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The Handwashing Practices and Awareness Among Children in Primary Schools in Karongi District, Rwanda: What Strategies Can Promote Effective Handwashing Practices?

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Abstract

Child mortality in Africa is a pressing issue, particularly due to diarrhea and respiratory tract infections. These diseases are often transmitted through improper handwashing practices. This research aimed to identify the factors that influence handwashing habits and assess the availability of adequate facilities and water sources in primary schools in the Karongi district. A mixed-method approach was used to collect data from 583 students through structured questionnaires and 120 teachers through semi-structured interviews. Additionally, interviews with parents and community members were conducted to gain broader insights into community hygiene practices and support systems. Quantitative analysis using SPSS showed that promoting handwashing among school children reduces illness and absenteeism. Over two-thirds (67.2%) of students reported receiving effective support from their teachers, and another two-thirds (66.7%) stated that they wash their hands with soap and water. Moreover, close to another two-thirds (64%) of students acknowledged the importance of hygiene in disease prevention, and nearly two-thirds (60.9%) were aware of the health risks associated with poor hygiene. Qualitative findings revealed that while primary schools have sufficient hygiene facilities, there are challenges such as water shortages, inadequate hygiene resources, a limited number of washing stations, and water supply shortages. The study concludes that it is crucial to promote handwashing through educational campaigns to reduce disease transmission and improve the health outcomes of school children in Rwanda. Additionally, it emphasizes the need to address resource challenges in primary schools.

Keywords: *Effective Practices, Handwashing Behaviors, Hygiene Education, Primary School Children, Rwanda.*

Introduction

Importance of Hygiene Education

Handwashing practices have long been recognized as an effective, affordable and simple method for controlling and reducing transmission of infectious diseases [1]. In addition to academic learning, school-going children should be educated about hygienic practices that contribute to healthier lives in the community [2]. Bloomfield et al. [3] have noted that in some regions around the world, such as Sub-Saharan Africa and parts of South Asia, access to necessities like water is still lacking. This deficiency affects many schools located in these regions, making it difficult to implement proper handwashing practices due to a lack of facilities such as soap and running water. As a result, infectious diseases are easily transmitted among children. Consequently, schools are required to implement disease control measures including promoting handwashing practices and

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providing hygiene materials and facilities in school premises to address and prevent such issues. Improper handwashing practices have been linked to various serious health problems. Furthermore, inadequate sanitation and hygiene services in most schools in developing countries contribute to the spread of infectious diseases [4].

School-going children learn about handwashing practices from various sources and these sources differ from one country to another. For example, in Indonesian schools, 91.86% of students reported learning about handwashing from their parents, 50% from healthcare professionals, 34.9% from teachers, and 2.3% from friends [5]. In Ethiopia, 75% of students learned about handwashing from their parents, followed by 56% from schools, 36% from television or radio channels, 8% from healthcare facilities, and 5% from friends. It has been observed that schools are the main source of learning about hand hygiene for children living in rural areas, while homes are the primary source for children living in urban areas. Additionally, the lack of soap and clean water is a common barrier to handwashing practices in schools [6]. This, in turn, contributes to the spread of infectious diseases such as colds, flu, and diarrhea.

Significance of Handwashing

Practising proper handwashing is crucial for maintaining good health. The World Health Organization (WHO) has identified handwashing as an essential technique for disease and infection control [7]. Biswas et al. and Mane et al. have argued in their studies that handwashing is the most effective method for preventing disease transmission among individuals [8, 9]. Handwashing has been found to produce better outcomes in disease control than interventions such as injections or vaccinations. For example, when children practice proper and efficient handwashing, greatly reduces the incidence of pneumonia and diarrheal diseases.

Promoting handwashing practices in primary schools can significantly improve children's health behaviours, leading to better personal hygiene both at school and at home. However, it is crucial to have adequate resources in place, including well-maintained restrooms, easily accessible handwashing facilities, and a consistent water supply. By promoting handwashing practices, schools can effectively prevent the spread of harmful pathogens and reduce common illnesses such as colds and flu. This can also contribute to lower student dropout rates and enhance academic habits and life skills among students, including accountability, self-care, and concern for personal hygiene. Overall, promoting handwashing practices in schools benefits the physical and mental health of individual students and the broader community [10].

Relevance to Primary School Children in Karongi District, Rwanda

Throughout history, Rwanda has played a role in promoting the importance of handwashing practices globally. Ignaz Semmelweis's research in the 1990s emphasized the significance of hand hygiene in healthcare, which continues to inspire practices in Rwanda. The contemporary health programs of Rwanda focused on enhancing the health of children and mothers align with international handwashing campaigns during epidemics like the Spanish flu. The historical evidence of the benefits of handwashing during worldwide epidemics supports Rwanda’s commitment to preventative healthcare [11]. Although there has been considerable research on handwashing practices in schools such as [12, 13, 14], little is known about the extent of handwashing practices in Rwandan schools [15], particularly in the Karongi district. Understanding the current status of handwashing practices in this area has been essential for primary schools in Karongi to implement effective interventions aimed at improving sanitation and hygiene facilities and increasing awareness among children. Thus, this study aims

to explore handwashing practices and awareness among children in primary schools in Karongi district, Rwanda.

Research Objectives

The objectives of this study were:

1. To investigate the prevailing handwashing behaviours among primary school children in Karongi District, Rwanda.
2. To identify challenges and gaps in current hygiene practices among primary school children in Karongi District, Rwanda.
3. To propose evidence-based strategies for developing and promoting effective handwashing practices tailored to the specific needs of the Karongi District, Rwanda.

Methodology

Study Design

The current study utilized a descriptive cross-sectional research design, which involves observing and describing a phenomenon at a specific moment in time. This design allows researchers to collect data from a large and diverse sample of participants within a relatively short period [16]. In this study, researchers obtained information from primary school children and their teachers. This approach provided a comprehensive understanding of hand hygiene practices among primary school children in Karongi District, Rwanda.

To collect data, the study employed surveys, interviews, and observations as the primary techniques. Surveys were utilized to gather quantitative data on handwashing practices, knowledge, and attitudes among primary school children. Semi-structured interviews were conducted with teachers, parents, and community members to gain deeper insights into their perspectives and experiences related to hand hygiene. Additionally, direct observations were carried out in school settings to observe handwashing practices and assess the availability of handwashing facilities firsthand.

