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Sociodemographic differences in WASH-related knowledge, attitudes, and practices among school children in rural India.

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Preface

The journey toward the chosen topic started with a very inspiring lecture on global health by my supervisor Sheri Lee Bastien during my first year at NMBU. This journey continued at the master thesis subject day held in January. Data from different research projects were made available for students as a master thesis project, including data from the SHINE intervention in India. I wanted to learn more about coding, data entry, statistics, and how to process this information in a systematic way. In addition, I wanted to learn more about WASH research and school-based interventions and how they can contribute to improving health in large and small communities. I am now more than ever in admiration, knowing all the hard work and dedication behind school-based interventions.

During this master thesis project, I have worked with inspiring women who have become role models I will look up to for the rest of my life. I would like to thank my supervisors, Sheri Lee Bastien and Fiona Vande Velde, for your excellent guidance, through ups and downs, through the process of becoming a mother (not sleeping) and for cheering me on all the way. Thank you, Anise Gold Watts, for your in-depth personal information and sharing your field experiences from SHINE India.

Submitting this master thesis represents an end of a personal era. I would like to thank my family. I would not be here if it weren't for you. Geir Erik, you always keep me grounded and in contact with what's important in life. To my father, you are my rock. Thank you for long talks and for guiding me through roadblocks. And to my little Hedda, all I do is for you.

"Lighting One Candle" by Yosa Buson

The light of a candle
Is transferred to another candle

—

Spring twilight

Abstract

Diarrhea is one of the leading causes of mortality for children under five in low- and middle-income countries (Ashbolt, 2004; Fewtrell et al., 2005). Diarrhea is possible to prevent with access to clean water, soap, adequate sanitation systems, and hygiene management (World Health organization, 2022b). Medical treatment of illnesses related to water, sanitation, and hygiene (WASH) represents a significant cost burden for the health sector (Mara et al., 2010). WHO estimates that 10 % of the total disease burden could be reduced worldwide if water sanitation and hygiene management and facilities were improved (World Health organization, 2019). This baseline cross-sectional study aimed to describe WASH-related knowledge, attitudes, and practices among students in sixth, seventh and eighth grade, before the SHINE intervention was implemented in two schools in rural India as part of a pilot study. Eighty-eight percent of the invited students completed the survey giving a total of 259 respondents. The thesis focuses specifically on WASH-related knowledge, attitudes, and practices (KAP) associated with handwashing behavior and in particular differences between males and females. Sections of the baseline SHINE surveys were chosen for further development which resulted in the variables *Attitudes*, *Behavioral control*, *Behavioral intention*, *Practices* and *Knowledge*. The Kruskal Wallis test were utilized to examine if there were any statistically significant differences between males and females. The findings indicate unequal mean ranks for behavioural intention, attitudes, knowledge and behavioural control between males and females. The survey responses revealed that handwashing practices were overall good, but the use of soap was not as frequently reported. The medians for behavioral intention and attitudes were high for both males and females indicating positive attitudes towards handwashing at key times, and a strong intention to wash hands. The results from the students WASH related knowledge was low for both males and females. These findings may indicate that the students could benefit from a intervention like SHINE that aims to improve structural factors like access to soap at the same time as they target behavioral change in addition to increasing knowledge.

Norsk sammendrag

Diaré er en av hovedårsakene til dødelighet for barn under fem år i lav- og mellominntektsland (Ashbolt, 2004; Fewtrell et al., 2005). Diaré er mulig å forebygge med tilgang til rent vann, tilstrekkelige sanitære fasiliteter og hygienehåndtering (World Health organization, 2022b). Medisinsk behandling av sykdommer knyttet til vann, sanitær og hygiene representerer en betydelig kostnadsbelastning for helsesektoren. WHO anslår at 10 % av den totale sykdomsbyrden kan reduseres dersom vannsanering og hygienehåndtering og fasiliteter ble forbedret (World Health organization, 2019). Denne tverrsnittsstudien av utgangsdato fra en spørreundersøkelse som hadde som mål å beskrive WASH-relatert kunnskap, holdninger og praksis blant elever i sjette, syvende og åttende klasse, før SHINE-intervensjonen ble implementert på to skoler i Tamil Nadu India som en del av en pilotstudie. Oppgaven fokuserer spesifikt på WASH-relatert kunnskap, holdninger og praksis assosiert med håndvaskadferd og spesielt forskjeller mellom menn og kvinner. Deler av utgangsmaterialet fra SHINE-undersøkelsene ble valgt for videreutvikling som resulterte i variablene holdninger, atferdskontroll, atferdsintensjon, praksis og kunnskap. En Kruskal Wallis-test ble brukt for å undersøke om det var noen statistisk signifikante forskjeller mellom menn og kvinner. Funnene indikerer ulik rank sum for atferdsintensjon, holdninger, kunnskap og atferdskontroll mellom menn og kvinner. Svarene på undersøkelsen viste at praksis for håndvask generelt sett var god, men bruk av såpe ble ikke rapportert like ofte. Medianene for atferdsintensjon og holdninger var høye for både menn og kvinner, noe som indikerer positive holdninger til håndvask på viktige tidspunkter, og en sterk intensjon om å vaske hender. Resultatene fra studentenes WASH-relaterte kunnskap var lav for både menn og kvinner. Disse funnene kan tyde på at studentene kan ha nytte av en intervensjon som SHINE som tar sikte på å forbedre strukturelle faktorer som tilgang til såpe samtidig som de retter seg mot atferdsendring i tillegg til å forbedre kunnskap.

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Abbreviations

Bristol Stool Form Scale	BSFS
Central Rural Sanitation Programme	CRSP
Community-Based Participatory Research	CBPR
Doctor of Philosophy	PhD
Integrated Behavioral Model for Water Sanitation and Hygiene Interventions	IBM-WASH
Knowledge, Attitudes, and Practices	KAP
Sanitation and Hygiene INnovation in Education	Project SHINE
Sustainable Development Goal	SDG
Swachh Bharat Mission	SBM
Total Sanitation Campaign	TSC
United Nations Children’s Fund	UNICEF
Water, Sanitation, and Hygiene	WASH
World Health Organization	WHO
Handwashing with soap	HWWS

Thesis structure

This thesis consists of an article and “Kappe”, or mantel in English.

The mantel consists of a preface, abstract, table of contents, table of attachments and figures, introduction, background, literature review and theoretical framework. It also contains short summaries of the methods, results, discussion, and conclusions of the article, but also discusses the chosen theory and reflections upon the limitations of this study. The outline of the article follows the template from *The Journal of Water, Sanitation and Hygiene for Development* (The Journal of Water Sanitation and Hygiene for Development, 2021). The general guidelines for article structure have been followed, but the article exceeds the maximum word count of 6000 words. The article includes -Abstract, introduction, material & method, results, discussion, and conclusion.

1.0 Introduction

1.1 Water, sanitation, and hygiene – A global public health challenge

The World Health Organization (2019) reports that approximately 2 billion people worldwide drink water contaminated with microbial pathogens and other disease-bearing agents (World Health organization, 2019). The latest estimates reveal that 3.6 billion people live with inadequate sanitation facilities (United Nations Children’s Fund, 2021) and 494 million people still defecate in the open (Joint Monitoring Programme for Water Supply; Sanitation and Hygiene, 2020). Lacking clean water and adequate sanitation facilities makes healthy hygiene practices difficult, putting billions of people worldwide at high risk of diarrhea and other fecal-oral transmitted diseases (Mara et al., 2010). It is reported that 829 000 deaths every year are related to insufficient sanitation, lack of clean water and hygiene facilities in low and middle-income countries (World Health organization, 2022b).

Safe drinking water, sanitation, and hygiene are fundamental to maintain good health, reducing risk of a range of different diseases (Mara et al., 2010; World Health organization, 2019). Some age groups are more vulnerable than others. Diarrhea is one of the leading causes of mortality for children under five in low- and middle-income countries (Ashbolt, 2004; Fewtrell et al., 2005), killing around 525 000 children every year (World Health organization, 2017). Recurrent infection and malnutrition can result in impaired cognitive and physical growth, causing lifelong consequences for children growing up (Fischer Walker et al., 2012; World Health organization, 2015). Diarrhea is possible to prevent with access to clean water, soap, adequate sanitation systems, and hygiene management (World Health organization, 2022b). Medical treatment of illnesses related to water, sanitation, and hygiene (WASH) represents a substantial cost burden for the health sector (Mara et al., 2010). WHO estimates that 10 % of the total disease burden could be reduced worldwide if water sanitation and hygiene management and facilities were improved (World Health organization, 2019). The prevalence of handwashing with soap at key times, e.g. after using the toilet, is estimated to be around 19% worldwide (Freeman et al., 2014). This estimate is surprisingly low considering how easy and accessible washing of hands is in most developed countries, however, in low and middle income countries are without access clean water,

sanitation, and hygiene facilities, making proper hygiene practices difficult (United Nations Children's Fund, n.d.).

Water, sanitation, and hygiene represents both a global public health challenge and a local one. UNICEF reports that almost half of all school children, approximately 818 million children lack access to handwashing facilities with water and soap (United Nations Children's Fund (UNICEF), n.d.). Moreover, WHO's annual report on water, sanitation and hygiene underscores that hand washing and handwashing facilities are greatly underinvested, whereas low and middle income countries suffering the greatest consequences (World Health organization, 2019). Handwashing has also proven to be the cornerstone in preventing the transmission of highly contagious diseases like covid-19 (Szczuka et al., 2021). The covid-19 pandemic resulted in massive public health campaigns so called "mass awareness campaigns" messaging the need for regular handwashing with soap or the use of sanitizer(Unilever, 2020). Campaigns like these in combination with countless numbers of local initiatives and smaller campaigns may have changed our handwashing behavior during the pandemic (Gupta, 2020), but the long term effect of these campaigns are yet to be documented.

