Introduction. Handwashing has been recognized as a convenient, effective, and cost-effective means of preventing communicable diseases. However, many people overlook the importance of handwashing when engaging in activities that require handwashing due to various factors. The objectives of this study were to assess the level of handwashing knowledge, attitudes, and practices and determine their relationships and how they are affected by sex, educational background, and age.

Methods. A cross-sectional survey was conducted among 636 respondents who received and completed an online questionnaire that was disseminated to the contacts of the researchers via WhatsApp, Email, LinkedIn, and Facebook. Respondents were presented with several statements to assess their handwashing knowledge, attitudes, and practices.

Results. Overall, 82.2% of respondents had good knowledge, 91% had a positive attitude, and 48.4% adhered to good handwashing practices. Having a high school level of education (OR = 0.193, p = 0.034), (OR = 0.145, p = 0.000) and (OR = 0.448, p = 0.049) decreased the likelihood of having good knowledge, positive attitudes, and good practices than in persons with tertiary level education. Predictors of good handwashing practices were knowledge (OR = 1.059, p = 0.37) and attitude (OR = 1.095, p = 0.000).

Conclusions. Enhancing people’s handwashing practices requires positive attitudes and good knowledge about handwashing. These need to be complemented by enhanced access to handwashing facilities and innovative measures to enforce and encourage compliance.
organizations started providing hand hygiene facilities at work and in public places. There was even an apparent shortage of alcohol-based sanitizers on the market. For that reason, on 16th March 2020, the President met with leaders of Ghana’s pharmaceutical industries to discuss the local production of materials, including sanitizers, and liquid soaps as part of the COVID-19 response in Ghana. Accordingly, the Food and Drugs Authority fast-tracked the registration of hand sanitizers, and by 10th April 2020, it had approved 327 hand sanitizers for the COVID-19 fight [5]. There was heightened production, purchase, and display of handwashing facilities such as Veronica buckets and hand cleaning products at public spaces, workplaces, and similar locations.

Handwashing has been a convenient, effective, and cost-effective means of preventing communicable diseases in developing countries. Many infections start when hands are contaminated with disease causing-organisms, and this can happen after using the toilet, coughing or blowing the nose, handling garbage, and touching other contaminated surfaces [6]. Most diseases such as diarrhea and pneumonia, which are transmitted mainly by contaminated hands, can be prevented by handwashing with soap [7]. However, many people overlook the importance of handwashing when engaging in activities that require the washing of hands. For example, less than 40% of zoo visitors are reported to wash their hands upon exiting animal contact areas [8]. A study in 54 countries in 2015 found that, on average, 38.7% of households practiced handwashing with soap [9].

Factors such as hygiene education, adequate organizational factors including the availability of handwashing materials, and strong examples from influential persons, could effectively increase adherence to hand hygiene practices and reduce the incidence of infections [10, 11]. In an observational study, it was reported that people who lived in urban districts, with high educational levels and sufficient knowledge on infectious diseases have a high handwashing compliance rate [12]. In addition, women are more likely to wash their hands than men after controlling for washroom characteristics and clustering effects associated with social norms [13]. Several studies have examined attitudes and perceptions toward hand hygiene and found, for example, that most healthcare workers held positive attitudes and perceptions [14-16]. In contrast, few studies have focused on people’s knowledge, attitudes, perceptions, and practices toward hand hygiene during a pandemic. A few studies were undertaken to identify the factors that most effectively motivated people to adopt certain protective measures, including hand hygiene during the H1N1 epidemic and SARS pandemic, mainly in Hong Kong, China, Singapore, and South Korea [17-20]. A post-Ebola virus disease epidemic study in Nigeria showed that a higher proportion of respondents had a good knowledge of the risk factors of the disease but had a poor practice of hand hygiene for infection control [21].

This current study assessed the handwashing knowledge, attitudes, and practices of the public (i.e., people 15 years or older living in Ghana) during the COVID-19 pandemic. The objectives were to determine if handwashing knowledge, attitude, and practices differ by sex, educational background, and age, and assess the level of handwashing knowledge, attitudes and practices, and the relationships among them. This study provides insights into the level of knowledge and attitudes Ghanaians have about hand hygiene, especially handwashing, and identifies the knowledge gaps as well as issues that must be addressed to always enhance hand hygiene practices including during pandemics and epidemics.

### Methodology

A quantitative method was employed. The study was conducted between July and October 2020 when the Ghana Health Service was urging everyone to adhere to the COVID-19 preventive protocols. Handwashing knowledge was assessed by providing a set of questions and statements with corresponding options for the study participants to choose correct answers (Tab. II). Handwashing attitudes were assessed by providing statements for the respondents to indicate whether they agreed with them or not (Tab. III). Handwashing practices were assessed by providing a list of the prescribed hand hygiene practices (as publicized at the onset of the COVID-19 pandemic) to the participants to indicate whether they adhere to the practices or not (Tab. IV). Because of the restrictions on movements due to the COVID-19 pandemic, the data was collected using an online link to the questionnaire linked to the KoBo Toolbox. The online survey link was shared with the contacts of the researchers via WhatsApp, Email, and LinkedIn. The researchers appealed to all the contacts who had received the online link to also share with their contacts. The study was approved by the Council for Scientific and Industrial Research Institutional Review Board with approval no: RPN 004/CSIR-IRB/2020. An introductory statement was included in the survey that informed participants about the purpose of the survey, assured them of the confidentiality of the data, and gave them the option to opt out if they felt uncomfortable.