Study Population

The participants in this study included primary school children and their teachers from the Karongi District. Specifically, 2,176 students from the case group schools and 9,969 students from the control group schools took part in the study. Additionally, 120 teachers were conveniently selected to voluntarily participate in this research.

Inclusion Criteria

Participants included primary school children in Karongi District aged 6-12 years, currently enrolled with regular attendance and parental consent, as well as currently employed primary school teachers with at least one year of experience as a teacher working in one of the sampled schools in Karongi District.

Exclusion Criteria

Participants excluded were children with chronic illnesses, irregular attendance, or without parental consent, teachers not currently employed or with less than one year of experience in one of the sampled schools in Karongi District or unwilling to provide consent.

Sample Size Determination

The formula utilized for sample size determination is a standardized approach widely employed in statistical research [17]. As part of its application in our study, it's essential to contextualize the population dynamics. Out of a total of 40,660 individuals within the primary school-going age bracket, only 12,144 are currently attending primary school. Among these, 2,175 students fall within the schools constituting the case group. Therefore, the remaining 9,969 students were from the control group.

It has been noted that for populations smaller than 10,000, such as in this case, employing the standard formula is deemed appropriate. This is due to its simplicity and the ease of remembering crucial parameters. As pointed out by Cuemath [17], the standard formula is preferred in

scenarios with small to moderately sized-populations.

$$n = \frac{N * z^2 * p(1-p)}{e^2(N-1) + z^2 * p(1-p)}$$

Given a margin of error (e) of 5%, a confidence level of 95% (with a Z-score of 1.96), and a response distribution (p) of 50%, the calculated sample sizes were 306 for the control group (N = 9,969) and 277 for the experimental group (N = 2,175). However, the final sample size for the study comprised 583 students. Additionally, 15 teachers from each selected school were conveniently chosen to participate in the study.

Sampling Technique

In this study, two sampling techniques were employed to ensure a representative and manageable participant group from a total population of 583 students and 120 teachers.

Simple Random Sampling: This technique was used to select the 583 primary school children. Though, this sampling was used to select the students, ensuring that every student had an equal chance of being included in the sample, thereby enhancing the representativeness of the study. This method was chosen to provide a comprehensive and unbiased representation of the student population.

Convenience Sampling: This technique was used to select the 120 teachers. Although, this sampling involved the selection of participants who were readily available and willing to participate. This method was chosen due to practical considerations, such as the availability and willingness of teachers to participate within the study's timeframe.

Data Collection Tools and Techniques

Data Collection

Structured questionnaires were used to collect the quantitative data for the study. A total of 30 close-ended questions were included in the questionnaire for the school children. A Likert 5-scale measurement was used to record their answers in the questionnaire (1 = Strongly disagree; 2 = Disagree; 3 = Neither agree nor disagree; 4 = Agree; 5 = Strongly agree). They were asked to check the box to answer the questions, which included questions on current handwashing practices in their respective schools. It also sought information on the challenges or problems that might be caused by the current practices and what are the types of health hazards that are caused by the handwashing practices.

Semi-structured interview with respondents was also carried out in the convenient place of the school premises in a convenient place chosen by the administration. Interviews were conducted face-to-face by trained interviewers who ensured confidentiality and respect for participants' perspectives throughout the process. Direct observations were carried out in school settings to observe handwashing practices and assess the availability and condition of handwashing facilities. Researchers observed the frequency and thoroughness of handwashing, adherence to proper handwashing techniques, and any barriers or challenges encountered during the process.

Data Analysis

The survey data collected from school children were analyzed using Statistical Package for the Social Sciences (SPSS) version 25 software. Descriptive statistics such as frequencies, percentages, means, and standard deviations were calculated to summarize the responses to survey questions. The qualitative data gathered from interviews and observations were analyzed using thematic analysis techniques. Transcripts from interviews were coded and categorized into themes and sub-themes related to handwashing behaviours, perceptions of hygiene education, access to handwashing facilities, and cultural influences. Similarly, observational data were coded to identify patterns and themes related to handwashing practices and the availability of handwashing facilities in school settings.

Ethical Considerations

The current study sought approval from the TAU University Review Board (URB) and the letter for data collection was issued by the University. A letter authorizing the researcher to collect data in schools was issued by the Karongi District Office of the Ministry of Education. Every participant received information regarding the study's purpose and was asked to fill out questionnaires with authorization from the local government. The respondents provided informed, and volunteer written consent letter and their identifiers and names were anonymously maintained during and after the study period. The consent for the school students was obtained from their parents or legal guardians.

Results

The data was collected through face-to-face semi-structured interviews with students and teachers. The interviews focused on handwashing practices and related hygiene factors for quantitative analysis. However, the sample size of the study was chosen as 583 for students and 120 for teachers. The chi-square analysis, correlation, and multiple linear regression analyses of the quantitative data were carried out using IBM SPSS 25.0 to conclude the results that aligned with the research objectives, including the knowledge and awareness of handwash techniques, behavioural determinants of handwashing, and develop the effective handwashing practices.

Quantitative Data Analysis

Initially, the sample characteristics of collected data were analysed through frequency and percentage analysis to determine the proportion of students and teachers across experimental and control groups (Table 1). The cross-tabulation was performed to find out the highest percentage of responses of teachers reported for their implementation of handwash practices among students. In a similar manner, the results reported for the promotion of hygiene practices, and availability of provided hygiene facilities at schools by comparing experimental and control groups for students' data. Moreover, the significant differences between behavioural determinants of handwash practices among students were analysed using the chi-square test.

Sample Characteristics

A total of five-hundred eighty-three students (N = 583) completed the questionnaire survey and one hundred twenty teachers (N = 120) submitted the responses for the online questionnaire survey. About 309 (53%) students and 60 (50%) teachers belonged to the control group while 274 (47%) students and 60 (50%) teachers were in the experimental group (Table 1). Regarding the school sector of students, the highest number of them were from Bwishyura (80; 13.7%). The second highest number of students was from Murambi (78; 13.4%) while the third highest number of students was from Gishyita (76; 13%) and Mutuntu (76; 13%). Both Gashari and Gitesi school sectors had the same number of students as 70 (12%) and Murundi reported the lowest number of students as 68 (11.7%). In the case of the teachers' school sector, an equal number of teachers were included 15 (12.5%) in this study.