The call for global action for clean water, sanitation and hygiene is reflected in and sustained by political and global interest in a long-term perspective, such as the United Nations sustainable development goals (SDG). The SDGs lay out a vision for the world by 2030, ratified by the UN general assembly in 2015. The main principle is to "*Leave no one behind*" through setting 17 specific goals, which calls for all countries to act to "*promote prosperity while protecting the planet*" (United Nations, n.d.-b). The Sustainable Development Goal (SDG) number six calls for clean water and sanitation for all by 2030 (United Nations, n.d.-a). SDG number six is undeniably connected to SDG number three "Good health and well-being"(United Nations, n.d.-b). To achieve and maintain good health, water, sanitation, and hygiene are fundamental pillars. But recent reports reveals that the world is way out of course in reaching the SDG for water, sanitation and hygiene so far (United Nations Children's Fund, 2021).The joint monitoring program (JMP) for water sanitation and hygiene by the World Health Organization (WHO) and the United Nations Children's fund provides an estimate on how the global community are doing on the SDGs, giving an indicaton on

progress (United Nations Children’s Fund (UNICEF) and World Health Organization (WHO), 2022). The latest JMP report on WASH progress in schools reveals that most of the SDG targets are way off track, for instance, 42% of schools are still in lack of basic hygiene facilities (Joint Monitoring programme for water and sanitation, 2022). This joint report also underscores that in order to reach the SDG targets for schools globally there is a need of five-fold increase on progress for basic hygiene services (Joint Monitoring programme for water and sanitation, 2022, p. 1). Estimates like these underscore the need for school-based WASH interventions to reach the Sustainable Development Goals.

2.0 Literature review

The effectiveness of WASH interventions has been mixed (Fewtrell et al., 2005, p. 50) and recent systematic reviews do not identify any one type of intervention to be the gold standard approach to combating illnesses like diarrhea (Curtis & Cairncross, 2003; Fewtrell et al., 2005; Martin et al., 2018; Ramesh et al., 2015; Staniford & Schmidtke, 2020). But there is consensus that interventions need to be integrated, comprehensive and appropriate to the social, cultural, political and economic context (Waddington & Snilstveit, 2009).

A systematic review of 18 different WASH interventions in schools (McMichael, 2019) found mixed results overall, but 13 studies included about WASH-related knowledge, behavior and attitudes reported evidence of positive change, amongst others, in relation to handwashing behavior with sanitizer or soap. The review also identified improvement in knowledge about hygiene and improved hygiene habits among school children (McMichael, 2019). Another systematic review, investigating hand washing with soap (HWWS) on diarrhea risk in the community found that washing hands with soap could reduce the risk by as much as 47%, pooled from 42-44% (Curtis & Cairncross, 2003). This evidence underscores that interventions that promote handwashing could contribute to save millions of lives (Curtis & Cairncross, 2003). When proper handwashing facilities with soap are available, handwashing serves as an inexpensive, easy and sustainable protective practice against a range of different diseases (United Nations Children’s Fund, n.d.). Dobe et al. (2013) even compares proper handwashing practices to a “self-administered vaccine” emphasizing how easy and effective this practice is in protecting against fecal-oral transmitted diseases (2013, p. 1). However, two cluster-randomized trials investigating handwashing with soap found no significant differences in

handwashing rates after behavioral change and educational campaigns among school children in India and local communities. The first of the two investigated if HWWS campaigns at schools could transfer knowledge and change behavior in the broader community (Lewis et al., 2018), the other study found that soap was often used when bathing, but less when washing hands at key times (Biran et al., 2008). These results reveal that achieving sustainable results is a challenge in WASH research. There are many possible explanations for this, but the use of different measurement tools could be one of them (McMichael, 2019).

The effectiveness of an intervention or behavioral campaign focusing on handwashing could be measured by for example checking hands for fecal transmitted pathogens or self-reported handwashing rates through surveys (Ramesh et al., 2015). Either way, to measure outcome of interventions or behavioral campaigns can be difficult. Studies that focus on measuring handwashing with soap using observation report more positive results than studies that focus on outcomes related to reducing disease burden (McMichael, 2019). A central challenge when comparing the effectiveness of WASH interventions is the different use and understanding of the medical term diarrhea (McMichael, 2019). The most common understanding of the term is as WHO defines it; “the passage of three or more loose or liquid stools per day (or more frequent passage than is normal for the individual)” (World Health organization, 2017, p. para. 2). However, the common use of the term diarrhea differs from culture to culture and for example normal loose stools may be confused with watery stools. To address this challenge, and to reduce the stigma related to assessment of stools, one of the SHINE India sub-studies by Gold-Watts et al.(2020) applies a relatively new approach using the Bristol stool form scale (BSFS) (Gold-Watts et al., 2021). The BSFS is commonly referred to as the “Bristol stool chart” (Chumpitazi et al., 2016), which gives the participants the opportunity to make a visual assessment of the different types of stools. Adaptations like these may contribute to reduce misconception of the term diarrhea, however, since the chart was made for health professionals and not developed for children this approach needs to be assessed in further WASH research, but has in a smaller scale showed promising results (Gold-Watts et al., 2021).

Some studies reported a positive outcome in changing WASH- related behavior such as handwashing using *nudging* which is refers to subtle changes in the environment that triggers

unconscious processes that affects our decision-making (Dreibelbis et al., 2016). By definition nudging is “any aspects of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives” (Thaler, 2009, p. 6). Nudging is a relatively new approach within WASH research, but has in short time received attention in several fields, such as, public health, dieting and nutrition (Hummel & Maedche, 2019). For instance, Dreibelbis et al.(2016) implemented an school based intervention in Bangladesh where they used simple nudging techniques that led the students from the toilets to where they could wash hands. For instance, painting bright arrows on ground. This led to an increase of observed handwashing rates from 4% to 74% 6 weeks after the intervention (Dreibelbis et al., 2016, p. 1). Studies such as this demonstrate that cost-efficient and straightforward methods can achieve positive results that might be promising for the development of future interventions. However, achieving sustained adoption of the behavioral targets and developing appropriate measurement tools remains challenging within WASH research (Martin et al., 2018).

3.0 Theoretical framework

Focusing on WASH-related knowledge, attitudes and practices, the Integrated Behavioural Model for Water, Sanitation, and hygiene (IBM-WASH) serves as a theoretical foundation for discussion of the findings in this study. As it is one of the most comprehensive social ecological models for WASH-research. The IBM-WASH framework was developed by Dreibelbis et al. (2013) on the basis of a systematic review of conceptual models and social-ecological theoretical frameworks used in WASH research (Dreibelbis et al., 2013). It outlines three dimensions that consist of determinants that influence the nature of WASH behavior and behavior change; these are contextual factors, psychosocial factors, and technology factors. These factors are distributed across five different levels: societal/structural, community, interpersonal/household, individual and habitual (Dreibelbis et al., 2013). The factors are also referred to as “dimensions”.

The Integrated Behavioural Model for Water, Sanitation, and Hygiene (IBM-WASH)

Levels	Contextual factors	Psychosocial factors	Technology factors
Societal/Structural	Policy and regulations, climate and geography	Leadership/advocacy, cultural identity	Manufacturing, financing, and distribution of the product; current and past national policies and promotion of products
Community	Access to markets, access to resources, built and physical environment	Shared values, collective efficacy, social integration, stigma	Location, access, availability, individual vs. collective ownership/access, and maintenance of the product
Interpersonal/Household	Roles and responsibilities, household structure, division of labour, available space	Injunctive norms, descriptive norms, aspirations, shame, nurture	Sharing of access to product, modelling/ demonstration of use of product
Individual	Wealth, age, education, gender, livelihoods/employment	Self-efficacy, knowledge, disgust, perceived threat	Perceived cost, value, convenience, and other strengths and weaknesses of the product
Habitual	Favourable environment for habit formation, opportunity for and barriers to repetition of behaviour	Existing water and sanitation habits, outcome expectations	Ease/Effectiveness of routine use of product

Table 1. Dreibelbis et al. (2013, p. 6)

The IBM-WASH framework will be used as a tool to analyze and discuss the respondent's WASH-related knowledge, attitudes, and practices (KAP). It will also be useful to categorize the information and to understand WASH behaviors and habits on the different levels. The framework provides an important structure for understanding all the different factors that may contribute to shaping handwashing behavior and will serve as an overarching model for this thesis. The three dimensions, contextual, psychosocial, and technology reflects the reciprocal triadic model in social cognitive theory (Dreibelbis et al., 2013) which will also be used in this thesis for a more in-depth understanding of determinants for health behavior change at a individual level.

Albert Bandura's social cognitive theory will help conceptualize how key constructs such as knowledge and self-efficacy (behavioral control) influence individual behavior (Bandura, 2002). The five main constructs in this theory are social environment, knowledge, perceived self-efficacy, outcome expectation, and goal formation (Bandura, 2004). It is especially the reciprocal triadic causation the theory is known for in the development of public health interventions because this aims to explain health behavior through the interaction between a person and his or her environment (Crosby, 2019). This may sound overly simplistic, but as there is a foundation in the five main constructs, this is a logical approach to the overall understanding of behavioral causation (Crosby, 2019). The "person" in the triadic model reflects a person's cognitive characteristics such as knowledge, self-efficacy, and outcome expectations (Bandura, 2004; Crosby, 2019). The environment is understood as both the physical environment and the social environment, which a person is at all times influenced

by, directly or indirectly (Crosby, 2019). When looking at the context for handwashing behavior, the environment can either promote proper handwashing behavior through social norms and accessibility, or it could inhibit such efforts (Crosby, 2019). There are substantial infrastructural differences between rural and urban communities when it comes to access to clean water, sanitation, and hygiene facilities (United Nations Children’s Fund, 2021). However, changing the physical environment does not enable behavioral change in itself; this is also influenced by knowledge, experience, social norms, and the cultural context (Dreibelbis et al., 2013).

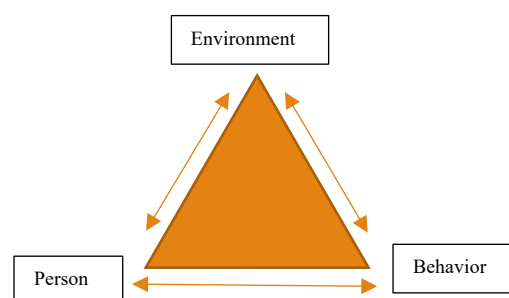


Figure 1. Illustration of the Reciprocal triadic causation adapted from Crosby(2019, p. 129)"

It is important to note the bidirectional arrows in this model. Meaning that the model operates as a whole and must be understood as a continuous process that changes throughout a lifetime, and may be situational or dependent on physical or mental wellbeing (Crosby, 2019, p. 129). The model will therefore serve as a theoretical platform for discussion of how knowledge, attitudes, and practices are associated with key WASH-related behavior patterns and outcomes for adolescents living and going to school in rural India.