### Tab. I. Regional distribution of respondents.

| Region       | No. | Region       | No.   | Region       | No. |
|--------------|-----|--------------|-------|--------------|-----|
| Ahafo        | 4   | Central      | 27    | Northern     | 11  |
| Ashanti      | 59  | Eastern      | 24    | Oti          | 28  |
| Bono         | 2   | Greater Accra| 305   | Savannah     | 6   |
| Bono East    | 6   | North East   | 1     | Upper East   | 5   |
|              |     |              |       | Western North| 1   |
Handwashing Knowledge, Attitudes, and Practices in Ghana

**Data Analysis**
A total of 679 respondents completed the survey, of which 645 were from Ghana and 34 were from other countries. However, of the respondents in Ghana, nine (9) did not complete the questionnaire; hence those cases were discarded in addition to the cases by respondents outside Ghana. The analysis presented here is thus based on 636 respondents who were residents in Ghana at the time of the survey.

**Assessment of Knowledge about Handwashing**
The questions were categorized into (1) materials used for handwashing, (2) benefits of handwashing, (3) diseases preventable by handwashing, and (4) knowledge about the Global Handwashing Day. A correct response attracted 1 point, while a wrong response attracted 0 points. The total correct points were calculated in terms of absolute numbers and percentages. A criterion was developed to determine the level of knowledge: a score of 70-100% = Good knowledge; a score of 50-69% = Fair knowledge; and a score of 0-49% = Poor knowledge.

**Assessment of Attitude about Handwashing**
An agreed response implied a negative attitude while a disagreed response indicated a positive attitude. An agreed response attracted -1, while a disagreed response attracted +1 point. The total point for attitude was calculated by adding the positive and negative points. A negative total implies a negative attitude, and a positive total suggests positive attitude.

**Assessment of Handwashing Practice**
Any handwashing practice adhered to attracted 1 point.

### Table II. Statements and responses on handwashing knowledge.

| Handwashing knowledge statements | Authors’ Marking scheme | % of respondents who gave correct responses | % of respondents who gave wrong responses |
|---------------------------------|--------------------------|------------------------------------------|----------------------------------------|
| **Materials used for handwashing** |                          |                                          |                                        |
| Water is a material used for handwashing | Yes                      | 94.0                                     | 6.0                                    |
| Soap is a material used for handwashing | Yes                      | 93.9                                     | 6.1                                    |
| Antiseptics are materials used for handwashing | No                       | 84.9                                     | 15.1                                   |
| An alcohol-based sanitizer is a material used for handwashing | No                       | 51.1                                     | 48.9                                   |
| **Level of knowledge on materials used for handwashing** | Good knowledge = 82.2%; Fair knowledge = 17.0%; Poor knowledge = 0.8% |                                         |                                        |
| **Benefits of handwashing** |                          |                                          |                                        |
| Handwashing is a part of personal hygiene | Yes                      | 96.9                                     | 3.1                                    |
| Handwashing prevents diseases | Yes                      | 93.9                                     | 6.1                                    |
| Prevents mosquito bites | No                       | 96.7                                     | 3.3                                    |
| Handwashing Protects children against ill-health | Yes                      | 75.9                                     | 24.1                                   |
| Handwashing Limits spread of infections | Yes                      | 93.4                                     | 6.6                                    |
| **Level of knowledge on benefits of handwashing** | Good knowledge = 90.4%; Fair knowledge = 8.0%; Poor knowledge = 1.6% |                                         |                                        |
| **Diseases preventable by handwashing** |                          |                                          |                                        |
| Cholera is preventable by handwashing | Yes                      | 95.1                                     | 6.9                                    |
| Malaria is preventable by handwashing | No                       | 97.0                                     | 3.0                                    |
| Hypertension (a No is correct) | No                       | 97.2                                     | 2.8                                    |
| COVID-19 is preventable by handwashing | Yes                      | 98.4                                     | 1.6                                    |
| Common cold, Catarrh is preventable by handwashing | Yes                      | 40.1                                     | 59.9                                   |
| Typhoid is preventable by handwashing | Yes                      | 52.8                                     | 47.2                                   |
| Diarrhea is preventable by handwashing | Yes                      | 77.4                                     | 22.6                                   |
| **Level of knowledge on diseases preventable by handwashing** | Good knowledge = 87.3%; Fair knowledge = 11.6%; Poor knowledge = 1.1% |                                         |                                        |
| **Knowledge about Handwashing Day** |                          |                                          |                                        |
| 15th October is Global Handwashing Day | Yes                      | 24.3                                     | 75.7                                   |
| **Level of knowledge on Global Handwashing Day** | Good knowledge = 14.8%; Fair knowledge = 47.0%; Poor knowledge = 38.2% |                                         |                                        |
| **The Overall level of Knowledge about handwashing** | Good knowledge = 84.1%; Fair knowledge = 14.5%; Poor Knowledge = 1.4% |                                         |                                        |
point while a practice not followed attracted 0 points. The points were summed up and the equivalent percentages calculated. A criterion was developed as follows to determine the level of practice: a score of 70-100% = Good practice; a score of 50-69% = Fair practice; and a score of 0-49% = Poor practice.