Table 1. Sample Characteristics of Primary Schools' Students and Teachers in Karongi District

Variables	Students (N = 583)	Teachers (N = 120)
School Category		
Control_group	309 (53.0%)	60 (50.0%)
Experimental_group	274 (47.0%)	60 (50.0%)
School Sector		
Bwishyura	80 (13.7%)	15 (12.5%)

Gaspari	70 (12.0%)	15 (12.5%)
Gishyita	76 (13.0%)	15 (12.5%)
Gitesi	70 (12.0%)	15 (12.5%)
Murambi	78 (13.4%)	15 (12.5%)
Murundi	68 (11.7%)	15 (12.5%)
Mutuntu	76 (13.0%)	15 (12.5%)
Ruganda	65 (11.1%)	15 (12.5%)

Source: Field Survey 2024

Provision of Hygiene Facilities in Schools

Provision of Facilities for Hygiene in Schools Based on Perspective of Students

The data findings showed that 140 (51.1%) respondents from the experimental group and 108 (35%) from the control group were mentioned that hand hygiene promoted in their schools. About 75 (27.4%) respondents from the experimental group and 76 (24.6%) from the control group positively reacted that their schools lack in providing soap and sanitiser. Out of them, 145 (52.9%) and 134 (43.4%) respondents were in experimental and control groups, respectively existence of hygiene facilities. In addition, 148 (54%) and 141 (45.6%) respondents from experimental and control groups, respectively had the availability of hand wash facilities (Table 2). According to the control group students, the provision of hygiene facilities was lower compared to the experimental group. Overall, the existence and availability of handwashing facilities were higher in Karongi District based on the above frequency analysis of 289 (48.6%) and 279 (47.9%) respondents, respectively. Thus, the promotion of hand hygiene at schools, the lack of soap and sanitiser ($p<0.001$), the existence of hygiene facilities ($p<0.001$), and the availability of hand wash facilities ($p<0.001$) were significantly associated with the knowledge and awareness about handwash techniques among students.

Table 2. Provided Facilities for Hygiene Practices in Schools in Karongi District from the Perspective of Students

Statements		**Frequency (N = 583)**	**Control Group (N = 309)**	**Experimental Group (N = 274)**	**p-value**
At Your Schools Promoting Hand Hygiene	Agree	163 (28.0%)	64 (20.7%)	99 (36.1%)	<0.001*
	Disagree	61 (10.5%)	57 (18.4%)	4 (1.5%)	
	Neither Agree nor Disagree	99 (17.0%)	75 (24.3%)	24 (8.8%)	
	Strongly Agree	248 (42.5%)	108 (35.0%)	140 (51.1%)	
	Strongly Disagree	12 (2.1%)	5 (1.6%)	7 (2.6%)	
Your School Lacks Providing Soap and Sanitizer, etc.	Agree	128 (22.0%)	35 (11.3%)	93 (33.9%)	<0.001*
	Disagree	136 (23.3%)	88 (28.5%)	48 (17.5%)	
	Neither Agree nor Disagree	119 (20.4%)	80 (25.9%)	39 (14.2%)	
	Strongly Agree	151 (25.9%)	76 (24.6%)	75 (27.4%)	

	Strongly Disagree	49 (8.4%)	30 (9.7%)	19 (6.9%)	
The Existence of Facilities to Wash Their Hands	Agree	176 (30.2%)	72 (23.3%)	104 (38.0%)	<0.001*
	Disagree	70 (12.0%)	61 (19.7%)	9 (3.3%)	
	Neither Agree nor Disagree	46 (7.9%)	36 (11.7%)	10 (3.6%)	
	Strongly Agree	279 (47.9%)	134 (43.4%)	145 (52.9%)	
	Strongly Disagree	12 (2.1%)	6 (1.9%)	6 (2.2%)	
Handwashing Facilities Were Available	Agree	147 (25.2%)	60 (19.4%)	87 (31.8%)	<0.001*
	Disagree	65 (11.1%)	58 (18.8%)	7 (2.6%)	
	Neither Agree nor Disagree	76 (13.0%)	46 (14.9%)	30 (10.9%)	
	Strongly Agree	289 (49.6%)	141 (45.6%)	148 (54.0%)	
	Strongly Disagree	6 (1.0%)	4 (1.3%)	2 (0.7%)	
***Denotes Statistical Significance at 0.05 (Chi-Square Test is Used)**					

Source: Field Survey 2024

Provision of Facilities for Hygiene in Schools Based on Perspective of Teachers

About 49 (81.7%) and 52 (86.7%) respondents from experimental and control groups, respectively mostly agreed that their schools are providing soaps, towels, etc. Out of them, 43 (71.7%) respondents from the experimental group and 54 (90%) from the control group mentioned that sinks are provided at the schools According to the perspective of many of the respondents, 50 (83.3%) from the experimental group 57 (95%) from the control group were considered that schools should provide hand drier options in handwash practices. Moreover, 58 (96.7%) and 54 (90%) in the experimental and control groups, respectively were aware of handwashing practices at their schools. About 42 (70%) in the experimental group and 43 (71.7%) in the control group received handwash practices at the schools (Figure 1). A total of 57 (95%) respondents from the experimental group and 58 (96.7%) from the control group believed that schools should support handwashing practices.

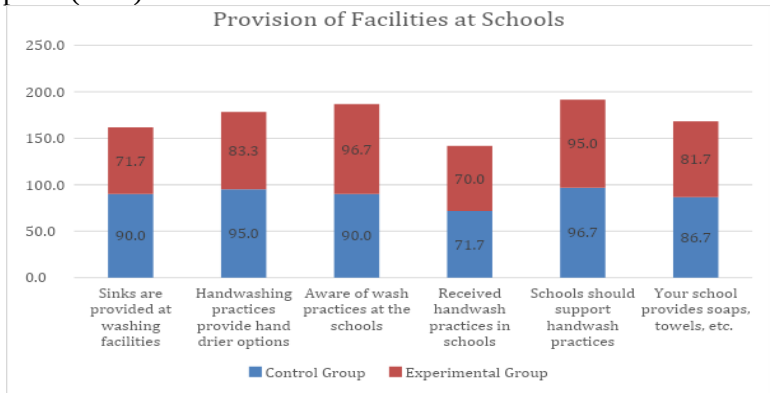

Figure 1. Provision of Hygiene Facilities at Rwanda Schools from the Perspective of Teachers

Source: Field Survey 2024

Implementing Hygiene Practices by Students in Karongi District

Most of the respondents, including 95 (34.7%) in the experimental group and 163 (52.8%) in the control group reported that hand gloves caused infections. Out of them, 203 (74.1%) and 163 (52.8%) respondents from experimental and control groups, respectively reported that they used spoons for eating than bare hands. In addition, 210 (76.6%) respondents from the experimental group and 164 (53.1%) respondents from the control group discussed that it is vital to implement hygiene practices at both school and home. Most of them, 79 (28.8%) and 85 (27.5%) respondents from experimental and control groups, respectively used hot water for washing their hands (Table 3).

