards Covid-19 among the surveyed respondents was 60.77 ± 38.44 (good) (Figure 3). Some positive attitudes were observed, 53.7% of the respondents said they will wash their hands after touching objects or surfaces, while 81.2% had access to running water (Table 2).

## Association of Knowledge and Attitude with Characteristics of Respondents

Data analysis showed that demographic factors influenced knowledge scores, being significantly higher ($p < 0.05$) in the older respondents, those with higher education or who had a larger family size. Age-wise, respondents in the older age groups were more likely to be informed/have knowledge related to Covid-19 when compared with those in the < 25 years old: 25 – 49 years old were twofold more likely to be informed [O.R; 2.0, 95% C.I; (1.1 – 3.6), $p = 1.7\text{x}10^{-2}$]. In terms of education, those in the higher strata were more informed when compared with those in the primary level stratum: those of the secondary level stratum were six-fold [O.R; 6.0, 95% C.I; (3.1 – 11.7), $p = 8.9\text{x}10^{-8}$] while those in the tertiary level stratum were eighteen-fold [O.R; 17.8, 95% C.I; (6.2 – 51.4), $p = 1.1\text{x}10^{-7}$] more likely to be informed when compare with their primary level stratum counterparts (Table 3).

Bivariate and multinomial linear regression analyses revealed that; sex, education, occupation, residence, family size, and house sizes, had a significant ($p < 0.05$) association with the attitudes of the respondents. Participants who had attended tertiary education, the unemployed, those in rural areas/hinterlands, and those who lived in two-room houses were, respectively, about four-fold [O.R; 4.3, 95% C.I; (1.5 – 12.2), $p = 6.9\text{x}10^{-3}$], two-fold [O.R; 1.6, 95% C.I; (0.6 – 4.3), $p = 3.9\text{x}10^{-1}$], two-fold [O.R; 1.7, 95% C.I; (1.0 – 2.6), $p = 3.2\text{x}10^{-2}$], and two and half-fold [O.R; 2.5, 95% C.I; (1.4 – 4.5), $p = 2.9\text{x}10^{-3}$] as compared to their referenced counterparts (Table 3).