The social cognitive causal model describes the role of self- efficacy and how it affects the other determinants for behavioral change (Bandura, 2004). The figure below shows the paths of the social cognitive causal model. More specifically, Bandura (2004) explains it as “Structural paths of influence wherein perceived self-efficacy affects health habits both directly and through its impact on goals, outcome expectations, and perception of sociostructural facilitators and impediments to health-promoting behavior» (Bandura, 2004, p. 146).

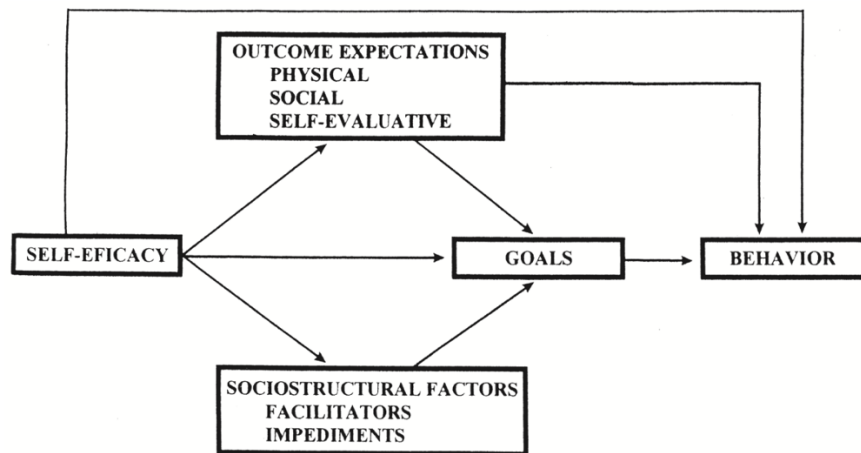


Figure 2. Albert Bandura (2004, p. 146)

4.0 School based interventions

Schools are an essential arena to implement WASH interventions because they are cost-effective and have the potential to reach many people in the community (Gold-Watts, 2020). Schools can also be an important field to understand which factors that contributes to shape adolescent’s health behaviors, like knowledge, attitudes, and practices. As Glanz & Bishop (2010) underscore “thinking beyond the individual to the social milieu and environment can enhance the chance of successful health promotion” (p. 401). Meaning that health promotion strategies need to consider more than the individual determinants of health and individual health behavior. This refers to the social and cultural context in addition to the physical environment. Many health behavior change theories focus on the interaction between the individual, environment and how we behave (DiClemente et al., 2013). School based interventions can target contextual, psychosocial, and technology dimensions at once, increasing the chance of reaching target goals such as improving health (McMichael, 2019). Applying models like the IBM-WASH in the development of interventions could improve the likelihood of achieving behavioral change because such ecological models not only address the individual determinants of behavioral change but also the contextual, technological and environmental determinants that may contribute (Dreibelbis et al., 2013). Behavioral change in cultures like India has proven to be quite complex when addressing WASH issues like public

defecation, which is closely related to the perception of cleanliness. Public toilets are by many perceived as dirty and may be perceived threat to once health (Gold-Watts, 2020). Schools may serve as an important arena for challenging such cultural perceptions. In summary, theory-based interventions that builds on understanding how influence from the environment and social norms can contribute to promoting healthy WASH-related behaviors are more likely to succeed (Dreibelbis et al., 2013).

4.1 Project SHINE (Sanitation & Hygiene Innovation in education)

The SHINE intervention in India is an adaptation of a school-based SHINE intervention originally implemented in rural Tanzania. The central focus is the application of participatory science and innovation in education to promote a healthier community through improved water, sanitation, and hygiene practices, using non-stigmatizing methods common to some other WASH approaches (Bastien et al., 2015; Hetherington et al., 2017). The SHINE intervention in India builds on some of the same theoretical foundations but translated the intervention into a new, culturally different context. The aim of SHINE India was to: "Improve WASH-related knowledge, attitudes, and practices among students in sixth, seventh and eighth standard, as well as encourage adolescents to become health promoters and changemakers within their community, through development of life and leadership skills" (Gold-Watts, 2020, p. 43). The SHINE intervention aimed to position youth as change agents, but also engaging the larger community in the development of sustainable WASH strategies to improve health (Gold-Watts, 2020; Hetherington et al., 2017). These same elements can be found in the Ottawa Charter central to health promotion (World Health organization, n.d.). The Ottawa Charter was launched at the first international conference on health promotion in Ottawa, 1986. One of the charter's central elements is to "strengthen community action" (World Health organization, n.d.). The core value of Health promotion is to enable all people to increase control over the elements that affect their health, where the definition of health is "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (World Health Organization, 2022a, p. para. 1).

Similar core values are found in WASH interventions using a community-based participatory research (CBPR) approach. The SHINE intervention uses such approaches (Gold-Watts, 2020). Originating from action research, the CBPR approach has been increasingly applied in community research worldwide, especially within public health research (Holkup et al., 2004). Save the children Sweden (1997) states that:

“A children- centred, participatory approach applies not only to research but also to programmes and project of all kinds. It is a total philosophy, which implies that children, their families, and communities should be gradually empowered in the course of work designed for their welfare, rather than remaining dependent on the ideas of other, more powerful people, for definitions of and solutions to their problems” (Save the Children Sweden, 1997, p. 184).

This emphasises that participatory methods gives children a voice in a world where power lies with adults, moreover it enables them to collect evidence to advocate for their own cause, solving their own problems (Save the Children Sweden, 1997). School based interventions could not only give a voice to children but also identify gender related problem areas.

5.0 Gender equality in WASH

The most central sustainable development goal in WASH research is goal nr 6. “Clean water and sanitation”. This is fundamental to achieve and maintain SDG nr 3” good health and wellbeing”(Nations, n.d). At the same time, there is an increasing awareness about how SDG nr.5 “Gender equality” are linked to both goals (Swedish International Development Cooperation Agency, 2019; UN Women, 2018). Challenges with access to clean water, sanitation and hygiene facilities affects males and females disproportionately (Carrard et al., 2022; Swedish International Development Cooperation Agency, 2019; UN Women, 2018; Water Aid., n.d). Women in low income countries are often at risk of violence when travelling long distances to get clean water or find a place to defecate when toilets are not available (Swedish International Development Cooperation Agency, 2019; Water Aid, n.d). Moreover, when young women reach puberty, they are in need of suitable sanitary and hygiene facilities to dispose of sanitary pads and to wash hands. Access to WASH facilities affects the

attendance at schools for females (Swedish International Development Cooperation Agency, 2019; Water Aid., n.d). The fact that WASH challenges in schools affects boys and girls differently has been noted by the Indian Government, for instance the statement by the Indian prime minister in 2014

«Educating girls is my priority. I have noticed that girls drop out of schools by the time they reach class 3rd or 4th just because schools don't have separate toilets for them. They don't feel comfortable. There should be toilets for boys and girls in all schools. We should concentrate on girl students not quitting schools.” (Shri Narendra Modi, Prime Minister, Teachers’ Day, September 5, 2014)(Ministry of Human Resource Development, n.d., p. 2).

While there are many sources to gender inequality in the society, schools are an fundamental arena where all students should have equal rights, facilities and resources (Swedish International Development Cooperation Agency, 2019). There is also increasing awareness about how research in several fields has been gender biased, for instance, are males overrepresented in public health data which may lead to an skewed image of how public health issues affect different groups in the society (Upchurch, 2020). School based WASH interventions should specifically focus on access to closed single sex toilets with trash bins and close proximity to washbasins with soap; such facilities are specially important to maintain menstrual hygiene (Gold-Watts, 2020; Swedish International Development Cooperation Agency, 2019; UN Women, 2018; Water Aid, n.d). The gender perspective contributes with important input in the development of WASH campaigns, interventions, and government policies. In order to target the right groups in WASH interventions important to consider this knowledge gap (Carrard et al., 2022; Water Aid, n.d).

6.0 Study setting - India

India has a population of approximately 1.39 billion people (The World Bank, 2021). The latest estimate by UNICEF and WHO reports that 630 millions live without adequate sanitation facilities and clean water, resulting in many people defecating outside (United Nations Children's Fund and The World Health Organization, 2020). Government Campaigns like the Swachh Bharat Mission (Clean India Campaign) launched by the Indian prime minister in 2014 has contributed to improve the WASH situation in India reducing the number of people defecating outside (United Nations Children's Fund, n.d.), with help from private sector, research initiatives, and nonprofit organizations. Open defecation is a complex public health issue not only due to access issues, but also as a result of cultural attitudes connected to how people perceive public toilets (Gold-Watts, 2020). Therefore, it is not sufficient to focus on the construction of toilets or wash basins. This health challenge also requires effective health promotion strategies that address underlying health behavior patterns, the individual determinants of health, alongside the structural determinants. This also involves understanding the many social, economic and cultural aspects that contribute influencing health behaviors (K. Glanz & D. B. Bishop, 2010).

The *Swachh Bharat Mission (Clean India Mission)* focuses especially on marginalized communities (Department of drinking water & sanitation, 2021) Here a range of different methods are used, like behavioral change campaigns focusing on approaches like Community Led total sanitation (CLTS) alongside more structural approaches, such as working to solve infrastructure problems. Former national campaigns like the Central Rural Sanitation Programme (CRSP) and Total Sanitation Campaign (TSC) also focuses on community-led initiatives and uses an demand driven approach (Department of Drinking Water and Sanitation, 2011). This includes the aim to promote good hygienic practices at school and at home alongside the specific aim to end open defecation in India (Department of Drinking Water and Sanitation, 2011). Behavioral change campaigns like these focus for instance on making improvements to the curriculum at schools to increase awareness about WASH and how to prevent WASH-related diseases (Department of drinking water & sanitation, 2021). For example school based national campaign «Swachh Bharat: Swachh Vidyalaya -Clean India: Clean Schools'» (Ministry of Human Resource Development, n.d.) has contributed to raise awareness about the WASH situations at Indian schools, but studies show that it remains a

challenge to achieve sustained adoption of WASH behaviors (Martin et al., 2018). There is an need for more school based public health campaigns that uses approaches that are suitable for children. An example of child friendly guideline for proper handwashing practices are the Centers for Disease control and prevention (CDC) five-step easy instruction for handwashing made for children. These steps are, one: “Wet your hands with clean, running water (warm or cold), turn off the tap, and apply soap», step two: «Lather your hands by rubbing them together with the soap. Lather the backs of your hands, between your fingers, and under your nails.», Step three: «Scrub your hands for at least 20 seconds. Need a timer? Hum the “Happy Birthday” song from beginning to end twice» Step four: «Rinse your hands well under clean, running water.» And step five: “Dry your hands using a clean towel or air dry them” (Centers for Disease control and prevention (CDC), 2022, p. para.6). The CDC also provides guidelines for handwashing promotion at schools and in the local community using many visual techniques such as stickers, posters, buttons, and badges. Making all material free to use for schools or other organizations working with early care and education (Centers for Disease control and prevention, 2022).