Table 3. Implementation of Hygiene Practices by Students in Schools of Karongi District

Statements		**Frequency (N=583)**	**Control Group (N= 309)**	**Experimental Group (N=274)**	**p-value**
Using Hand Gloves May Cause Infections	Agree	111 (19.0%)	61 (22.3%)	50 (16.2%)	<0.001*
	Disagree	94 (16.1%)	39 (14.2%)	55 (17.8%)	
	Neither Agree nor Disagree	75 (12.9%)	38 (13.9%)	37 (12.0%)	
	Strongly Agree	258 (44.3%)	95 (34.7%)	163 (52.8%)	
	Strongly Disagree	45 (7.7%)	41 (15.0%)	4 (1.3%)	
Use Spoons for Eating Rather than Bare Hands	Agree	100 (17.2%)	47 (15.2%)	53 (19.3%)	<0.001*
	Disagree	51 (8.7%)	47 (15.2%)	4 (1.5%)	
	Neither Agree nor Disagree	55 (9.4%)	43 (13.9%)	12 (4.4%)	
	Strongly Agree	366 (62.8%)	163 (52.8%)	203 (74.1%)	
	Strongly Disagree	11 (1.9%)	9 (2.9%)	2 (0.7%)	
It is Essential for Both School and Home	Agree	101 (17.3%)	52 (16.8%)	49 (17.9%)	<0.001*
	Disagree	51 (8.7%)	47 (15.2%)	4 (1.5%)	
	Neither Agree nor Disagree	50 (8.6%)	40 (12.9%)	10 (3.6%)	
	Strongly Agree	374 (64.2%)	164 (53.1%)	210 (76.6%)	
	Strongly Disagree	7 (1.2%)	6 (1.9%)	1 (0.4%)	
Use Hot Water to Clean Your Hands	Agree	131 (22.5%)	70 (22.7%)	61 (22.3%)	<0.001*
	Disagree	104 (17.8%)	70 (22.7%)	34 (12.4%)	
	Neither Agree nor Disagree	103 (17.7%)	73 (23.6%)	30 (10.9%)	
	Strongly Agree	164 (28.1%)	85 (27.5%)	79 (28.8%)	
	Strongly Disagree	81 (13.9%)	11 (3.6%)	70 (25.5%)	
Rub Your Hands to Reduce the Spread of Germs	Agree	105 (18.0%)	44 (14.2%)	61 (22.3%)	<0.001*
	Disagree	122 (20.9%)	70 (22.7%)	52 (19.0%)	
	Neither Agree nor Disagree	126 (21.6%)	103 (33.3%)	23 (8.4%)	
	Strongly Agree	126 (21.6%)	67 (21.7%)	59 (21.5%)	

	Strongly Disagree	104 (17.8%)	25 (8.1%)	79 (28.8%)	
Using Hand Sanitizer to Reduce the Spread of Germs	Agree	111 (19.0%)	49 (15.9%)	62 (22.6%)	<0.001*
	Disagree	89 (15.3%)	59 (19.1%)	30 (10.9%)	
	Neither Agree nor Disagree	68 (11.7%)	39 (12.6%)	29 (10.6%)	
	Strongly Agree	260 (44.6%)	156 (50.5%)	104 (38.0%)	
	Strongly Disagree	55 (9.4%)	6 (1.9%)	49 (17.9%)	
Using Hand Sanitizer to Reduce the Spread of Infections	Agree	113 (19.4%)	55 (17.8%)	58 (21.2%)	<0.001*
	Disagree	85 (14.6%)	62 (20.1%)	23 (8.4%)	
	Neither Agree nor Disagree	52 (8.9%)	30 (9.7%)	22 (8.0%)	
	Strongly Agree	320 (54.9%)	157 (50.8%)	163 (59.5%)	
	Strongly Disagree	13 (2.2%)	5 (1.6%)	8 (2.9%)	
Five Minutes is Effective Enough for Handwashing	Agree	104 (17.8%)	39 (12.6%)	65 (23.7%)	<0.001*
	Disagree	108 (18.5%)	83 (26.9%)	25 (9.1%)	
	Neither Agree nor Disagree	114 (19.6%)	52 (16.8%)	62 (22.6%)	
	Strongly Agree	200 (34.3%)	116 (37.5%)	84 (30.7%)	
	Strongly Disagree	57 (9.8%)	19 (6.1%)	38 (13.9%)	
Hand Dryer Equip Hands After Washing It	Agree	87 (14.9%)	46 (14.9%)	41 (15.0%)	<0.001*
	Disagree	111 (19.0%)	56 (18.1%)	55 (20.1%)	
	Neither Agree nor Disagree	85 (14.6%)	45 (14.6%)	40 (14.6%)	
	Strongly Agree	210 (36.0%)	155 (50.2%)	55 (20.1%)	
	Strongly Disagree	90 (15.4%)	7 (2.3%)	83 (30.3%)	
Recommend to Friends About Handwashing Practices	Agree	116 (19.9%)	35 (11.3%)	81 (29.6%)	<0.001*
	Disagree	65 (11.1%)	51 (16.5%)	14 (5.1%)	
	Neither Agree nor Disagree	62 (10.6%)	48 (15.5%)	15 (5.1%)	
	Strongly Agree	313 (53.7%)	168 (54.4%)	145 (52.9%)	
	Strongly Disagree	27 (4.6%)	7 (2.3%)	20 (7.3%)	
***Denotes statistical significance at 0.05 (Chi-square test is used)**					

Source: Field Survey 2024

Many of the respondents in the experimental group, 79 (28.8%) strongly disagreed that rubbing hands would reduce the spread of germs while 103 (33.3%) from the control group neither agreed nor disagreed with the same. Over half, 156 (50.5%) in the experimental and 104 (38%) in the control group used hand sanitiser to reduce the spread of germs. Moreover, 163 (59.4%) and 157 (50.8%) respondents from experimental and control groups, respectively

used hand sanitiser for controlling the spread of infections. On the other hand, five minutes is effective enough for hand washing from the perspective of 84 (30.7%) respondents from the experimental group and 116 (37.5%) respondents from the control group. Moreover, hand dryer options were not used by respondents (83; 30.3%) in the experimental group. On the contrary, 155 (50.2%) respondents from the control group were considered to use the hand dryer after washing their hands. About 168 (54.4) and 145 (52.9%) from experimental and control groups, respectively were highly recommended handwashing practices to their friends. Overall, 374 (64.2%) and 366 (62.8%) respondents mentioned that hygiene practices are important at both schools and at home and used spoons rather than bare hands for eating, respectively. The significant results at $p<0.001$ were: causing infections due to hand gloves, using spoons for eating rather than bare hands, the importance of hygiene practices at both school and home and using hot water for washing the hands. Others were: rubbing hands to reduce the spread of germs, using hand sanitiser to reduce the spread of germs and control the spread of infections Additional ones were: five minutes is effective for hand washing, using a hand dryer after washing), and recommend handwash practices to their friends were significantly associated with the knowledge and awareness of students regarding hygiene and hand wash practices.