Initial data analysis included descriptive statistics and cross-tabulations (chi-square tests) where the influence of sex, age, and educational background on respondents’ responses was examined. The cross-tabulation analysis on knowledge scores yielded some results where the expected cell counts were less than 5; hence the knowledge scale was dichotomized into ‘good knowledge’ and ‘fair knowledge’. Also, correlations and crosstabulations were performed to assess the relation of handwashing knowledge and attitude with handwashing practices. Furthermore, in cases where chi-square tests were significant, logistic or multinomial regression was used to determine the relationships. Finally, odds ratios (OR), p-values, and confidence intervals were reported for each level of the variables.

**Results**

The respondents were made up of 52.3% male and 43.7% female, with 58.5% being youthful (15-35 years) and 41.5% being older (36-80 years). About 77.3% had tertiary level of education while 15.7% and 6.9% had high school and basic school level education, respectively. The regional distribution of the respondents appeared to have been influenced by the networks of the researchers. Table II shows the proportion of respondents who gave correct or wrong responses. A total of 82.2% of
Handwashing Knowledge, Attitudes, and Practices in Ghana

Tab. V. Cross tabulations of educational level against handwashing knowledge, attitude and practices.

| Cross tabulations of educational level against handwashing knowledge, attitude and practices | Basic School | High School | Tertiary level | Total |
|-----------------------------------|-------------|-------------|----------------|-------|
| Good knowledge                    | 4.7%        | 10.1%       | 69.5%          | 84.1% |
| Fair knowledge                    | 2.2%        | 5.7%        | 8.0%           | 15.9% |
| Positive attitude                 | 6.3%        | 11.5%       | 73.4%          | 91.2% |
| Negative attitude                 | 0.6%        | 4.3%        | 3.9%           | 8.8%  |
| Good practice                     | 3.6%        | 3.8%        | 41.0%          | 48.4% |
| Fair practice                     | 1.1%        | 6.9%        | 11.8%          | 19.8% |
| Poor practice                     | 2.2%        | 5.0%        | 24.5%          | 31.8% |

Cross tabulations of handwashing practices against knowledge and attitude

| Cross tabulations of handwashing practices against knowledge and attitude | Good practice | Fair practice | Poor practice | Total |
|------------------------------------------------------------------------|---------------|---------------|---------------|-------|
| Good knowledge                                                         | 42.8%         | 14.6%         | 26.7%         | 84.1% |
| Fair Knowledge                                                         | 5.7%          | 5.2%          | 5.0%          | 15.9% |
| Positive attitude                                                      | 46.3%         | 17.2%         | 27.7%         | 91.2% |
| Negative attitude                                                      | 2.2%          | 2.7%          | 3.9%          | 8.8%  |

Respondents had good knowledge of the materials that are used for handwashing. However, about 51% said alcohol-based sanitizers are among materials used for handwashing, probably because they were unclear about the difference between handwashing and hand sanitizing, which does not involve the use of water. Also, 90.4% of respondents had good knowledge about the benefits of handwashing but 24.1% did not know that handwashing could protect children against ill-health. Furthermore, 87.3% had good knowledge about diseases that could be prevented by handwashing but 59.9% and 47.2% of respondents did not know that common cold and typhoid, respectively were preventable by handwashing.

Only 387 out of 636 respondents were aware of the existence of the Global Handwashing Day (GHWD) and just 24% of the 387 knew the date on which the GHWD is commemorated. Overall, 90.4% of respondents had good handwashing knowledge, 8% had fair knowledge, and 1.6% had poor knowledge.

On handwashing attitudes, overall, 91% of respondents had a positive attitude towards handwashing, with 75-98% showing a positive attitude for each statement except the statement “You will not wash your hands after using the toilet if you feel the water is not clean” where 50.9% portrayed a negative attitude (Tab. III). Also, 21-25% of the participants showed a negative attitude by agreeing that they would not wash their hands after using the toilet (a) if there is not enough water (23.1%), (b) if there is no soap (24.8%), and (c) if handwashing is not their habit (21.5%).

In terms of handwashing practices, Table IV shows that overall, less than 50% of respondents undertake most of the prescribed handwashing practices. About 32% of respondents exhibited poor handwashing practices as they did not adhere to most of the prescribed practices. The practices that most respondents adhered to were ‘washing their hands before entering an office or workplace’ (81.0%), ‘washing their hands before entering a supermarket’ (84.7%), and ‘washing hands after touching surfaces outside of the home’ (78.9%).

Cross-tabulation of the level of handwashing knowledge with sex, age, and level of education yielded a significant Pearson chi-square statistic only for the level of education (Tab. V). Also, a Chi-square test was performed for handwashing practices against knowledge and attitude and the results were statistically significant (Tab. V). Hence logistic regression analysis was performed to assess how educational background influences handwashing knowledge, attitude, and practices as well as how handwashing knowledge and attitude influence practices (Tab. VI).