7.0 Research rationale and research question

In the development of effective WASH interventions, there is a need for knowledge about how adolescents are affected by and perceive public health challenges, and which determinants contribute to shaping their WASH-related knowledge, attitudes, and practices (KAP) (Karen Glanz & Donald B Bishop, 2010; Hetherington et al., 2017; McMichael, 2019). Building such an understanding includes capturing handwashing practices, attitudes towards handwashing, and knowledge about WASH using approaches that are grounded in behavioral change theory and uses research methods that are suitable for school children. For instance, while child-friendly approaches might include participatory research involving children in the research agenda, focus group discussions, visual techniques and putting children in the center of the research process (Larsson et al., 2018; Save the Children Sweden, 1997), it is also essential to develop an understanding of how surveys targeting adolescents can contribute. With a large foundation of research that underscores challenges in WASH affect

males and females disproportionately it is relevant to investigate if there are any differences between males and females in this study regarding their WASH-KAP.

This thesis aims to describe the students' handwashing behavior through WASH-related knowledge, attitudes, and practices (KAP), as well as to investigate if there are differences between males and females. The main research question guiding this study is: Are there any gender differences in WASH-related knowledge, attitudes, and practices of the respondents? It is anticipated that developing a more in-depth understanding of the student's WASH-related knowledge, attitudes, and practices (KAP) will contribute to the existing knowledge foundation, that hopefully could be useful in analyzing follow-up data or may be relevant for the development of WASH interventions and research tools, including surveys, in the future.

8.0 Methods

The methods chapter in the article is extensive, but some details related to the data collection and data preparation, as well as ethical considerations are expanded and supplemented here.

8.1 Sample & data-collection

The baseline survey data used in this master thesis originates from the more extensive intervention study SHINE (Sanitation & Hygiene INnovation in Education), a pilot study in India's Tamil Nadu district that was carried out from 2016 to 2018 by NMBU Ph.D. student at the time, Anise Gold-Watts (Gold-Watts, 2020). This baseline cross-sectional study aimed to describe WASH-related knowledge, attitudes, and practices among students in sixth, seventh and eighth grade, before the intervention took place. The thesis focuses specifically on WASH-related knowledge, attitudes, and practices (KAP) associated with handwashing behaviors and in particular whether there are differences between males and females.

The overall SHINE study used a multi-stage sampling strategy in the recruitment of schools and participants. Primarily using purposive sampling (Gold-Watts, 2020, p. 61). Three schools in the Tamil Nadu district were selected to participate after formative research in the field, initiative from the local community, Sri Narayani Hospital, and Research Centre in

Thirumalaikodi, India (Gold-Watts, 2020). Two of the schools were invited to participate in the English survey after being piloted in Tamil targeting six, seven and eight grade. The two schools are private, and was founded by spiritual leader and guru, Sri Sakthi Amma. The education the students receive at school reflects the spiritual values and beliefs that are central to the local spiritual center. All classes are taught in English, and the students are encouraged to speak English also when not attending class (Gold-Watts, 2020, p. 46). The WASH facilities at the two schools were considered to be good in general, but some toilets were missing doors and handwashing facilities are considered to be limited as there was no soap available, and taps were placed over fifty yards from the toilet (Gold-Watts, 2020). A total of 292 students were invited to participate with an age span from 10 to 14 years old within sixth, seventh and eighth grade in the two schools. Eighty-eight percent of the invited students completed the survey giving a total of 259 respondents. The survey was completed in paper form at school and was administered personally by the researchers at the two schools.

8.2 Survey design

The entire baseline survey is 22 pages long, including the introduction and the opportunity to provide feedback about the survey at the end. The survey is divided into ten sections.

Table 1.

Baseline survey overview

<i>Section</i>	<i>Subsections and items</i>	<i>Response option or Scale</i>
Sociodemographic Variables	Three items: Age, Sex, and Grade.	-Age written -Check box for grade and sex
Section 1	Eight items about their living condition: the primary source of drinking water, what type of toilet they use, and if they have access to soap.	-Multiple choice w/pictures Four-point frequency scale from 1 to over 5 Binary: Yes/no
Section 2	Seven subsections about daily habits concerning WASH. Twenty items in total	Five-point frequency scale: Every day to not at all - five-point Likert-type scales: Very likely to very unlikely Very important to not at all important Very easy to very difficult Binary: Yes/no Multiple choice

Section 3	Two subsections about personal health practices, asking the respondents to recall hygienic practices in the last 30 days. Nineteen items in total	Five-point frequency scale: Always to never Complete a sentence
Section 4	Six subsections. The respondents are asked about personal health and introduced to the Bristol Stool Chart (visual scale of stool), asking about diarrhea using the illustration of a very watery stool. Respondents are asked to recall the last 30 days. Six items in total	Picture of Bristol stool scale Multiple choice from type 1-7 (Stools) Multiple choice weekdays Recall of last 30 days Binary: Yes/no Four-point frequencies scale from 1 to over 7
Section 5	Two items about experiences at school (how well they did at school)	Five-point scale From: "I scored among the very best in my class" to "I scored among the worst in my class" Binary: Yes/no
Section 6	Three subsections about what they remember learning at school and their attitude towards science. Twenty-four items in total.	-True/False/Not sure -From agree to disagree
Section 7	Three subsections about sanitation and hygiene knowledge. In first subsection the respondents are asked to write what they know about sanitation and hygiene. Items about sanitation and hygiene capturing WASH- related knowledge. Twenty-two items in total.	-Written response - True/false/Not sure
Section 8	Eighth subsections about family and home. Eighth items in total.	Yes/no Multiple choice Option to choose between two items "My main caretaker can read" or "My main caretaker cannot read" Level of education from "No formal education" to "College or university" Check box for main caretaker eight types to choose from. Check box for "The other individual that help to take care of you at home"
Section 9	Seven items about main caretaker's education level, occupational status and how long they worked for money. Two items repeated about intention to wash hands.	Binary: Yes/no How many: Fill number From "They worked six months or more for money" to "they did not work at all for money" -Four-point frequency scale from 1 -over 5

Section 10	Feedback about the survey: Three items	-Five-point Likert type scale From Very easy to very difficult -Language- Written response -Comments – Written Response
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Table 1. Description of the baseline survey.

The survey was originally developed for the SHINE intervention in Tanzania. A detailed description of the development of the survey is described in project SHINE conceptual paper (Bastien et al., 2015, p. 30). It was later processed to fit the context of SHINE India, some scales were altered, and some scales were added to fit the new scope (Gold-Watts, 2020). As presented in Table 1, the SHINE survey utilized a combination of different scales and response options. The most frequently used scale in the SHINE survey is a five-point Likert scale ranging from agree to disagree. This is the most common scale within survey research and used in many different sectors – from research to commercial use (Sullivan & Artino, 2013). In some of the sections the five point Likert scale was complimented with a “smilyometer”, developed to measure children’s opinion in a illustrative way, which is recommended for surveys among children (Borgers et al., 2000).

8.3 Data entry and data cleaning

Before starting the data entry, a codebook was developed guided by a handbook in coding (Bélisle, n.d). The questions were labeled according to each section of the survey, and the responses were transformed into codes. The paper surveys were coded and manually entered in the statistical software JMP according to each question and code. The original JMP-file with raw data was saved at a safe NMBU large server (W) area. For the purposes of this master thesis, a new JMP file was made for each analytical step so that it would be possible to trace every step in the process, this file did not include ID numbers.

8.4 Missing values

Missing values were coded as -99(Bélisle, n.d), but JMP did not recognize this value as missing. After careful consideration, and in agreement with the supervisors, missing values were re-coded into a blank value, and inspected by using a strategy of exclusion over a 25% missing values for both respondents and questions (Broeck et al., 2005). As such, JMP was able to analyze the missing values, and it also gave the possibility to check the data in other

statistical programs like SPSS and excel without making changes to the file. A total of eighth respondents were excluded reducing the dataset by 3 %, giving 251 respondents for the data analysis, 141 males and 110 females. None of the variables had more than 25% missing values and on that account, none were excluded. There is no clear consensus within the social sciences regarding a cutoff point for missing values, some researchers state that no more than 10% missing values should be accepted (Bennett, 2001), others report unbiased results up to 50% missing values (Madley-Dowd et al., 2019). At the same time it is widely recognized that by leaving out respondents this could reduce statistical power, as Dong (2013) expresses “ ignoring cases with missing data leads to the loss of information which in turn decreases statistical power and increases standard errors” (Dong & Peng, 2013, p. 2). However, the final decision to exclude the respondents with over 25% missing values were substantiated by literature on data cleaning (Broeck et al., 2005) and was also in agreement with supervisors.

8.5 Variables

To meet the delimitation in this thesis and to make it feasible, groups of questions relating to students’ WASH-KAP were selected for analysis. To ensure a focused thesis, it was necessary to purely focus on handwashing knowledge, attitudes, and practices.

Six sections were selected for further analysis. In addition to the variable sex, concepts were identified as *behavioral intention*-, *attitudes*-, *behavioral control*- *practices towards handwashing and WASH-related knowledge*. Except for the latter these variables were developed by summarizing each adequate item and dividing by the total number of items in that group (e.g. $(Q1 + Q2 + Q3)/3$) making an index variable (Abeyasekera, n.d.; Stockemer, 2019). “An index is a type of measure that contains several indicators and is used to summarize a general concept» (Matthew DeCarlo, 2018, p. para. 14). The different items were not ranked or given any weight.