**Table 3.** Association of Respondents' General Characteristics and Knowledge/Attitudes related to Covid-19

| **Dependent Variables** | | **Knowledge‡ (*n* = 182)** | | | | **Attitude‡ (*n* = 172)** | | | |
|---|---|---|---|---|---|---|---|---|---|
| **Independent Variables** | **Subclass** | **Frequency (%)** | **$\chi^2$/F (*p* - value)** | ***p* – value** | **O.R (95% C.I.)** | **Frequency (%)** | **$\chi^2$/F (*p* - value)** | ***p* – value** | **O. R (95% C.I.)** |
| Sex | Male | 79 (43.4) | 0.16 ($6.9x10^{-1}$) | | | 63 (36.6) | 3.99 ($4.6x10^{-2}$) * | $1.7x10^{-2}$* | 1.7 (1.1 - 2.8) † |
| | Female | 103 (56.6) | | | | 109 (63.4) | | Ref | 1.0 |
| Age (years) | < 25 | 49 (26.9) | 9.14 ($1.0x10^{-2}$) * | $7.2x10^{-1}$ | 0.9 (0.4 – 1.8) | 37 (21.5) | 0.24 ($8.9x10^{-1}$) | | |
| | 25 – 49 | 93 (49.5) | | $1.7x10^{-2}$* | 2.0 (1.1 – 3.6) † | 102 (59.3) | | | |
| | ≥ 50 | 40 (22.0) | | Ref | 1.0 | 33 (19.2) | | | |
| Education | Tertiary | 12 (6.6) | 17.94 ($1.2x10^{-4}$)* | $1.1x10^{-7}$* | 17.8 (6.2 – 51.4)† | 11 (6.4) | 9.73 ($7.7x10^{-3}$)* | $6.9x10^{-3}$* | 4.3 (1.5 - 12.2) † |
| | Secondary | 80 (44.0) | | $8.9x10^{-8}$* | 6.0 (3.1 – 11.7) † | 94 (54.7) | | $4.7x10^{-1}$ | 0.8 (0.5 - 1.4) |
| | Primary | 90 (49.5) | | Ref | 1.0 | 67 (39.0) | | Ref | 1.0 |
| Occupation ∞ | Unemployed | 12 (6.6) | 13.20 ($1.0x10^{-2}$)* | $5.6x10^{-4}$* | 0.2 (0.1 – 0.5) | 9 (5.2) | 14.10 ($7.1x10^{-3}$)* | $3.9x10^{-1}$ | 1.6 (0.6 - 4.3)† |
| | Farming | 11 (6.0) | | $3.2x10^{-2}$* | 0.3 (0.1 – 0.9) | 13 (7.6) | | $1.7x10^{-1}$ | 0.5 (0.2 - 1.4) |
| | Business | 41 (22.5) | | $1.9x10^{-7}$* | 0.1 (0.0 – 0.2) | 44 (25.6) | | $1.8x10^{-3}$* | 0.3 (0.1 - 0.6) |
| | Skilled | 50 (27.5) | | Ref | 1.0 | 41 (23.8) | | Ref | 1.0 |
| | Unskilled | 68 (37.4) | | $1.5x10^{-2}$* | 0.4 (0.2 – 0.8) | 65 (37.8) | | $3.4x10^{-1}$ | 1.4 (0.7 - 2.7) † |
| Residence | Rural | 88 (48.4) | 1.20 ($1.6x10^{-1}$) | | | 78 (45.3) | 5.68 ($1.7x10^{-2}$)* | $3.2x10^{-2}$* | 1.7 (1.0 - 2.6) † |
| | Urban | 94 (51.6) | | | | 94 (54.7) | | Ref | 1.0 |
| Family size (persons in household) | 0 – 4 | 106 (58.2) | 11.30 ($7.8x10^{-4}$)* | $1.2x10^{-1}$ | 0.7 (0.4 – 1.1) | 99 (57.6) | 8.76 ($3.1x10^{-3}$)* | $3.8x10^{-7}$* | 0.2 (0.1 - 0.4) |
| | 5 – 10 | 76 (41.8) | | Ref | 1.0 | 73 (42.4) | | Ref | 1.0 |
| House size (rooms in household) | 1 room | 19 (10.4) | 7.34 ($2.5x10^{-2}$)* | $4.3x10^{-1}$ | 0.7 (0.3 – 1.6) | 28 (16.3) | 7.58 ($2.3x10^{-2}$)* | $7.1x10^{-1}$ | 1.2 (0.5 - 2.7)† |
| | 2 rooms | 88 (48.4) | | $8.1x10^{-2}$ | 0.6 (0.3 – 1.1) | 67 (39.0) | | $2.9x10^{-3}$* | 2.5 (1.4 - 4.5)† |
| | > 2 rooms | 67 (36.8) | | Ref | 1.0 | 77 (44.8) | | Ref | 1.0 |

Ref: reference, SD: Standard Deviation, $\overline{x}$: mean, $\chi$2: Chi square, ‡: not all participants answered this question, *: indicate significant p-values, †: indicates most the likelihood parameter, ⁑: The reference category is; Knowledgeable/Good Attitudes

## Practices of Participants towards Covid-19

The mean practice (±SD) score 26.70 ± 7.60 showed moderate practice towards Covid-19. For practices pertaining to current preventive measures, the respondents outlined three (Chloroquine, Vitamin C, and Paracetamol) of the drugs in the regimen recommended by the Cameroonian Ministry of Public Health. Respondents were ignorant of the full regimen as they left out azithromycin and zinc; further, 180 (44.6%) had no idea of any current prevention measure against Covid-19.

One hundred and twenty-two [122 (30.2%)] of the study participants had good practices towards the prevention of the scourging pandemic (Table 5; Figure 3). Looking at what people take as preventive measures, 161 (39.9%) eat citrus fruits, and 44 (10.9%) take vitamin C tablets (Table 4). It was also observed that 65 (16.1%), and 30 (7.4%) respectively, resorted to prayer, and frequent baths. Moreover, 180 (44.6%) of respondents took no preventive precautions against Covid-19 (Table 4).