Qualitative Data Analysis

Concerning qualitative data analysis, a semi-structured interview design was utilized to collect responses from teachers (n = 120) regarding the challenges faced by students in implementing handwashing practices, and strategies for promoting hygiene in schools. Using NVivo 14, the qualitative data focusing on handwashing practices and hygiene in Rwanda schools through thematic analysis. This analysis represented codes and themes to comprehend the crucial role of handwashing practices and strategies for promoting hygiene within school settings.

NVivo 14 software was used to assess the outcomes of word frequency for collected interview responses that were transcribed into the text format. The results were shown for hand washing practices adopted by teachers in Karongi District. Three different themes emerged from interview responses of teachers from the Karongi district, such as the importance of WASH practices, hygiene promotion in the schools, and challenges and actions taken for good hygiene practices. The broad themes were explained using word clouds and hierarchical charts of data analysis to highlight their views regarding washing practices implemented by schools in Karongi district, Western Province, Rwanda.

Importance of Handwash Practices

It has essentially become more important to implement handwashing practices after the COVID-19 pandemic to reduce the disease transmission. Specifically, it is required to be aware of handwashing practices among children and teachers in schools. This study was about understanding the importance of handwashing practices in schools in the Karongi district.

According to the perspective of interviewees, hygiene purposes, reducing disease transmission, handwash practices, campaigns, soap, water, good habits, promotion, and monitoring, washing facilities, proper hygiene, etc. were considered as factors to be considered as important for handwash practices (Figure 2). Most of them discussed that hygiene and avoiding disease attacks were important reasons for handwashing practices among students. Although schools in the Karongi district implemented handwash practices and have water and soap facilities, it is required to promote the wash practices among children through campaigns and make them aware of the importance of proper hygiene to maintain individual health. Thus, the schools of Karongi district in Rwanda should promote handwash

practices among children to reduce the diseases and maintain the hygiene.

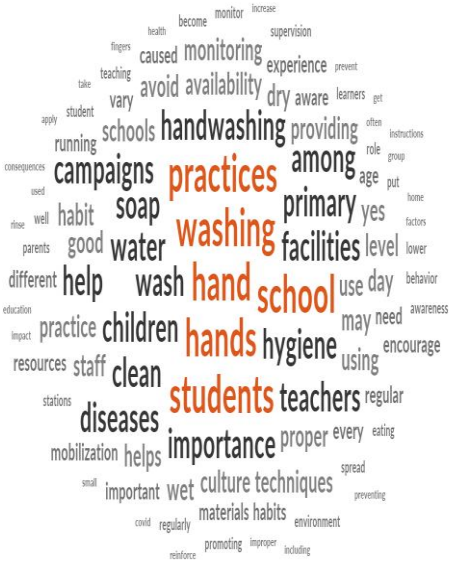

Figure 2. Importance of Handwash Practices in Karongi District Schools

Source: Field Survey, 2024

Promotion of Hygiene Activities in Rwanda Schools

The interviewed teachers reported that schools in Karongi district, Rwanda employed washing facilities, provision washing stations and washing materials, and implemented washing practices (Figure 3). They ensured that they had sufficient washing facilities and stations to promote the washing practices among students and promote hygiene. In addition, the schools of Karongi district promoted hygiene practices through good hand hygiene, promoting hand hygiene, effective hand hygiene products, and developing good hand hygiene behaviours among students (Figure 4).

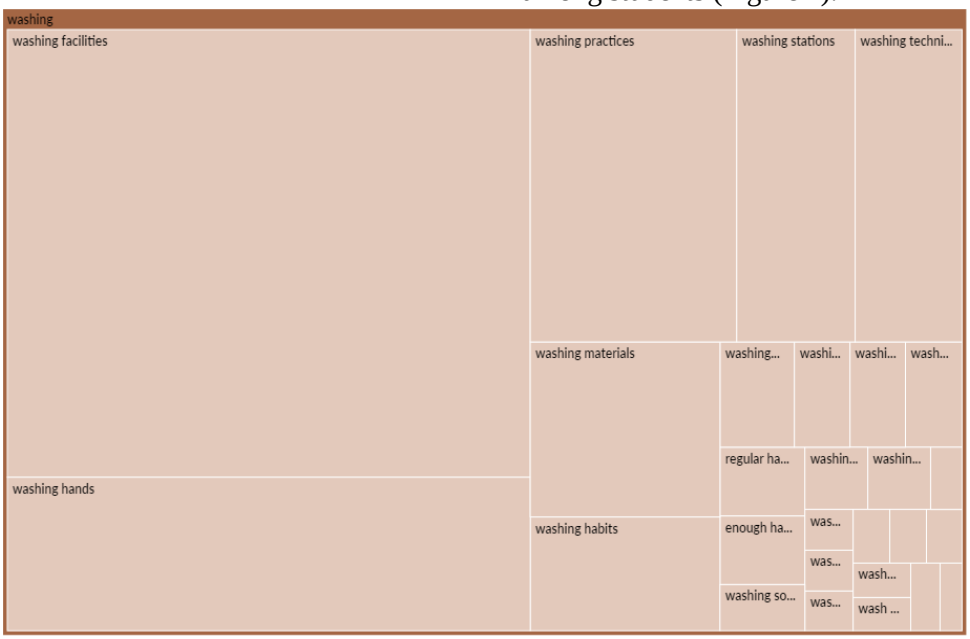

Figure 3. Promotion of Washing Practices Among Students in Schools of Karongi District