The logistic model (Tab. VI) showed that having a basic level of education (OR = .136, p = .024) and high school level of education (OR = 0.193, p = 0.034.) decreased the likelihood of having good knowledge about handwashing by 0.136 and 0.193 times, respectively than in persons with tertiary level education. The results suggest a statistical association between level of education and level of knowledge about handwashing, however, basic and high school levels of education is not significant in predicting fair level knowledge. Results also showed that having a high school level of education (OR = 0.145, p = 0.000) decreased the odds of showing a positive attitude towards handwashing by 0.145 times than in people with tertiary level education. This suggests a statistical association between level of education and having a positive rather than negative handwashing attitude, however, this is not statistically significant in persons having a basic level of education.

Similarly, persons having a high school level of education (OR = 0.448, p = 0.049) were 0.448 times less likely to exhibit good handwashing practices than in persons with a tertiary level of education after controlling for the other factors in the model. Furthermore, a person with a high school level of education (OR = 2.860, p = 0.000) is 2.860 times more likely to exhibit fair handwashing practices compared to poor handwashing practices than in persons with a tertiary level of education after controlling for the other factors in the model. These results suggest that having a higher level of education could enhance one’s handwashing attitude and practices compared to a lower level of education.
In terms of the influence of knowledge and attitude on handwashing practices, firstly, correlations analysis showed that handwashing knowledge \((r = 0.154, p < 0.001)\) and handwashing attitude \((r = 0.197, p < 0.001)\) had significant positive associations with handwashing practices. In contrast, the knowledge score \((r = 0.394, p < 0.001)\) had a positive association with the attitude score. These suggest that people would adhere to most handwashing practices if they had a positive attitude toward handwashing and have good knowledge about handwashing. Secondly, the logistic regression model showed that increasing the knowledge score \((OR = 1.059, p = 0.37)\) by 1 unit increased the likelihood of having good handwashing practices compared to poor practices by 1.059 times after controlling for the other factors in the model. This result showed a statistical association between a person’s handwashing knowledge score and the level of handwashing practices exhibited; however, the association is not significant in terms of predicting a fair level of handwashing practice. Results also showed that if a person increases his/her handwashing attitude score \((OR = 1.095, p = 0.000)\) by 1 unit increased the likelihood of having good handwashing practices compared to poor practices by 1.095 times after controlling for the other factors in the model. This showed a statistical association between a person’s handwashing attitude score and the level of handwashing practices exhibited; however, the association is not significant in terms of predicting a fair level of handwashing practice. Results also showed that if a person increases his/her handwashing attitude score \((OR = 0.931, p = 0.004)\) by 1 unit increased the likelihood of having good handwashing practices compared to poor practices by 0.931 units if a person’s attitude score increased by a unit. These suggest that the more positive one’s attitude is towards handwashing, the greater the likelihood that the person would adhere to most handwashing and hand hygiene practices.

### Discussion

This study assessed whether handwashing knowledge, attitude and practices differ by sex, educational background and age or not and determined the level of handwashing knowledge, attitude and practices and their relationships. Although 82.2% of respondents had good knowledge of the materials used for handwashing, about half of the respondents indicated that alcohol-based sanitisers were among materials used for handwashing. This indicates that some people did not know the distinction between handwashing, which entails washing hands with non-antimicrobial or antimicrobial soap and water, and other means of ensuring hand hygiene. It is important for hygiene educators and promoters to emphasise the difference and note which hand hygiene methods should be promoted under specific conditions. For example, in poor communities where access to hand sanitizers may be a challenge, it is critical to promote handwashing with water and soap that may be easily accessible. Although sanitizers are used to maintain hand hygiene, it is important to emphasize that it is not the same as handwashing. Similarly, antiseptics are not used for handwashing, but antiseptic agents may be contained in antimicrobial soaps that are used for handwashing [22]. In this case, it is important for public health educators to distinguish between antiseptic handwash, which entails washing hands with water and soap or other detergents containing an antiseptic agent, and an antiseptic hand rub which involves applying a waterless antiseptic agent to all surfaces of the hands to reduce the number of microorganisms present [22].

Handwashing provides several benefits that could contribute to changing people’s attitudes and behaviors towards handwashing. Most respondents in this study had good knowledge about the benefits of handwashing,
However about one-third did not know that handwashing could protect children against ill-health. Good knowledge about this handwashing benefit is very critical because of the vulnerability and susceptibility of children to microbial infections. According to the WHO diarrheal disease, which is a symptom of infections caused by a host of bacterial, viral, and parasitic organisms, most of which are spread by feces-contaminated water, is the second leading cause of death in children under five years old, killing around 525,000 children each year [23]. Therefore, the importance of handwashing for the prevention of infectious disease especially, in children, has been established and is advocated for [24-27]. It is estimated that about one-third of infections are preventable by practicing correct handwashing [28].

Regarding the specific diseases preventable by handwashing, the overall knowledge level is good in 87.3% of respondents. This is not different from a study by Suen et al. [29], who found that majority of their respondents could differentiate between the diseases that could or could not be transmitted through poor hand hygiene. Notwithstanding the overall good knowledge, the findings showed that about 60% of respondents did not know that the common cold could be prevented by handwashing, while 47% did not know the power of handwashing in preventing typhoid infection. These findings suggest that more education is needed on the various health benefits of handwashing, especially for endemic infectious diseases. In Ghana, typhoid fever was ranked among the top twenty causes of outpatient morbidity and accounted for 1.2%, 1.7%, and 1.3% of hospital admissions in 2017, 2016, and 2015, respectively. The transmission of typhoid fever occurs through the faecal-oral route; hence hygienic procedures such as handwashing are important for preventing and controlling the infection [30]. A study in Jakarta, Indonesia, where typhoid is endemic, found that households that do not use soap for handwashing are at a significantly higher risk of contracting typhoid [31]. Handwashing with soap could prevent respiratory infections by 16-21%, reduce pneumonia by 25%, and protect about 1 of 5 young children with respiratory infections [32-34]. The low-level knowledge with respect to specific illnesses calls for the need for more education on the various health benefits of handwashing as well as common diseases it could help prevent.