**Table 4.** Practices of Respondents

| Variable | Subclass | Frequency | Percent |
|---|---|---|---|
| Current preventive measures | Chloroquine | 27 | 6.7 |
| | Vitamin C | 44 | 10.9 |
| | Citrus fruits | 161 | 39.9 |
| | Paracetamol (PCM) | 12 | 3.0 |
| Current preventive measures Score | No current preventive measure | 180 | 44.6 |
| | At least 1/4 current preventive measure | 204 | 50.5 |
| | At least 2/4 current preventive measures | 20 | 5.0 |
| Known traditional medicine for Covid-19 ($n$ = 396) ‡ | Known traditional medicine for Covid-19 | 12 | 3.0 |
| Measures to take if a Covid-19$^+$ person elopes hospital | Alert the authorities in charge | 254 | 37.1 |
| | Advise h/her to take other treatment while staying at home | 42 | 10.4 |
| | Avoid being in contact with h/her | 131 | 32.4 |
| Graded measures to take if a Covid-19$^+$ person elopes hospital | No measure | 35 | 8.7 |
| | At least 1/3 measure to take | 311 | 77.0 |
| | 2/3 measures to take | 58 | 14.4 |

‡: Not all Participants Answered this Question

## Predictors of Practices of Participants towards Covid-19

Bivariate and multinomial linear regression analyses revealed that educational status had significant associations with respondents' practices towards the Covid-19 preventive measures.

**Table 5.** Association of Respondents' General Characteristics and Practices regarding Covid-19

| **Dependent variable** | | **Practices⁑ (*n* = 122)** | | | |
|---|---|---|---|---|---|
| **Independent Variables** | **Subclass** | **Frequency (%)** | **$\chi^2$/F (*p* - value)** | ***p* – value** | **O.R (95% C.I.)** |
| Sex | Male | 48 (39.3) | 0.64 ($4.3x10^{-1}$) | $3.7x10^{-1}$ | 1.3 (0.8 - 2.1)† |
| | Female | 74 (60.7) | | Ref | 1.0 |
| Age (years) | < 25 | 41 (33.6) | 18.70 ($8.7x10^{-5}$)* | $7.7x10^{-2}$ | 0.5 (0.3 - 1.1) |
| | 25 – 49 | 55 (45.1) | | $2.6x10^{-1}$ | 1.4 (0.8 - 2.6)† |
| | ≥ 50 | 26 (21.3) | | Ref | 1.0 |
| Education | Tertiary | 9 (7.4) | 5.69 ($5.8x10^{-2}$)* | $2.7x10^{-4}$* | 5.3 (2.2 - 13.0)† |
| | Secondary | 56 (45.9) | | $8.0x10^{-3}$* | 2.1 (1.2 - 3.7)† |
| | Primary | 57 (46.7) | | Ref | 1.0 |
| Occupation | Unemployed | 0 (0.0) | 34.40 ($6.2x10^{-7}$)* | - | - |
| | Farming | 3 (2.5) | | - | - |
| | Business | 24 (19.7) | | - | - |
| | Skilled | 43 (35.2) | | - | - |
| | Unskilled | 52 (42.6) | | - | - |
| Work environment | Home | 36 (29.5) | 18.55 ($9.4x10^{-5}$)* | $8.7x10^{-2}$ | 1.6 (0.9 - 2.8)† |
| | Office | 11 (9.0) | | $5.6x10^{-8}$* | 8.9 (4.1 - 19.7)† |
| | Outdoor | 66 (54.1) | | Ref | 1.0 |
| Family size (persons in household) | 0 – 4 | 72 (59.0) | 7.00 ($8.1x10^{-3}$)* | $7.1x10^{-2}$ | 0.6 (0.4 - 1.0) |
| | 5 – 10 | 50 (41.0) | | Ref | 1.0 |

Ref: reference, SD: Standard Deviation, $\overline{x}$: mean, $\chi$2: Chi square, ‡: not all participants answered this question, *: indicate significant p-values, †: indicates the most likelihood parameter, ⁑: The reference category is Good practice

## Correlation between KAP towards Covid-19

Significant positive correlations ($p < 0.001$) were recorded between KAP scores in the study sample. For example, knowledge scores were strongly positively correlated to practice ($r$ = 0.75) and weakly negatively correlated to attitude ($r$ = -0.2) scores, while attitude scores were weakly positively correlated to practice ($r$ = 0.17) (Table 6; Figure 4).