Source: Field Survey 2024

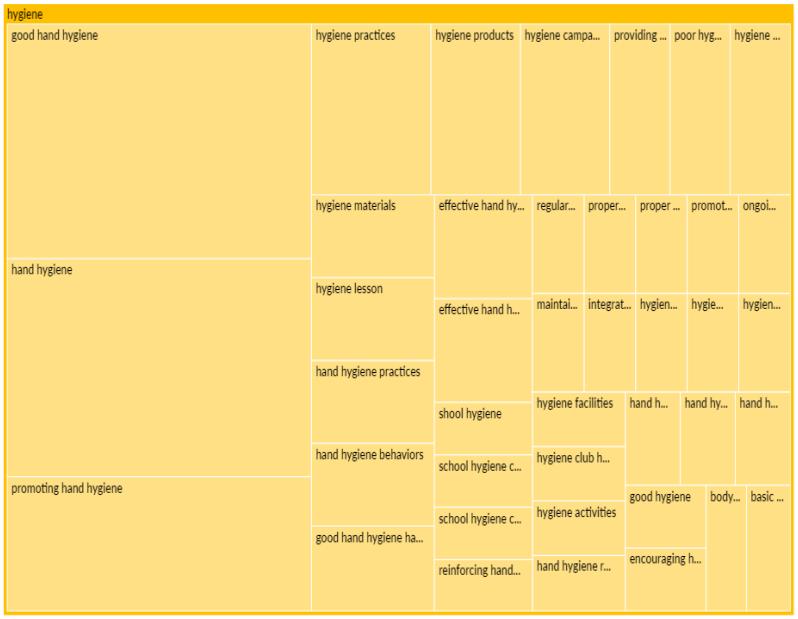

Figure 4. Promotion of Hand Hygiene Among Students in Schools of Karongi District

Source: Field Survey 2024

Challenges and Actions for Good Hygiene Practices

The students were raised several challenges and problems that they faced for hygiene practices. Specifically, the schools were lacking in water, shortage of washing facilities and materials, insufficient hygiene, limited handwash stations, resource constraints, ignorance of regular hygiene practices, budget issues, cultural boundaries, etc. (Figure 5). Thus, the schools from Karongi district, Rwanda should have to focus on resolving the challenges like lack of water, limited washing stations, insufficient hygiene, and shortage of facilities.

Figure 5. Challenges Faced by Students in Hygiene Practices

Source: Field Survey 2024

Furthermore, the problems faced by students were illness, diseases, germs spread, sickness, infections, harmful practices, etc. (Figure 6). These were the major responses reported by

teachers who working at schools in Karongi District. Therefore, schools should have to overcome these problems by maintaining efficient hygiene practices at their premises.

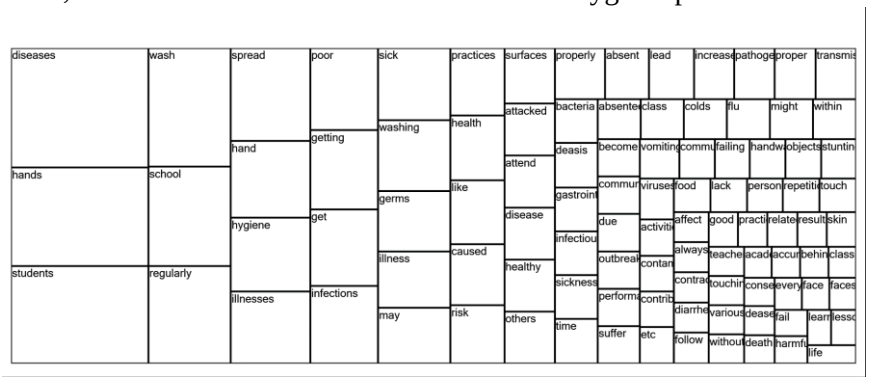

Figure 6. Problems Faced by Students in Implementing Hygiene Practices

Source: Field Survey 2024

The recommendations for good hygiene practices were provided by teachers and their responses were analyzed. Accordingly, parents, hand washing practices, soap, hygiene facilities, washing facilities, encourage wash practices, remind the children, follow regular handwash practices, provide good hand hygiene practices, hand sanitizers, etc. (Figure 7). These results indicated that schools in Karongi District should have to promote their students to implement handwash practices, use the washing facilities, educate the parents about washing practices, remind them about washing after eating and after using the toilet, use soap and towels, and regular monitoring of wash practices, and proper hygiene. Thus, it would be useful in promoting hygiene practices across schools in Karongi District.

Figure 7. Solutions for Good Hygiene Practices in Schools of Karongi District

Source: Field Survey 2024

Discussion

The students mentioned that it is important to implement handwashing practices at both home and school in this study. Similarly, the previous studies of [14, 18] discussed that handwashing practices should be considered by schools and encourage the students to implement them at schools and home as well. To address the first objective, it was revealed that a significant number of primary school children in Karongi District do not consistently practice proper handwashing, especially after using the toilet and before meals. This inconsistency highlights the need for more structured hygiene education programs in schools. In addition, they preferred to use spoons for eating than bare hands which is supported by the findings of Twinomuhwezi [19]. These results were improved by qualitative data findings that depicted schools in Karongi

district promoted hygiene practices in terms of good hand hygiene, efficient usage of hand hygiene products, promote hand hygiene, and develop good behavioural patterns of hand hygiene. This study also found that challenges and problems of hygiene practices faced by students at their schools included lacking water, insufficient hygiene, limited handwash stations and handwash facilities, and resource constraints. The major problems were sickness, spreading of germs, diseases, illness, and infections faced by students in their schools of Karongi district. These qualitative results are in line with the findings of the study of Chen et al. [20] which perceived the greater severity of illness to be compliance with the improved preventive measures. In addition, teachers felt the fear of missing classes by students due to diarrhoea which is associated with not handwashing hands after using the toilet. To address the second objective, this study identified gaps such as inadequate infrastructure for handwashing, like limited availability of soap and water, and a lack of consistent monitoring and reinforcement of handwashing practices by teachers and parents. Moreover, cultural and social factors that may influence hygiene behaviours were also noted as significant challenges. To overcome these challenges, the teachers recommended strategies like educating the parents about washing practices, promoting hygiene practices among students, using the washing facilities, implementing handwash practices, using soap and towels, and reminding the students about washing after eating and using the toilet. Thus, the schools of Karongi district can maintain proper hygiene by implementing these effective strategies. To address the third objective, this study proposed evidence-based strategies such as integrating handwashing education into the school curriculum, providing regular training for teachers on hygiene promotion, installing more handwashing stations, and ensuring a consistent supply of hand hygiene products. Additionally, engaging parents and community members in hygiene education programs can reinforce the importance of handwashing at home. The students' handwashing behaviours are predicted towards the implementation of hygiene practices at their schools in the Karongi district. The present study determined that there was a statistical significance between the attitude of students towards handwash practices and hygiene implementation ($p<0.001$; R-square: 0.55).