Overall, the majority (91.2%) of the respondents had a positive attitude towards handwashing, with over 70% showing a positive attitude for each statement except for three. The highest proportion of respondents (97.5%) showed a positive attitude towards the statement ‘handwashing is important aligning with a study where 89.8% agreed to this statement [35]. For the statement “You will not wash your hands after using the toilet if you feel the water is not clean”, about half of the respondents portrayed a negative attitude which calls to question the kind of water that can be used for handwashing. This is critical, especially in communities where water may be prone to contamination. However, it is critical to emphasize that water for handwashing does not have to be as clean as drinking water because research has found that washing hands with soap and even very contaminated water from the municipal water supply still delivered health benefits including diarrhea reduction [36]. Also, about 21-25% of the respondents showed a negative attitude by agreeing that they would not wash their hands after using the toilet (a) if there is not enough water (23.1%); (b) if there is no soap (24.8%), and (c) if handwashing is not their habit (21.5%). Although handwashing with soap is substantially more effective at removing dirt and germs from hands, the use of water alone does help reduce the risk of diarrhea [37]. Thus, it is preferable to wash hands with only water to not wash at all because of the absence of soap. In hygiene education, where there is no water, it is important to emphasize other hand hygiene practices such as the use of hand sanitizers. The findings bring to the fore the importance of ensuring the provision, availability, and access to handwashing materials or hand hygiene materials. Handwashing is a repetitive action that may lead to the formation of a habit, and habits can influence behaviour [38]. However, about 78.5% of respondents were of the view that even if they had not developed the habit of handwashing, they would wash their hands after using the toilet. This positive attitude could be the result of their understanding of the benefits of handwashing. Handwashing practices are the actual activities that will lead to disease prevention. Hence, it was quite unsatisfactory that overall, less than 50% of respondents undertook most of the COVID-19 prescribed handwashing and hygiene practices while one-third of respondents exhibited poor hand washing practices. Similar findings were reported by Fielmua et al. [39] and UNICEF [33], where only 20% of the Ghanaian population were found to wash their hands with soap while awareness about the importance of the practice remains low, with a handwashing growth rate of 8% over the period 2014-2017 [33]. Similar findings were reported by Rabbi and Dey [40], where 90% of their respondents had knowledge about the importance of handwashing before eating, but only 21% did so. The practices that most respondents adhered to were ‘washing hands before entering an office’ (81.0%), ‘washing hands before entering a supermarket’ (84.7%), and ‘washing hands after touching surfaces outside of the home’ (78.9%). These results could be attributed to the COVID-19-related directives by the Ghana government, where handwashing and hand hygiene facilities were supposed to be provided at public spaces, including offices, supermarkets, churches, and bus stations. These facilities were not only provided, but there were also persons stationed near the facilities to enforce compliance by people visiting these public spaces. The provision of these facilities in shops and other public spaces has also been reported in a study conducted in Northern Ghana [39]. However, contrary to our findings, they found that adherence to COVID-19 safety protocols at shopping centres was very poor, with about 91.3% of the customers not practicing handwashing before entering the shops although handwashing facilities
were provided. They also report that non-adherence to COVID-19 protocols was higher in shops where there was no pressure to conform to the protocols. Gender and age of respondents had no significant influence on the level of handwashing knowledge, attitude, and practices. However, the educational level of respondents was found to significantly influence the level of handwashing knowledge, such that the higher the educational level the better the knowledge in issues related to handwashing. Similar findings were reported by Suen et al. [29], in which having a tertiary education level improved handwashing knowledge. On the contrary, they found that gender and age influence handwashing knowledge, whereas being female and middle-aged significantly enhanced handwashing knowledge. Our findings also differ from Fielmua et al. [39], who found that youth and children had a poor attitude towards the COVID-19 protocol practices including, handwashing, compared to adults. In Ghana, before the COVID-19 pandemic, messages on handwashing were rarely shared with the public; hence most people who knew might have read about it themselves or were taught during their formal education. In Ghana, where the illiteracy rate among persons 15 years and older is 21% World Bank [41], it will be useful to integrate handwashing messages in non-formal educational programs as well as during church and funeral programs, festivals and other social gatherings. It is also critical to incorporate handwashing lessons in all educational curricula starting from preschool through basic to tertiary levels. The positive correlations found among handwashing knowledge, attitude, and practices suggest that people would adhere to most handwashing practices if they had a positive attitude towards handwashing and had good knowledge about handwashing procedures and benefits. This was confirmed in the logistics regression analyses where there were statistical associations between a person’s handwashing knowledge score, positive attitude, and handwashing practices. Thus, a higher handwashing knowledge score and a positive attitude towards handwashing are likely to increase a person’s adherence to the prescribed handwashing practices. Fielmua et al. [39] also found that attitude is critical to handwashing behavior and the fight against the COVID-19. These findings are in line with Garba and Uche [42], who found that level of knowledge and attitude toward proper handwashing practices were significantly associated with the adherence to the practice.