It would have been interesting to look at differences between the schools and socioeconomic status, but information on how to differentiate the two schools on the survey pages was unfortunately not available at the time of data entry. For example, the front of the surveys was marked by hand with a small v on one side and a number on the other side. These values

were not entered into JMP as it was assumed that these markings were not formal. Moreover, the items that were capturing socioeconomic status had multiple inconsistencies in survey responses, resulting in too many missing values. This would in turn be a less reliable variable, and therefore not included. Several other variables would have been relevant to investigate such as school attendance, self-reported diarrhea using the Bristol stool scale, but to keep a clear and focused thesis it was necessary to center the attention to handwashing and investigate the possible differences between males and females. The results from the other sections in the baseline survey were therefore omitted from this thesis's analysis.

8.6 Development of the knowledge variable

The section in the survey referred to as the "knowledge section" included nineteen items on WASH-related knowledge (Appendix 2). In the process of developing this variable, a total of nine items were excluded from further data analysis. The original survey was capturing other dimensions such as attitudes and behavioral intentions in addition to knowledge.

Subsequently, items that did not measure WASH-related knowledge were excluded.

Moreover, items had to be clear, unambiguous, and not repetitive. For instance, as described in attachment 3, the students were asked if the following statement is true "*If my friends do not wash their hands before eating, I will not either*" – Three items stated in the same manner were rather measuring social norms and behavioral intentions instead of WASH-related knowledge and were thereby excluded. Furthermore, one of the items was stated in a double negative sense: "*It is not dangerous for my health to play near garbage/trash and wastewater*". This item was excluded because it may be difficult to interpret for the youngest students (10 years old). As Borgers, Leeuw and Hox underscores in their research about developing survey for children, the age group 8-11 has little to no tolerance for ambiguity or negatively phrased questions (Borgers et al., 2000). After further reflection, this may also have been an issue with translating SHINE to the cultural context or in the recruitment of grades in the two schools. The original SHINE survey developed for Tanzania was using scales from the global School- Based Student Health Survey (GSHS) primarily tested on children in the age group 13-17 worldwide (Bastien et al., 2015, p. 30).

Another three of the items were considered too similar. Some of the items explicitly mentioned using soap when washing hands related to getting an illness in general; others mentioned diarrhea specifically as an illness. On that account, two of the three items were excluded, keeping the item that was deemed the clearest, "*Washing your hands with soap can help prevent you from getting diarrhea.*".

Two items measured the student's perception of having someone to talk to about sanitation and hygiene-related challenges, including "*I feel like I can...*". These items were not capturing WASH-related *knowledge* and were thereby excluded. This process ensured that the items left for the final analysis were indeed measuring knowledge; thus, not other factors that the researchers in the more extensive SHINE study might want to capture. The values were recoded to create a score. If the student answered "true" on a item that was correct gave the value =1, not sure were given the value 0, and if the students checked the wrong box this was given a value= -1. The knowledge variable did not calculate and report the score from respondents with a missing value in one of the ten items, resulting in 26 missing values in this variable. Several strategies were discussed with supervisors on how to treat the missing values. To be able to include the other values, the missing knowledge items was recoded as "0" equal to "not sure". Most likely, students that did not check the box, did not know the answer to the question or missed the question. Since a value of 0 is neutral, this would not affect the result positively or negatively but make it possible to include the other responses to the items. However, this may affect the total percentage of students getting a high score.

8.7 Statistical analyses

The variables behavioral intention, practices, attitudes, behavioral control, and knowledge was subject to appropriate testing before running the final analysis. In this process Cronbach's alpha was used to measure internal consistency. Variance were checked with a Levenes test, and the normal distribution with a Shapiro Wilks test. If assumptions of normality and variance are not met a non-parametric Kruskal Wallis test would be performed comparing mean ranks. When comparing the means between two groups - in this case, only males and females, a one-way ANOVA is an appropriate statistical test because it uses a simple method to reduce the complexity of comparing several means. It is more common to use with more than two groups, but it is possible to use if an independent samples t- test is

deemed not a good fit (Lomuscio, 2021). The one-way ANOVA divides the overall variance into two groups, which calculates the variance within groups and the variance between groups (Stockemer, 2019). In order to perform a one-way ANOVA, some assumptions need to be met, most notably that the data are normally distributed and that the two groups have approximately equal variance (Stockemer, 2019). If these assumptions are violated a nonparametric test using rank sums are appropriate to use. A Mann -Whitney U test is a suitable alternative to a one-way ANOVA when data are not normally distributed; it is also sometimes referred to as the “one-way ANOVA on ranks» (Lærd statistics, n.d, p. para. 1). The Mann -Whitney U test is a non-parametric test that does not assume a normal distribution with equal variance and is appropriate when comparing two unrelated groups (Lærd statistics, n.d).

Another appropriate test equivalent to the Mann-Whitney test would be a Kruskal Wallis test, but this is more common to use if you compare more than two groups like the ANOVA. However, the statistical software used in this analysis (JMP) only offers a *Wilcoxon test* and states that it is equivalent to a Mann-Whitney test, and calls it the *Kruskal Wallis test* when comparing more than two groups (JMP Support, 2021). To avoid any confusion the Kruskal Wallis test will be referred to as *Kruskal Wallis test* even though only two groups are being compared. The Kruskal Wallis test is a non-parametric coequal to the single factor analysis of variance (Corder, 2014). Guided by JMP support for users the Kruskal Wallis test will be performed as an nonparametric test if the assumptions of normality and equal variance is violated (JMP Support, 2022).

8.8 Reliability analyses

To measure the internal consistency of the items included in each variable Cronbach’s alpha was used. Cronbach’s alpha offers commonly used way to determine if a variable including several item is reliable, thus capturing an adequate index for the same concept (The open university, n.d). The alpha value ranges from 0-1, a high level will indicate that the variable is more reliable through strong internal consistency (Taber, 2018). When testing the items together, a low value may give reason to question whether there is one or several items that is not measuring the same underlying concept, indicating that items are not sufficiently

intercorrelated (Sullivan & Artino, 2013). The most common threshold for the Cronbach's alpha value is = 0.7, however, it is not uncommon to accept alpha values from ≥ 0.6 , where under 0.6 is considered poor and below < 0.5 is unacceptable (Taber, 2018; Zach., 2021). In agreement with supervisors, the cut-off score for the Cronbach's alpha value was set to 0.7, scores below this value were considered poor and indicated a low internal consistency. This guided the final decision to exclude one item. In the group developed into *behavioral intention*. The third item as presented in the table below (Table 1.) had an value of $\alpha=0.8036$ if item deleted where the group Cronbach's alpha value was $\alpha= 0,6713$. The values indicated that the set of items did not have a satisfying internal consistency. When reviewing the items again two of the items were addressing the intention to use soap/ash when washing hands, and the third item were addressing the intention to wash hands before you eat if a clean toilet if it were available. The third item were removed leaving to items measuring the intention to use soap/ash when washing hands.

Table 1.
Variable development – Cronbach's alpha

Variable	Description	Scale	Items	Cronbach Alpha	Cronbach Alpha if item deleted
Behavioral intention	Three items about what the students plan to do in each scenario. "What do you plan to do?"	From very likely to very unlikely	If soap/ash is available how likely is it that you will wash your hands next time you use the toilet?	0,6713	0.3807
				*0.8036	
			If soap/ash is available how likely is that you will wash your hands before the next time you eat?		0.3688
			If a clean toilet/latrine is available, how likely is it that you will wash your hands before the next time you eat?		0.8036* (Item excluded)
Attitudes	Attitudes was captured by four items where the respondents were asked to answer how important is the following?	From very important to not at all important.	Washing hands with water and soap/ash before eating	0,7165	0.6608
			Washing hands with water and soap after eating		0.6963
			Washing hands with soap/ash after using toilet/latrine		0.5999
			Washing hands with soap/ash after caring for animals		0.6685
Behavioral control	Behavioral control was captured by two items: What do you think about these statements?	From very difficult to very easy	How difficult is it to wash your hands with soap/ash and water before eating?	0,8608	

			How difficult is it to wash your hands with soap/ash and water after using the toilet/latrine?		
Practices	Practices was captured by eight items – asking the respondents to recall the last 30 days how often did you...?	On a scale from never to always.	Use soap/ash when washing hands?	0,8412	0.8423
			Wash your hands before eating?		0.8164
			Wash your hands after using the toilet or latrine?		0.8247
			Wash your hands after touching animals?		0.8078
			Wash your hands after coughing or sneezing?		0.8239
			Wash your hands after playing outdoors?		0.8174
			Wash your hands after eating?		0.8257
			Wash your hands before preparing food?		0.8212

As presented in table 1, the Cronbach's alpha value were above 0.8 in practices and behavioral control indicating a highly reliable set of items. Once the third item in behavioral intention was excluded the Cronbach's alpha value was $\alpha = 0.8036$. The group value for the items in attitudes was $\alpha = 0.7165$, a little lower than the other variables, but still within an acceptable level (Gliem & Gliem, 2003). Overall, these values indicate a reliable set of items for further analysis.

8.9 Ethical considerations

Project SHINE was approved by the NSD the 6 July 2017 (Appendix 1.). Before the data entry a formal approval via e-mail from NSD was given 3. September 2020 to use the baseline surveys in this master thesis project. Each respondent in the survey has been given an ID number by the researchers that was written on the first survey page, students were also instructed not to write their name or any other information that may reveal their identity on the survey pages. The student and their parents were given consent forms and the research rationale was explained (Appendix 2.) (Gold-Watts, 2020). ID-numbers were registered into JMP so that it would be possible to match the follow-ups surveys at a later point. The JMP-file

with the raw data was safely transferred to the NMBU Large server(W) after advice from NMBU counselor on research data storage. This file will be returned to NMBU supervisor at the end of this project. A new file without the ID-numbers was made, and the list of names that could identify the students by the ID number has been kept separate from the surveys so that the respondent's identity was at all times kept private and not available to this master thesis project. The paper surveys were stored at NMBU archives until the beginning of data entry and were later kept in a safe at home since the university was closed during the covid pandemic when this project started, this was an agreement with NMBU supervisor. The data were at all times treated with respect, keeping in mind the responsibility that comes with handling such material. Children are especially vulnerable in a world where power lies with adults (Save the Children Sweden, 1997). When adults collect information about children it is not only important that the methods that are being used are appropriate to capture children's voices, but also that the entire process are done without introducing any unintended harm to the children targeted (Save the Children Sweden, 1997).

9.0 Results

Referring to the article for the full results chapter, shorter summaries are presented here.