The study of Chen et al. [20] resonated with our study findings and discussed that the students' handwashing determinants promote the behaviour of hygiene in terms of washing their hands after eating and another common approach used for handwashing with soap by students. According to the study of Contzen et al. [21], it can be challenging to measure social behaviours like handwashing and hygiene practices because people have been inclined towards changing their behavioural patterns through observations or overreporting. The study by Rosenman et al. [22] extended to recommend that precise measurement is not necessary for self-reported data which could be useful in informing the policy and designing the intervention programmes for desired outcomes although the study of Contzen et al. [21] with self-reported nature resulted in the issues of social desirability bias in the responses of participants. Thus, it is essential to understand the behavioural determinants and knowledge or awareness about handwashing and hygiene practices to assist people towards positive hygiene and handwashing practices. These findings underline the critical role of continuous education and community involvement in sustaining hygiene practices, thereby improving overall health outcomes for children in Karongi District.

1. To investigate the prevailing handwashing behaviours among primary school children in Karongi District, Rwanda.
2. To identify challenges and gaps in current hygiene practices among primary school children in Karongi District, Rwanda.

3. To propose evidence-based strategies for developing and promoting effective handwashing practices tailored to the specific needs of the Karongi District, Rwanda.

Conclusion

This study has emphasized the importance of promoting hand hygiene interventions and campaigns among students to improve their knowledge and practices. Although the proportion of students in Karongi district, Western Province, Rwanda, who implemented handwashing practices properly was lower, the mixed-method study design showed strong support from teachers in all primary schools for these practices. This study revealed that a significant number of primary school children do not consistently practice proper handwashing, especially after using the toilet and before meals. However, the students' efforts to wash their hands with soap and water significantly contributed to reducing disease transmission. While schools generally provide sufficient facilities, more focus is needed on promoting hygiene practices and handwashing interventions among children. The study identified challenges and gaps in current hygiene practices including lack of water, insufficient hygiene education, limited handwash stations and handwash facilities, and resource constraints. These gaps need to be addressed to ensure comprehensive and effective hygiene practices among students.

Moreover, specific WASH interventions should target improving handwashing practices and hygiene education both at the family level (involving parents and children) and within schools (involving teachers). These strategies could be the integration of handwashing education into the school curriculum, providing regular training for teachers on hygiene promotion, installing more handwashing stations, and ensuring a consistent supply of hand hygiene products. The study successfully addressed the main problem of integrating hygiene practices into the education system to prepare future generations for current challenges. Rwanda, despite its economic constraints, is making commendable efforts to improve hygiene practices through initiatives and decisions aimed at upliftment.

Therefore, it is recommended that the local government support schools by providing well-designed handwashing facilities and infrastructure to enhance proper handwashing practices. Future studies should consider involving parents in the quantitative study design to provide a more robust analysis. Detailed and comprehensive analyses of hand hygiene practices and their associated influential factors among students in the Karongi district were conducted, providing valuable insights.

Recommendations

Based on the main findings, the following recommendations are crucial for improving handwashing practices and hygiene education:

1. The District Health and Education Offices could implement comprehensive WASH intervention programs and hygiene education at the family level. This should involve children, parents, and teachers to ensure a holistic approach to hygiene practices.
2. The schools could consider increasing the provision of well-designed handwashing facilities and infrastructure in schools. This will support proper handwashing practices among students.
3. The Ministries of Education and Health could develop and integrate targeted hand hygiene campaigns and interventions within the school curriculum. This will consistently reinforce the importance of handwashing and hygiene among students.
4. The District Health and Education Offices could engage parents and the wider community in hygiene education initiatives. This will create a supportive environment that encourages and models good

handwashing practices at home and in the community.

5. The District could collaborate with health organizations and NGOs to provide resources and support for hygiene education and infrastructure development.

Contribution to Knowledge

The study provides insights into handwashing habits and hygiene awareness among primary school students in the Karongi district, Rwanda. Through quantitative analysis, the study shows the effectiveness of promoting handwashing among students in reducing illness and absenteeism, highlighting the impact of school-based hygiene promotion. Qualitative findings reveal challenges in primary school hygiene infrastructure, such as water shortages and inadequate resources, providing insight into barriers to effective hygiene practices. The study emphasizes the importance of promoting handwashing through educational campaigns and addressing resource challenges in primary schools to enhance health outcomes for school children in Rwanda, offering actionable policy recommendations for improving hygiene practices.

Limitation of Study

Limitations were identified in the study's narrow focus on handwashing habits alone, without considering broader hygiene practices. Furthermore, the study did not sufficiently explore cultural and socioeconomic factors that may influence handwashing. Additionally, the assessment of the long-term sustainability of hygiene interventions was lacking, emphasizing the need for further research.

Suggestions for Future Research

Further research in the Karongi district, Rwanda could focus on investigating broader hygiene practices among primary school students. It is also important to conduct in-depth studies to understand how cultural and socioeconomic factors influence handwashing behaviours. Additionally, conducting longitudinal studies will help assess the long-term effect of hygiene interventions.

Strength of the Research

The study excels in its comprehensive examination of handwashing habits among primary school students. It employs a combination of methods, providing valuable insights and presenting practical policy suggestions.

Weakness of the Study

The study's limited focus on handwashing overlooks broader hygiene practices and does not sufficiently explore cultural influences.

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Conflicts of Interest

The author declares no conflict of interest.