One major limitation of the study is that all the data are based on self-reports by the respondents, which the authors could not verify because the study was online based. In addition, regional influence on the results was not assessed because of their uneven representation, which reflects the sampling technique employed.

Conclusions

This study assessed the handwashing knowledge, attitudes, and practices of people living in Ghana during the COVID-19 pandemic. Handwashing knowledge was found to be generally good among the respondents; however, in terms of the distinction between handwashing and hand sanitizing materials as well as the specific diseases that are preventable by handwashing, a lot more public education is required. It is also important to create more awareness about Global Handwashing Day and sensitize people on the importance and significance of the Day. Furthermore, handwashing knowledge, attitude, and practices were found to be statically associated with the educational background of respondents; hence it is important to take advantage of this and incorporate handwashing education in formal educational curricular as well as non-formal educational programs to address the needs of people who may not be literates.

Most respondents generally had a positive attitude to handwashing and were of the view that handwashing is important, especially after visiting the toilet. However, it is important for public health and hygiene educators to clearly explain what types of water could be used, whether soap should necessarily be used, and what to do when there is inadequate or no water and/or soap. Despite the general good knowledge and positive attitudes to handwashing, most respondents exhibited poor adherence to the prescribed handwashing and hand hygiene practices except in a situation where measures had been put in place to enforce compliance. This study has revealed that enhancing people’s handwashing practices requires positive attitudes towards handwashing as well as good knowledge about the appropriate materials used for handwashing and the health benefits of handwashing. These need to be complemented by enhanced access to handwashing facilities and innovative measures to enforce and encourage compliance with most hand hygiene practices, especially during pandemics such as COVID-19 and epidemics such as cholera and other endemic infectious diseases.

Acknowledgment

The authors are grateful to all their colleagues and friends who helped in sharing the survey link.

Ethical approval

The study was approved by the Council for Scientific and Industrial Research Institutional Review Board with approval no: RPN 004/CSIR-IRB/2020.

Conflict of interest statement

The authors declare no potential conflicts of interest.

Funding sources

The study was self-funded by the authors.
Authors’ contributions

RO and FZ designed the study. RO, SBT, FZ, WA participated in the data collection and analysis. RO drafted the manuscript. All authors read, revised, and approved the manuscript.