Levenes test

Behavioral Intention	Practices	Attitudes	Behavioral control	Knowledge
F ratio: 10,8662 P-value: 0,0011*	F ratio: 2,6781 P-value: 0,1031*	F ratio: 26,1181 P-value: <,0001*	F ratio: 24,6425 P-value: <,0001*	F ratio: 4,7504 P-value: 0,0091*

Levene's test showed unequal variance for all variables, apart from Practices (F(1, 237) 2.678, $p = .103$): Behavioral intention (F(1, 248) 10.866, $p = .001$); Attitudes (F(1, 246) 26.118, $p < .001$); Behavioral control (F(1, 246) 24.643, $p < .001$); Knowledge (F(1, 249) 4.75, $p = .009$)(Table 2).

Shapiro Wilks test

Sex	Behavioral Intention	knowledge	Practices	Attitudes	Behavioral Control
Boys	W: 0,7409294 P value: <,0001	W: 0,9682175 P value: 0,0045	W: 0,6611762 P value: <,0001	W: 0,69092 P value: <,0001	W: 0,7521984 P value: <,0001
Girls	W: 0,6158562 P value: <,0001	W: 0,96273 P value: 0,0031	W: 0,728904 P value: <,0001	W: 0,59105 P value: <,0001	W: 0,54560 P value: <,0001

The Shapiro Wilks test revealed that the data were not drawn from a normally distributed population all variables had an p value below ($p = < 0.05$)(Table 3.).

Based on this outcome the data does not meet the assumptions of a one-way ANOVA.

Instead, a non-parametric Kruskal Wallis test was used comparing mean ranks.

Kruskal Wallis test

Behavioral Intention	Practices	Attitudes	Behavioral control	Knowledge
Prob>Chi sq :0,0303 DF 1 Z: 2,16482 Prob>Z: 0,0304*	Prob>Chi sq: 0,9171 DF 1 Z: -0,10310 Prob>Z: 0,9179	Prob>Chi sq: <,0001 DF 1 Z: 3,89888 Prob>Z: <,0001*	Prob>Chi sq: <,0001 DF 1 Z: 4,19699 Prob>Z: <,0001*	Prob>Chi sq: 0,0181 DF 1 Z: 1,95374 Prob>Z: 0,0507

The Kruskal Wallis-Test showed significant differences between males and females with respect to the variables: Behavioral intention ($Z(1, 248) 2.165, p = .03$), Attitudes; ($Z(1, 246) 3.899, p < .001$), Behavioral control; ($Z(1.246) 4.196, p < .001$), and Knowledge; ($Z(1.249)1.953, p = .0182$). These findings indicated that the mean ranks for these variables are unequal across males and females. There is, however, no difference in practices between males and females ($Z(1, 237) -.103, p = .917$).

Summary statistics	Behavioral Intention	Knowledge	Practices	Attitudes	Behavioral Control
Median	5	1	4.87	5	5
Mean	4.26	1.17	4.57	4.68	4.31
St dev.	1.14	3.45	.67	.55	1.10
St. Err. mean	.07	.217	.04	.03	.06
N	250	251	239	248	248
Summary statistics for Males	Behavioral Intention	Knowledge	Practices	Attitudes	Behavioral Control
Median	5	0	4.87	4.75	4,5
Mean	4.11	0.68	4.54	4.55	4.07
St dev.	1.22	3.13	0.74	0.66	1.23
St. Err. mean	0.10	0.26	0.06	0.05	0.10
N	141	141	134	138	139
Summary statistics for females	Behavioral Intention	Knowledge	Practices	Attitudes	Behavioral control
Median	5	2	4.87	5	5
Mean	4.44	1.8	4.6	4.83	4.61
St.dev.	0.98	3.73	0.56	0.30	0.80
St.Err mean	0.09	0.35	0.05	0.02	0.07
N	109	110	105	110	109

Table 6. Survey responses practices

Practices	Always	Most of the time	About half the time	Sometimes	Never
Use soap/ash when washing hands?	70.5%	11.6%	3.4%	12%	2.3%
Wash your hands before eating?	89.9%	3.1%	1.9%	3.4%	1.5%
Wash your hands after using the toilet or latrine?	90.7%	3.4%	2.3%	1.5%	1.9%
Wash your hands after touching animals?	80.7%	7.8%	1.9%	5.8%	3.5%
Wash your hands after coughing or sneezing?	63.2%	11.3%	9.7%	9.3%	6.2%
Wash your hands after playing outdoors?	74.4%	12.2%	2.7%	7%	3.5%
Wash your hands after eating?	93.3%	1.9%	1.1%	1.9%	1.5%
Wash your hands before preparing food?	75.3%	12.1%	2.7%	5.8%	3.9%

Each item calculated by total percent of valid values.

WASH- related Knowledge

The distribution of the highest score from five and above was 5= (n10), 6= (n20), 7= (n6), 8= (n6), 9= (n2), 10= (n1). The lowest score was -6. Medians for males = 0, medians for females = 2. The histogram illustrates the differences between males and females in this variable. Medians for both sexes were low, some females had higher scores than males and there were only females getting the highest scores of 10.

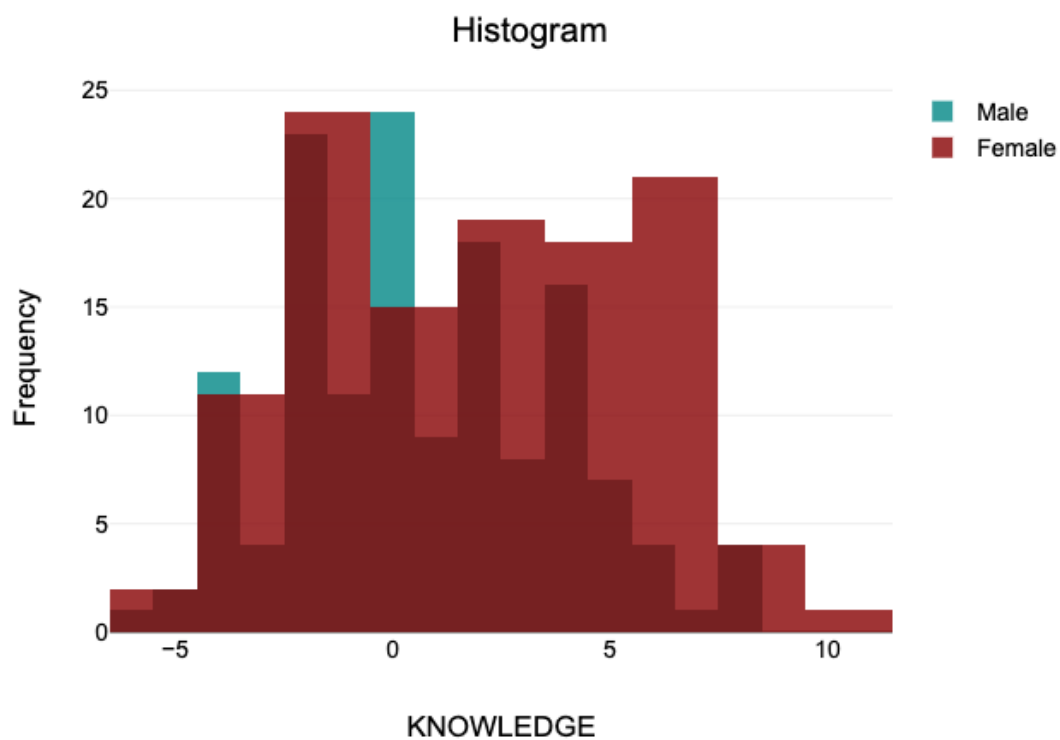


Figure 3. Histogram illustrating the distribution of knowledge scores

10.0 Discussion

This sub-section includes shorter summaries of the discussion from the article and in addition reviews the results in light of the underlying theories that informed the development of the SHINE intervention, including the survey and its relevance to public health.

This study aimed to describe the students' handwashing behavior through WASH-related knowledge, attitudes, and practices (KAP), and to investigate possible differences between males and females. The results indicate a significant difference in mean ranks between males and females for behavioral intention, attitudes, behavioral control, and knowledge. However, the results do not indicate differences in the variable practices. The survey responses revealed a high rate of males and females that reported always washing their hands after going to the toilet, with a total of 90.7% recalling this practice in the last 30 days. Similarly, 89.9% reported always washing their hands before eating. While these results may indicate proper handwashing practices, only 70.5% reported always using soap when washing their hands. The importance of using soap when washing hands may be underestimated. Burton et al. (2011) emphasizes that using soap when washing hands is far more efficient than using only water, but many still perceive it as unnecessary (2011). The results suggests that especially handwashing with soap could improve from baseline. Moreover, the findings indicates that knowledge about handwashing and risk perception is somewhat low, with only 18% of the respondents getting a score from five and above. Only one respondent of the 251 had all ten items correct. The distribution of the highest score from five and above was 5= (n10), 6= (n20), 7= (n6), 8= (n6), 9= (n2), 10= (n1). The lowest response score was -6, (Mdn=1).

An interesting observation is that the scores from the knowledge items contrasts with the findings in the other variables using Likert type scales. While these findings are interesting, it is important to note that the survey responses in this variable had far more missing values than the other variables (26 missing). Even though the missing values seemed to not follow any pattern or were related to one particular item, the chosen strategy for treating the missing values as an "0" may influence the results and may affect the validity of the knowledge variable. At the same time, the knowledge variable includes some items about risk

perception and knowledge about how to protect oneself from getting illnesses like diarrhea, items that are more difficult to answer than items in practices or attitudes, that might seem more intuitive. The contrast in the findings from knowledge to the other variables are not unexpected. Handwashing practices may be influenced by other determinants than knowledge about disease prevention, like normative beliefs, disgust, or external factors like accessibility (Abdi, 2016). According to social cognitive theory, an individual needs to have self-efficacy, knowledge about risks and benefits, outcome expectations, and goals to change behavior (Bandura, 2004). In addition, the structural and social environment needs to facilitate the desired behavior (Bandura, 2004). The theory also describes knowledge as a precondition for change. However, merely knowing the risks of getting an illness without having the means to do something about it leads to low motivation to change (Bandura, 2004).