References

[1]. Gawai, P. P., Taware, S. A., Chatterjee, A. S., & Thakur, H. P., 2016, A Cross Sectional Descriptive Study of Hand Washing Knowledge and Practices Among Primary School Children in Mumbai, Maharashtra, India. *Int J Community Med Public Health*, 3(10), 2958-2966, https://doi.org/10.18203/2394-6040.ijcmph20163391

[2]. Khatoon, R., Sachan, B., Khan, M. A., & Srivastava, J. P., 2017, Impact of School Health Education Program on Personal Hygiene Among

School Children of Lucknow District. *Journal of Family Medicine and Primary Care,* 6(1), 97-100, https://doi.org/10.4103/2249-4863.214973

[3]. Bloomfield, S. F., Aiello, A. E., Cookson, B., O'Boyle, C., & Larson, E. L., 2007, The Effectiveness of Hand Hygiene Procedures in Reducing the Risks of Infections in Home and Community Settings Including Handwashing and Alcohol-Based Hand Sanitizers. *American Journal of Infection Control,* 35(10), S27-S64, https://doi.org/10.1016/j.ajic.2007.07.001

[4]. McMichael, C., 2019, Water, Sanitation and Hygiene (Wash) in Schools in Low-Income Countries: A Review of Evidence of Impact. *International Journal of Environmental Research and Public Health*,16(3), 359, https://doi.org/10.3390/ijerph16030359

[5]. Setyautamii, T., Sermsri, S., & Chompikul, J., 2012, Proper Hand Washing Practices Among Elementary School Students in Selat Sub-District, Indonesia. *Journal of Public Health and Development,* 10 (2), 3–20, Retrieved From https://he01.tci-thaijo.org/index.php/AIHD-MU/article/view/2642

[6]. Admasie, A., Guluma, A., & Feleke, F. W., 2022, Handwashing Practices and its Predictors Among Primary School Children in Damote Woide District, South Ethiopia: An Institution Based Cross-Sectional Study. *Environmental Health Insights,* 16, https://doi.org/10.1177/11786302221086795

[7]. World health organization (WHO) 2015, Clean Care is Safer Care, Retrieved From https://www.who.int/gpsc/clean_hands_protection/en/

[8]. Biswas, D., Sahoo, S., Dasgupta, A., Preeti, P. S., & Amitavakumar Das, S., 2015, Quantification of Perception Status of Hand Washing Practice Among School Children in a Rural Area of West Bengal. Scholars *Journal of Applied Medical Sciences,* 3(4), 1683-1687, https://doi.org/10.36347/sjams.2015.v03i04.015

[9]. Mane, A. B., Reddy, N. S., Reddy, P., Chetana, K. V., Srijith, S. N., & Sriniwas, T., 2016, Differences of Hand Hygiene and its Correlates Among School Going Children in Rural and Urban Area of Karnataka, India. *Archives of Medicine,* 8(5), 1-5, https://doi.org/10.21767/1989-5216.1000163

[10]. Anand, D., & Prakash, S., 2018, Assessment of the Hygiene and Sanitation Practices of Students of Class VI to IX in Urban Government Inter College at Allahabad District, India. *Int J Community Med Public Health,* 5(9), 3870-3875, https://doi.org/10.18203/2394-6040.ijcmph20183428

[11]. Louis, E. F., Eugene, D., Ingabire, W. C., Isano, S., & Blanc, J., 2022, Rwanda's Resiliency During the Coronavirus Disease Pandemic. *Frontiers in Psychiatry,* 12, https://doi.org/10.3389/fpsyt.2021.589526

[12]. Steiner-Asiedu, M., Van-Ess, S. E., Papoe, M., Setorglo, J., Asiedu, D. K., & Anderson, A. K., 2011, Hand Washing Practices Among School Children in Ghana. *Current Research Journal of Social Sciences,*3(4), 293-300, Retrieved From https://maxwellsci.com/print/crjss/v3-293-300.pdf

[13]. Nwajiuba, C. A., Ogunji, C. V., Uwakwe, R. C., & David, E. I., 2019 Handwashing Practices Among Children in Public Schools in Imo State, Nigeria. *Global Journal of Health Science,* 11(14), 15, https://doi.org/10.5539/gjhs.v11n14p15

[14]. Almoslem, M. M., Alshehri, T. A., Althumairi, A. A., Aljassim, M. T., Hassan, M. E., & Berekaa, M. M., 2021, Handwashing Knowledge, Attitudes, and Practices Among Students in Eastern Province Schools, Saudi Arabia. *Journal of Environmental and Public Health,* https://doi.org/10.1155/2021/6638443/

[15]. Habumugisha, V., 2018, Assessing Students' Knowledge, Attitudes and Practices on Water, Sanitation, Hygiene, and Related Diseases in Selected Schools in Musanze District, Rwanda (Master's thesis), Retrieved From https://repository.pauwescop.net/bitstream/handle/1/263/MT_Vincent%20HABUMUGISHA.pdf?sequence=1&isAllowed=y

[16]. Bangdiwala, S. I., 2019, Basic Epidemiology Research Designs I: Cross-Sectional Design. *International Journal of Injury Control and Safety Promotion,* 26(1), 124-126, https://doi.org/10.1080/17457300.2018.1556415

[17]. Cuemath, (n.d.), Sample Size Formula-What is Sample Size Formula? Examples, Retrieved From https://www.cuemath.com/sample-size-formula/

[18]. Berhanu, A., Mengistu, D. A., Temesgen, L. M., Mulat, S., Dirirsa, G., Alemu, F. K., ... & Geremew, A., 2022, Hand Washing Practice Among Public Primary School Children and Associated Factors in Harar town, eastern Ethiopia: An Institution-Based Cross-Sectional Study. *Frontiers in Public Health*, 10, 975507, https://doi.org/10.3389/fpubh.2022.975507/

[19]. Twinomuhwezi, B., 2021, Factors Associated with Hand Washing Practices Among Secondary School Students in Ndorwa East Constituency in Kabale District (Doctoral Dissertation, Kabale University), Retrieved From https://backend.kab.ac.ug/server/api/core/bitstreams/d434141d-4e54-4d9b-81a5-4cf08df38479/content

[20]. Chen, X., Ran, L., Liu, Q., Hu, Q., Du, X., & Tan, X., 2020, Hand Hygiene, Mask-Wearing Behaviors and its Associated Factors During the COVID-19 Epidemic: A Cross-Sectional Study Among Primary School Students in Wuhan, China. *International Journal of Environmental Research and Public Health*, 17(8), 2893, https://doi.org/10.3390/ijerph17082893

[21]. Contzen, N., De Pasquale, S., & Mosler, H. J., 2015, Over-Reporting in Handwashing Self-Reports: Potential Explanatory Factors and Alternative Measurements. *PloS one,*10(8), e0136445, https://doi.org/10.1371/journal.pone.0136445/

[22]. Rosenman, R., Tennekoon, V., & Hill, L. G., 2011, Measuring Bias in Self-Reported Data. *International Journal of Behavioural and Healthcare Research*, 2(4), 320-332, https://doi.org/10.1504/IJBHR.2011.043414/