References

[1] World Health Organisation. Coronavirus disease (COVID-19) pandemic. Available at: https://www.who.int/emergencies/diseases/novel-coronavirus-2019 (Accessed on: April 05, 2020).
[2] UNICEF. Everything you need to know about washing your hands to protect against coronavirus (COVID-19). Available at: https://www.unicef.org/ghana/everything-you-need-know-about-washing-your-hands-protect-against-coronavirus-covid-19 (Accessed on: April 05, 2020).
[3] Ministry of Health. Ghana confirms two cases of COVID-19. Available at: https://ghanairlineservice.org/covid19/downloads/covid_19_first_confirmed_GH.pdf (Accessed on: April 12, 2020).
[4] CITI Newsroom. Coronavirus: Government bans religious activities, funerals, all other public gatherings. Available at: https://citinewsroom.com/2020/03/government-bans-church-activities-funerals-all-other-public-gatherings/ (Accessed on: April 12, 2020).
[5] CITI Newsroom. FDA approves 327 hand sanitizers for COVID-19 fight. Available at: https://citinewsroom.com/2020/04/fda-approves-327-hand-sanitizers-for-covid-19-fight-full-list/ (Accessed on: April 18, 2020).
[6] Majorin F, Freeman MC, Barnard S, Routray P, Boisson S, Clasen T. Child feces disposal practices in rural Orissa: a cross-sectional study. PLoS one 2014;9:e89551. https://doi.org/10.1371/journal.pone.008955
[7] UNICEF. Committing to Child Survival: A Promise Renewed Progress Report 2013. Available at: https://reliefweb.int/report/world/committing-child-survival-promise-renewed-progress-report-2013 (Accessed on: June 22, 2020).
[8] Anderson JL, Warren CA, Perez E, Louis RI, Phillips S, Wheeler J, Misra R. Gender and ethnic differences in hand hygiene practices among college students. Am J Infect Control 2008;36:361-8. https://doi.org/10.1016/j.ajic.2007.09.007
[9] WHO and UNICEF. JMP Hand washing dataset. WHO/UNICEF Joint Monitoring Programme (JMP) for water supply and sanitation. Available at: https://washdata.org/ (Accessed on: August 16, 2020).
[10] Yeung WK, Tam WSW, Wong TW. Clustered randomized controlled trial of a hand hygiene intervention involving pocket-sized containers of alcohol-based hand rub for the control of infections in long-term care facilities. Infect Control Hosp Epidemiol 2011;32:67-76. https://doi.org/10.1086/657366
[11] Huis A, Schoonhove, L, Grol R, Donders R, Hulscher M, van Achterberg T. Impact of a team and leaders-directed strategy to improve nurses’ adherence to hand hygiene guidelines: a cluster randomised trial. Int J Nurs Stud 2013;50:464-74. https://doi.org/10.1016/j.ijnurstu.2012.08.004
[12] Tao SY, Cheng YL, Lu Y, Hu YH, Chen DF. Handwashing behaviour among Chinese adults: a cross-sectional study in five provinces. Public health 2013;127:620-8. https://doi.org/10.1016/j.puhe.2013.03.005
[13] Mariwah S, Hampshire K, Kasim A. The impact of gender and physical environment on the handwashing behaviour of university students in Ghana. Trop Med Int Health 2012;17:447-54. https://doi.org/10.1111/j.1365-3156.2011.02950.x
[14] Tai JW, Mok M, Ching ESB, Seto PTY, Pittet WHD. (Nurses and physicians’ perceptions of the importance and impact of healthcare-associated infections and hand hygiene: a multicenter exploratory study in Hong Kong. Infection 2009;37:320-33. https://doi.org/10.1007/s15010-009-8245-x
[15] Zimakoff J, Kjesel AB, Larsen SO, Holstein B. A multicenter questionnaire investigation of attitudes toward hand hygiene, assessed by the staff in fifteen hospitals in Denmark and Norway. Am J Infect Control 1992;20:58-64. https://doi.org/10.1016/0116-6553(92)80001-2
[16] Patarakul K, Tan-Khum A, Kanha S, Padungpane D, Jaichaiyapum O. Cross-sectional survey of hand-hygiene compliance and attitudes of health care workers and visitors in the intensive care units at King Chulalongkorn Memorial Hospital. J Med Assoc Thai 2005;88:S287. https://doi.org/10.1111/j.1365-2648.2005.03490.x
[17] Lau JTF, Yang X, Tsui H, Kim JH. Monitoring community responses to the SARS epidemic in Hong Kong: from day 10 to day 62. J Epidemiol Community Health 2003;57:864-70. https://doi.org/10.1136/jech.57.11.864
[18] Tang CSK, Wong CY. Factors influencing the wearing of face-masks to prevent the severe acute respiratory syndrome among adult Chinese in Hong Kong. Prev Med 2004;39:1187-95. https://doi.org/10.1016/j.ypmed.2004.04.032
[19] Leung GM, Quah S, Ho LM, Ho SY, Hedley AJ, Lee HP, Lam TH. A tale of two cities: community psychobehavioral surveillance and related impact on outbreak control in Hong Kong and Singapore during the severe acute respiratory syndrome epidemic. Infect Control Hosp Epidemiol 2004;25:1033-41. https://doi.org/10.1086/502340
[20] Park JH, Cheong HK, Son DY, Kim SU, Ha CM. Perceptions and behaviors related to hand hygiene for the prevention of H1N1 influenza transmission among Korean university students during the peak pandemic period. BMC infectious diseases 2010;10:1-8. https://doi.org/10.1186/1471-2334-10-222
[21] Martins SO, Osijeryo AO. Hand hygiene practices post Ebola virus disease outbreak in a Nigerian teaching hospital. Ann Ib Postgrad Med 2017;15:16-22. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5598437/
[22] UNC Medical Center. Hand hygiene and use of antiseptics for skin preparation. Available at: http://spice.unc.edu/wp-content/uploads/2019/04/Hand-Hygiene-and-Use-of-Antiseptics-IC0024.pdf (Accessed on: March 04, 2021).
[23] World Health Organisation. Diarrhoeal disease. Available at: https://www.who.int/news-room/fact-sheets/detail/diarrhoeal-disease#:~:text=Diarrhoeal%20disease%20is%20the%20
[24] World Health Organisation. Hand hygiene: The evidence for skin preparation. Available at: http://spice.unc.edu/wp-content/uploads/2019/04/Hand-Hygiene-and-Use-of-Antiseptics-IC0024.pdf (Accessed on: March 04, 2021).
[25] Centers for Disease Control and Prevention. Handwashing: Clean Hands Save Lives. Available at: https://www.cdc.gov/handwashing/index.html (Accessed on: May 04, 2021).
[26] Jordan V. Coronavirus (COVID-19): infection control and prevention measures. J Prim Health Care 2020;12:96-7. https://doi.org/10.1071/HC19590
[27] Heymann DL, Shindo N. Coronavirus (COVID-19): what is next for public health? Lancet 2020;395:542-5. https://doi.org/10.1016/S0140-6736(20)30374-3
[28] Randle J, Metcalfe J, Webb H, Luckett JCA, Nerlich B, Vaughan N, Hardie KR. Impact of an educational intervention measures. J Prim Health Care 2020;12:96-7. https://doi.org/10.1016/1471-2334-10.1086/502340
[29] Suen LK, So ZY, Yeung SK, Lo KY, Lam SC. Epidemiological study of the impact of handwashing on the hospital environment on the handwashing behaviour of un
[30] UNICEF. Diarrhoeal disease is the number one disease of childhood and associated with second, and inadequate%20sanitation%20and%20hygiene (Accesses on: March 04, 2021).
[31] World Health Organisation. Hand hygiene: The evidence for clean hands. Available at: https://www.who.int/teams/integrated-health-services/infection-prevention-control/hand-hygiene (Accessed on: July 23, 2021).
[32] World Health Organisation. Hand hygiene, assessed by the staff in fifteen hospitals in Denmark and Norway. Am J Infect Control 1992;20:58-64. https://doi.org/10.1016/0116-6553(92)80001-2
[33] Jordan V. Coronavirus (COVID-19): infection control and prevention measures. J Prim Health Care 2020;12:96-7. https://doi.org/10.1071/HC19590
[34] Heymann DL, Shindo N. Coronavirus (COVID-19): what is next for public health? Lancet 2020;395:542-5. https://doi.org/10.1016/S0140-6736(20)30374-3
[35] Randle J, Metcalfe J, Webb H, Luckett JCA, Nerlich B, Vaughan N, Hardie KR. Impact of an educational intervention upon the hand hygiene compliance of children. J Hosp Infect 2013;85:220-5. https://doi.org/10.1016/j.jhin.2013.07.013
[36] Suen LK, So ZY, Yeung SK, Lo KY, Lam SC. Epidemiological investigation on hand hygiene knowledge and behaviour: a cross-sectional study on gender disparity. BMC Public Health 2019;19:1-14. https://doi.org/10.1186/s12889-019-6705-5
[30] Naing NN, Isa AR, Ahmad Z. Hygiene and eating habits of the families with typhoid patients. Med J Indonesia 1998;7(Supp1):215. https://doi.org/10.13181/mji.v7iSupp1.1115