The contextual dimension in the IBM-WASH model refers to the determinants that that may influence a specific behavior in the environment or the individual setting (Dreibelbis et al., 2013). The environment can facilitate proper handwashing practices by having access to some form of washbasin with pump or running water and soap. Proximity to such facilities is important to foster proper handwashing practices. The medians for behavioral control (Mdn=5), attitudes(Mdn=5), behavioral intention(Mdn=5) and practices(Mdn=4.87) were all high, this may indicate that the students had a high intrinsic motivation to wash hands at key times. Then again, the participants in this study did not have access to soap at school, and the handwashing facilities were placed over 50 yards from the toilets. Proper handwashing behavior is less likely to improve without access to acceptable handwashing facilities (Dreibelbis et al., 2013). "Understanding handwashing behaviours among school children at home must be understood within the context of handwashing water, soap, and facilities available at schools» (Dreibelbis et al., 2013, p. 7). While all school children should have equal access to such facilities, there are far more girls dropping out of school than boys because of WASH related issues (Ministry of Human Resource Development, n.d.; UN Women, 2018). It is also reported that girls in India are absent 20% of the school year due to lack of proper WASH facilities (Water Aid, n.d.). While there is an increasing awareness around the gender gap in WASH research (Carrard et al., 2022), very few WASH studies addresses the problem specifically. Furthermore, in light of literature and numerous reports on gender inequity related to WASH (Swedish International Development Cooperation Agency, 2019; UN

Women, 2018; Water Aid, n.d), it is interesting to find differences in all variables between males and females except self-reported practices. There is a need for more research about gender inequity in WASH, especially in school settings. While many schools in India have separate toilets for girls after national campaigns and local initiatives, many of these toilets are poorly maintained, lacking water or lock on doors, which do not facilitates sustained use (Ministry of Human Resource Development, n.d.). Moreover, when not having a place to wash hands or trash bins near toilets this is not making hygiene practices easy for school children, inhibiting the development of good habits.

There are a variety of psychological factors influencing behavior (Reyes Fernández et al., 2016). Social cognitive theory seeks to capture the broadest determinants of health behavior through the reciprocal model (Bandura, 2004). Central to this model is self-efficacy, which can be explained as an individual's belief in own capability of mastering a planned behavior (Bandura, 1977; Serovich et al., 2018). Self-efficacy can be linked to behavioral control in this study, for example, if students do not have access to proper handwashing facilities while they know the benefits of washing hands they might feel in less control of outcome and thereby less motivated to perform the planned behavior (Bandura, 1977). While on the other hand, increasing knowledge when handwashing facilities are in place could possibly influence attitudes and behavioral intention, which in turn could lead to motivation to change and increasing self-efficacy. The Psychosocial dimension in the IBM model explain this as the social and psychological determinants that influences behavior. It can also refer to the ability to master technology adaption (Dreibelbis et al., 2013). School-based interventions that use different approaches to address the targeted behavior have been more effective than approaches that focus on only the outcome such as reduction in disease (Ginja et al., 2021). Glanz & Bishop (2010) refers to increasing evidence that health promotion interventions that are grounded in a specific theoretical framework are more likely to be succeed than interventions that lack a theoretical foundation (2010). Furthermore, using combinations of several theories can strengthen intervention outcome (K. Glanz & D. B. Bishop, 2010). This makes it particularly important that WASH interventions are underpinned by relevant theory that can explain and predict WASH-related behaviors. The literature also underscores the fact that access to clean water, proper sanitation and hygiene facilities in schools is not only a necessity, but a human rights issue (McMichael, 2019; United Nations Childrens Fund and

The World Health Organization, 2020). Therefore, interventions targeting schools are an important area to address health inequities and promote health (Lopez-Quintero et al., 2009).

10.1 Limitations

Cross sectional studies are limited by collecting data from only one single point of time (Stockemer, 2019). In this case, this gives the opportunity to describe the students WASH - related knowledge, attitudes and practices at baseline, but cannot make any assumptions about causality. Therefore, description of concepts should be supplemented by theory (Stockemer, 2019). When using survey data that has already been collected some information and interpretations could be lost. This study evaluated predefined concepts from the SHINE baseline survey, one of its overall aims was to capture WASH-related knowledge, attitudes and practices. This process entailed mapping which sections could be used in further analyses depending on how reliable items were considered to be. As Stockemer (2019) states “there should be a high degree of convergence between the measure and the concept it is thought to represent»(2019, p. 14). This means that the strength of a study could be indicated by how well it measures what it says it’s going to measure. This study has carefully reviewed items and tested the reliability of the index variables. However, the treatment of the missing values in the knowledge variable is a notable limitation in this study. In retrospect it would have been possible to use another strategy, such as, excluding the 26 respondents or assigning them a mean or a middle value.

Other limitations linked to school-based WASH interventions are related to the setting or context, type of school (private or public) and possible language barriers. The two schools in this study are private, were many students have a scholarship. This may result in a highly motivated group of students normally performing well in school; thus, their performance and knowledge level may be different from students attending a public school. Surveying children can present many challenges, and the development of surveys and suitable scales for children and adolescents is still in need of more recent and specific methodology recommendations (Borgers et al., 2000; Larsson et al., 2018). There is an increasing body of peer reviewed literature on how to conduct and involve children in the research process, many going under the umbrella participatory research (Hart, 1992; Huang et al., 2016;

Larsson et al., 2018; Shier, 2001). But few go into details of how to developing surveys targeting different age groups (Larsson et al., 2018). A study by Christian et al. (2010) about data collection strategies for children and adolescents managed to include children in developing and evaluating questionnaires, putting the children at the center of the research process. While their findings are interesting they do not imply specific methods for future development, targeting children and adolescents in different age groups (Christian et al., 2010). Therefore, it is important to acknowledge how other child friendly approaches can contribute to the development of school based WASH interventions.

11.0 Endnote

The survey responses revealed a high rate of students reporting always washing their hands after going to the toilet; the findings do suggest, however, that there was room for improvement regarding hygienic practices such as washing hands with soap. The two schools did not have access to soap at school, which could explain why many students reported that it was "Very important" to wash hands with soap, but only 70,5% reported doing so.

The results from this study indicated a significant difference in mean ranks between males and females for behavioral intention, attitudes, behavioral control, and knowledge. However, there were not significant differences in the variable practices. The knowledge score may indicate that the targeted population could benefit from an intervention like SHINE, which combines different methods to achieve behavioral change to improve and maintain good health for adolescents. Although it is not possible to draw any further conclusions from these results to other populations, it may be interesting to compare to follow-ups.

12.0 Literature/ reference list

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Sociodemographic differences in WASH-related knowledge, attitudes, and practices among school children in rural India.

Short title: WASH-related knowledge, attitudes, and practices among school children in rural India.

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Abstract

Diarrhea is one of the leading causes of mortality for children under five in low- and middle-income countries (Ashbolt, 2004; Fewtrell et al., 2005). Diarrhea is possible to prevent with access to clean water, soap, adequate sanitation systems, and hygiene management (World Health organization, 2022). Medical treatment of illnesses related to water, sanitation, and hygiene (WASH) represents a significant cost burden for the health sector (Mara et al., 2010). WHO estimates that 10 % of the total disease burden could be reduced worldwide if water sanitation and hygiene management and facilities were improved (World Health organization, 2019). **Aims and methods:** This baseline cross-sectional study aimed to describe WASH-related knowledge, attitudes, and practices among students in sixth, seventh and eighth grade, before the SHINE intervention was implemented in two schools in rural India as part of a pilot study. Eighty-eight percent of the invited students completed the survey giving a total of 259 respondents. The study focuses specifically on WASH-related knowledge, attitudes, and practices (KAP) associated with

handwashing behavior and in particular differences between males and females. Sections of the baseline SHINE surveys were chosen for further development which resulted in the variables *Attitudes*, *Behavioral control*, *Behavioral intention*, *Practices* and *Knowledge*. The Kruskal Wallis test were utilized to examine if there were any statistically significant differences between males and females. **Results:** The findings indicate unequal mean ranks for behavioural intention, attitudes, knowledge and behavioural control between males and females. The survey responses revealed that handwashing practices were overall good, but the use of soap was not as frequently reported. The medians for behavioral intention and attitudes were high for both males and females indicating positive attitudes towards handwashing at key times, and a strong intention to wash hands. The results from the students WASH related knowledge was low for both males and females. These findings may indicate that the students could benefit from an intervention like SHINE that aims to improve structural factors like access to soap at the same time as they target behavioral change in addition to increasing knowledge.

Keywords: WASH, PUBLIC HEALTH, SCHOOLBASED INTERVENTION, IBM-WASH, HANDWASHING, HEALTH PROMOTION, KAP, WASH-KAP.

Introduction

Safe drinking water, sanitation, and hygiene are fundamental to maintaining good health, reducing the risk of various diseases (Mara et al., 2010; World Health organization, 2019). Some age groups are more vulnerable and susceptible than others. Diarrhea is one of the leading causes of mortality for children under five (Ashbolt, 2004; Fewtrell et al., 2005), killing around 525 000 children every year (World Health organization, 2017). Recurrent infection can lead to malnutrition which in turn can impair cognitive and physical growth, causing functional consequences for children growing up (Fischer Walker et al., 2012; World Health organization, 2015). Diarrhea is possible to prevent with access to clean water, soap, adequate sanitation systems, and hygiene management (World Health organization, 2022). Medical treatment of illnesses related to water, sanitation, and hygiene (WASH) represents a massive cost burden for the health sector (Mara et al., 2010). WHO estimates that 10 % of the total disease burden could be reduced worldwide if water sanitation, hygiene management, and facilities were improved (World Health organization, 2019). The prevalence of handwashing with soap at key times, e.g., after using the toilet, is estimated to be around 19% worldwide (Freeman et al., 2014). This estimate is surprisingly low considering how washing hands could reduce the risk of getting an oral-fecal transmitted disease reported as much as 42% (Curtis & Cairncross, 2003).

Water, sanitation, and hygiene represent both a global public health challenge and a local one. UNICEF reports that almost half of all school children, approximately 818 million children lack access to handwashing facilities with water and soap (United Nations Children's Fund, n.d.-a). The World Health Organization's annual water, sanitation, and hygiene report (2019) underscore that hand washing and handwashing facilities are greatly underinvested, where low and middle income countries suffering the most significant consequences (World Health organization, 2019). The call for global action for clean water, sanitation, and hygiene needs to be sustained by political and global interest in a long-term perspective, such as the United Nations' Sustainable Development Goals (SDG). The SDGs lay out a vision for the world by 2030, ratified by the UN general assembly in 2015. The main principle is to "*Leave no one behind*" by setting 17 specific goals, which call for all countries to act to "*promote prosperity while protecting the planet*" (United Nations, n.d.-b). The Sustainable Development Goal (SDG) number six calls for clean water and sanitation by 2030 (United Nations, n.d.-b). SDG number six is undeniably connected to SDG number

three, "Good health and well-being" (United Nations, n.d.-a). To achieve and maintain good health, water, sanitation, and hygiene are fundamental pillars.