**Table 6.** The Correlations between Scores of KAP towards Covid-19

| **Variable(s)** | **Knowledge** | **Attitudes** | **Practices** |
|---|---|---|---|
| Knowledge | 1.000 | -0.023 | $0.749^{**}$ |
| Attitudes | $6.46x10^{-01}$ | 1.000 | $0.174^{**}$ |
| Practices | $7.96x10^{-74}$ | $4.57x10^{-04}$ | 1.000 |

**Correlation is significant at the 0.01 level (2-tailed)

Note: the upper triangle constitutes of $r$ values and the lower triangle constitute of $p$ values.

In bivariate analysis, knowledge shows no significant association with attitudes but shows a significant association with practice (Figure 4).

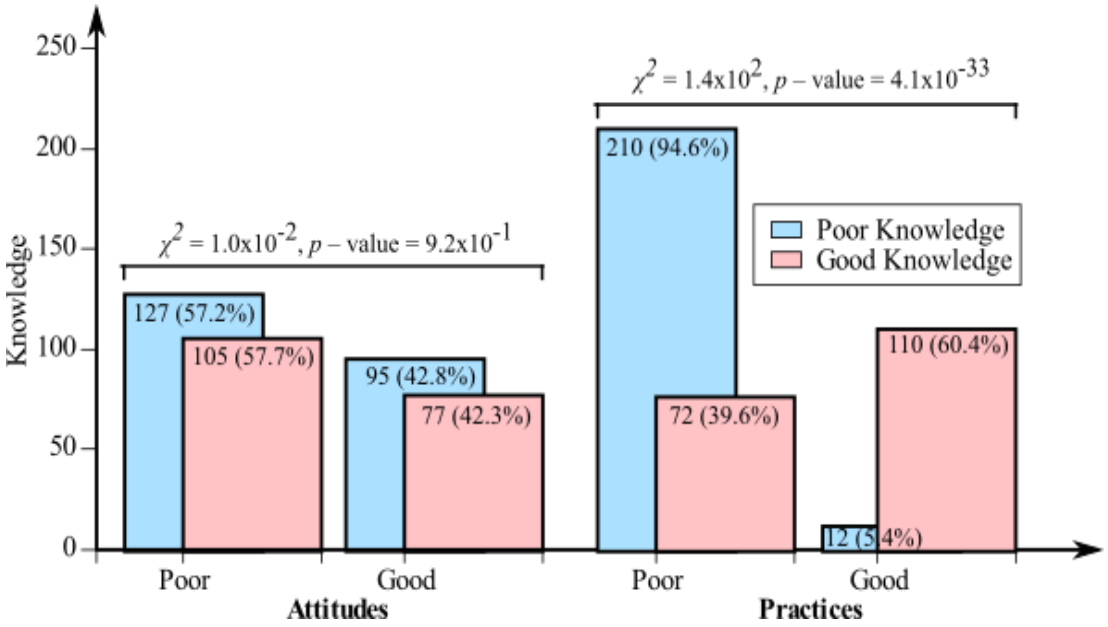


**Figure 4.** Association of Knowledge with Attitudes/Practices

## Discussion

The purpose of this study was to explore the general level of KAP towards Covid-19 among Cameroonians residing in the BHD. In general, we found that the knowledge, attitude, and practice levels of participants towards Covid-19 were moderate, good, and moderate, respectively; thus poor compliance with preventative measures.

### Knowledge Covid-19

Our data shows that 45.0% of the residents had good knowledge of Covid-19.