[31] Volllaard AM, Ali S, Van Asten HA, Widjaja S, Visser LG, Surjadi C, Van Dissel JT. Risk factors for typhoid and paratyphoid fever in Jakarta, Indonesia. JAMA 2004;291:2607-15. https://doi.org/10.1001/jama.291.21.2607

[32] Global Handwashing Partnership. Clean Hands Prevent Cold and Flu: What you need to know to protect yourself through good hygiene. Available at: https://globalhandwashing.org/wp-content/uploads/2017/12/Clean-Hands-Prevent-Cold-Flu-slide-deck.pdf (Accessed on: March 17, 2021).

[33] UNICEF. Simple act of handwashing with soap could save thousands lives. Available at: https://www.unicef.org/ghana/media_10778.html (Accessed on: May 14, 2020).

[34] Centers for Disease Control and Prevention. Show me the science - why wash your hands? Available at: https://www.cdc.gov/handwashing/why-handwashing.html (Accessed on: July 23, 2021).

[35] Wu K-S, Lee SS-J, Chen JK, Tsai HC, Li CH, Chao HL, Chou HC, Chen YJ, Ke CM, Huang YH, Sy CL, Tseng YT, Chen YS. Hand hygiene among patients: attitudes, perceptions, and willingness to participate. Am J Infect Control 2013;41:327-31. https://doi.org/10.1556/1646.9.2017.24

[36] Global Handwashing Partnership. FAQs. Available at: https://globalhandwashing.org/about-handwashing/faqs/ (Accessed on: April 17, 2021).

[37] Luby SP, Halder AK, Huda T, Unicomb L, Johnston RB. The effect of handwashing at recommended times with water alone and with soap on child diarrhea in rural Bangladesh: an observational study. PLoS Med 2011;8:e1001052. https://doi.org/10.1371/journal.pmed.1001052

[38] Ajzen I. Nature and operation of attitudes. Annu Rev Psychol 2001;52:27-58. https://doi.org/10.1146/annurev.psych.52.1.27

[39] Fielmua N, Guba BY, Mwingyine DT. Hand hygiene and safety behaviours at shopping centres in COVID-19: an observation in Wa township in Ghana. J Water Sanit Hyg Dev 2021;11:442-52. https://doi.org/10.2166/washdev.2021.240

[40] Rabbi SE, Dey NC. Exploring the gap between handwashing knowledge and practices in Bangladesh: a cross-sectional comparative study. BMC public health 2013;13:1-7. https://doi.org/10.1186/1471-2458-13-89

[41] World Bank. Literacy rate, adult total (% of people ages 15 and above) – Ghana. Available at: https://data.worldbank.org/indicator/SE.ADT.LITR.ZS?locations=GH&most_recent_value_desc=false (Accessed on: April 18, 2021).

[42] Garba MB, Uche LB. Knowledge, attitude, and practice of hand washing among healthcare workers in a tertiary health facility in northwest Nigeria. J Med Trop 2019;21:73. https://doi.org/10.4103/jomt.jomt_16_19

Received on July 25, 2021. Accepted on February 10, 2022.

Correspondence: Rose Omari, Science and Technology Policy Research Institute, Council for Scientific and Industrial Research, P.O. Box CT 519, Cantonments, Accra, Ghana - Tel.: +2332344158896 - E-mail: rose.omari@yahoo.com; romari@csir.org.gh

How to cite this article: Omari R, Zotor F, Baah-Tuahene S, Arthur W. Handwashing knowledge, attitudes, and practices in Ghana. J Prev Med Hyg 2022;63:E59-E68. https://doi.org/10.15167/2421-4248/jpmh2022.63.1.2271

© Copyright by Pacini Editore Srl, Pisa, Italy

This is an open access article distributed in accordance with the CC-BY-NC-ND (Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International) license. The article can be used by giving appropriate credit and mentioning the license, but only for non-commercial purposes and only in the original version. For further information: https://creativecommons.org/licenses/by-nc-nd/4.0/deed.en