The main sources of information about Covid-19 included social media, television, mouth-to-mouth, and newspaper, perhaps because most of the participants were internally displaced persons, literate, and underemployed. Information about Covid-19 could have easily reached the participants through WhatsApp, television, and directed mouth-to-mouth communication. Fewer respondents had knowledge of the modes of Covid-19 transmission; droplet spread, handshaking, touching of contaminated objects, as well as public health preventive measures, namely, hand washing/use of hand sanitizers, wearing of masks in public, and social distancing. Our findings are in agreement with a similar study conducted in the Buea Health District of Cameroon with intermediate knowledge of Covid-19 [25]. Nonetheless, our findings differ between studies conducted in Cameroon, Uganda, Saudi Arabia, Palestine, and Bangladesh, that all show high knowledge scores regarding Covid-19 [6,31-33]. These differences might be explained by the differences in study design; different study times, sample sizes as well as gender differences. We found significant differences in knowledge scores by socio-demographic characteristics, namely, age, education, and family size, among others, contrary to findings in Uganda [6], where differences were due to gender.

### Attitudes

Our study shows that participants have some positive attitudes towards the WHO/MOH guidelines to halt the spread of Covid-19. The overall attitude towards WHO/MOH guidelines is low, and this might translate to compromised adherence to practicing public health preventive measures, which might pose a public health threat of community transmission of Covid-19. Our findings are similar to those of a similar study in Buea [25] and differs from another

study in Cameroon [32]. Our findings also differ from studies conducted in Uganda, Palestine, and Saudi Arabia that found high attitude scores [6,31,33]. In our study, the attitude scores are different with respect to levels of education, sex, occupation, which is similar to findings worldwide [3].

### Practices

The proportion of participants with good practice in this study was low with a mean practice score of 26.70 ± 7.60 (Moderate), which was similar to that reported in a similar study in the Buea Health District [25], and lower than that of a nationwide study [32]. Our findings were also different from those in a study amongst Filipino Health Care Workers (HCWs), which revealed that all respondents were aware or neutral to the risks of Covid-19, yet many of them did care for the infected patients [4].

### Strengths and Limitations

### Strengths of the Study

This is the first study in BHD to assess KAP to/towards Covid-19. This study covered randomly selected three HAs in BHD and thus presents credible evidence that can inform policy makers, epidemiologists, public health practitioners, health service managers, and researchers, among others, about prospective public health information dissemination strategies, as well as existing gaps that need immediate public health preventive measures.

### Limitations of the Study

Despite these strengths, there are numerous limitations that should be considered in the interpretation of the results. Our sample size was relatively small compared to other studies. This was not surprising because during the data collection period, the ongoing conflict restricted lots of movements to critical workers, particularly security personnel and healthcare providers, and most economic/social activities that pulled participants from their homes were partially closed. Second, since there was fear of the unknown as well as lack of trust, many potential participants would not accept data collectors in their homes. Moreover, we did not use financial support to entice respondents as it was a voluntary exercise. Therefore, our responses are limited to those whom we were able to meet at home/markets/shops/health facilities.

However, the data on KAP were uniformly distributed, suggesting that the present sample size is sufficient for statistical inference. Since this was a cross-sectional study, our findings demonstrate an association and no temporal relationship. Lastly, we did not study several factors which contribute to differences in KAP between males and females, such as source, access, frequency, and intensity of exposure to health information, including cultural differences, among others. We recommend that prospective studies should consider these factors.

## Conclusion and Recommendations

The study shows an overall low proportion of KAP of/towards Covid-19. We observed educational differences in KAP of/towards Covid-19. We conclude that the current public health preventive efforts should be directed towards closing the identified gaps in KAP. This will help to halt the spread of Covid-19 in the BHD and Cameroon as a whole.

### Ethics Approval and Consent to Participate

Ethical clearance for this study was obtained from the North West Regional Delegation of Public Health (Reference N°: 95/ATT/NWR//RDPH/BRIGAD). Informed consent was obtained from all subjects involved in the study.

## Competing Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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