India has a population of approximately 1.39 billion people (The World Bank, 2021). The latest estimates by UNICEF and WHO reports that 630 millions live without adequate sanitation facilities and clean water, resulting in many people defecating outside (United Nations Children's Fund and The World Health Organization, 2020). Government Campaigns like the Swachh Bharat Mission (Clean India Campaign) (Department of drinking water & sanitation, 2021) launched by the Indian prime minister in 2014 have contributed to improving the WASH situation in India by reducing the number of people defecating outside (United Nations Children's Fund, n.d.-b) with help from the private sector, research initiatives, and nonprofit organizations. However, this substantial health issue necessitates effective, evidence-based interventions that address the problem through different approaches like involving youth in the research process, implementing changes to curricula at school, and developing surveys that are suitable for adolescents (Larsson et al., 2018). This also include effective health promotion strategies that address underlying health behavior patterns, the individual determinants of health, alongside the structural determinants (K. Glanz & D. B. Bishop, 2010). For instance, using behavioral change theory to target social norms in addition to facilitate access to soap at school.

The *Swachh Bharat Mission (Clean India Campaign)* focuses primarily on marginalized communities (Department of drinking water & sanitation, 2021). Here, various methods are used, for instance behavioral change campaigns focusing on approaches like *Community Led total sanitation (CLTS)* an integrated approach with focus on involving the local community in analyzing and facilitating the communities sanitation status working together to end open defecation (Kar, 2008). Behavioral change campaigns often happen alongside more structural approaches, such as working to solve infrastructure problems e.g., construction of toilets. Some behavioral change campaigns focus, for instance, on improving schools' curricula to increase awareness about WASH and how to prevent WASH-related diseases (Department of drinking water & sanitation, 2021; Ministry of Human Resource Development, n.d.). However, only making changes to the curricula at school is not sufficient to enable, sustain and maintain behavioral changes (Biran et al., 2009), therefore WASH interventions often uses participatory approaches that focuses on several dimensions at once such as contextual,

psychological and technological grounded in behavioral change theory (Dreibelbis et al., 2013; Fawcett et al., 1995; Hetherington et al., 2017; Save the Children Sweden, 1997).

The research literature on WASH interventions effectiveness is mixed, and there is no clear consensus on the best approach to achieve sustained WASH related behavioral outcomes e.g. reduction in diarrhea, transmission of fecal-oral transmitted diseases or increasing handwashing rates (McMichael, 2019; Ramesh et al., 2015; Staniford & Schmidtke, 2020). A literature review of 18 different WASH interventions in schools (McMichael, 2019) found mixed results overall, but 13 studies reported evidence of positive change in relation to handwashing behavior with sanitizer or soap. They also found improvement in knowledge about hygiene and improved hygiene habits (McMichael, 2019). Another systematic review, investigating handwashing with soap on diarrhea risk in the community found that washing hands with soap could reduce the risk by as much as 47%, pooled from 42-44% (Curtis & Cairncross, 2003). This evidence underscore that interventions that promote handwashing could contribute to save millions of lives (Curtis & Cairncross, 2003). When proper handwashing facilities with soap are available, handwashing serves as an inexpensive, easy and sustainable protective practice against a range of different diseases (United Nations Children's Fund, n.d.-a). However, two other systematic reviews on WASH in school and a local Indian community found no significantly effect on handwashing rates when comparing pre and post results (Biran et al., 2009; Lewis et al., 2018). Waddington & Snilstveit (2009) state that in order to be effective, interventions need to be integrated, comprehensive and appropriate to the social, cultural, political and economic context (Waddington & Snilstveit, 2009). Others refers to increasing evidence that health promotion interventions that are grounded in a specific theoretical framework are more likely to be effective than interventions that lack such foundations (K. Glanz & D. B. Bishop, 2010). Also, using the combinations of several theories can strengthen the interventions likeliness to succeed (K. Glanz & D. B. Bishop, 2010).

Schools are essential for implementing WASH interventions because they are cost-effective and can reach many people in the community (Gold-Watts, 2020; Lewis et al., 2018). It can also be a vital arena to understand which factors or determinants that contribute to shaping adolescent's health behaviors, like knowledge and attitudes (Lopez-Quintero et al., 2009). Effective WASH interventions could not only save many lives, it can also contribute to good health and wellbeing (Karen Glanz & Donald B Bishop, 2010).

Using schools to promote "proper handwashing behavior" may reduce the risk of getting fecal-oral transmitted diseases like diarrhea among adolescents and the broader community (Lopez-Quintero et al., 2009). Several studies involving children and adolescents are using participatory methods to achieve sustainable behavioral change within communities and to use youth as change agents (Holkup et al., 2004; Larsson et al., 2018). However, the transaction of knowledge and behavioral change in the local community using school children as change agents has shown to be challenging to document, and the results effectiveness have been mixed (Lewis et al., 2018). Two cluster-randomized trials investigating handwashing showed no significant difference in handwashing rates after handwashing interventions/behavioral campaigns (Biran et al., 2009; Lewis et al., 2018). While some intervention studies have observed an increase of handwashing rates from 4% to 74% by 6 weeks after the intervention (Dreibelbis et al., 2016). Studies like this show that cost-efficient and straightforward methods can achieve positive results that might be interesting for the development of intervention studies in the future. But achieving sustained adoption of the behavioral targets and to develop appropriate measurement tools remains challenging in WASH research (Martin et al., 2018).

The SHINE intervention in India builds on a school-based SHINE intervention in rural Tanzania, which applies participatory science and innovation in education to promote a healthier community through improved water, sanitation, and hygiene practices, using non-stigmatizing methods (Bastien et al., 2015; Hetherington et al., 2017). The SHINE intervention in India builds on some of the same theoretical foundations but translated the intervention into a new, culturally different context. The aim of SHINE India was to: "Improve WASH-related knowledge, attitudes, and practices among students in sixth, seventh and eighth standard, as well as encourage adolescents to become health promoters and changemakers within their community, through development of life and leadership skills" (Gold-Watts, 2020, p. 43). Central to this intervention is an innovation among youth to position them as change agents, but also engaging the larger community and empowering the cue to action (Gold-Watts, 2020; Hetherington et al., 2017). Intervention studies like SHINE are also addressing how young girls in particular are in need of WASH interventions (Gold-Watts, 2020; Gold-Watts et al., 2021). It's reported that girls in India are absent 20% of the school year related to menstruation (Water Aid., n.d) At the same time is there an increasing amount of literature addressing how research in several fields has been gender biased, for

instance, are males overrepresented in public health data which may lead to an skewed image of how public health issues affect different groups in the society(Upchurch, 2020).

Challenges linked to water, sanitation and hygiene facilities affects males and females disproportionately (Carrard et al., 2022; Swedish International Development Cooperation Agency, 2019; UN Women, 2018). Women in low income countries are often at risk of violence when travelling long distances to get clean water or find a place to defecate when toilets are not available (Water Aid, n.d). Moreover, when young women reach puberty, they need suitable sanitary and hygiene facilities to dispose of sanitary pads and to wash hands (Carrard et al., 2022; Swedish International Development Cooperation Agency, 2019). Gender differences in relation to WASH is important to consider in order to develop interventions that targets the different problem areas and is often forgotten (Carrard et al., 2022), in schools this is especially related to access to closed toilets with locks, trash bins to dispose of menstrual hygiene products and close proximity to handwashing facilities with soap.

In the development of effective WASH interventions, there is a need for knowledge about how adolescents are affected by and perceive public health challenges, and which determinants contribute to shaping their WASH-related knowledge, attitudes, and practices (KAP) (Karen Glanz & Donald B Bishop, 2010; Hetherington et al., 2017; McMichael, 2019). Building such an understanding includes capturing handwashing practices, attitudes towards handwashing, and knowledge about WASH using approaches that are grounded in behavioral change theory. This also involves using research methods that are suitable for school children. For instance, while child-friendly approaches might include participatory research involving children in the research agenda, focus group discussions, visual techniques and putting children in the center of the research process (Save the Children Sweden, 1997). It is also essential to develop an understanding of how surveys targeting adolescents can contribute. Nonetheless, with a large foundation of research that underscores challenges in WASH affect males and females disproportionately it is relevant and important to investigate if there are any differences between males and females regarding WASH-KAP. The overall aim of this study is to describe the students' handwashing behavior through WASH-related knowledge, attitudes, and practices (KAP), as well as to identify possible differences between males and females. Focusing on WASH-related knowledge, attitudes and practices the Integrated Behavioural Model for Water, Sanitation, and hygiene (IBM-WASH) and Albert

Bandura's Social cognitive theory (Bandura, 2004) serves as a theoretical foundation of the findings in this study. The IBM – WASH is one of the most comprehensive models for WASH-research in newer time. The model serves as a solid theoretical platform build on a large amount on former WASH-research developed by Dreibelbis et al. (2013) from a systematic review of conceptual models and social-ecological theoretical frameworks used in WASH research.

Material & methods

Study design and population

The baseline survey data used in this master thesis originates from the more extensive intervention study SHINE (Sanitation & Hygiene INnovation in Education), a “two group, non-equivalent control group pilot study with a design that includes a pretest- posttest with one follow-up.” (Gold-Watts, 2020, p. 44). This study was carried out in India's Tamil Nadu district from 2016 to 2018.

This baseline cross-sectional study aimed to describe WASH-related knowledge, attitudes, and practices among students in sixth, seventh and eighth grade, before the intervention took place. The strengths of a cross sectional study are, amongst other issues, that it is inexpensive and well suited for public health planning, as it measures both outcome and exposure at the same time (Setia, 2016). The study focuses specifically on handwashing behavior through WASH-related knowledge, attitudes, and practices (KAP). To keep this focus, variables that captured the intention to wash hands, behavioral control related to hand washing, attitudes towards hand washing, hand washing practices, and WASH-related knowledge were identified. Additionally, the study examined whether there were differences between males and females.

Data collection and preparation

A total of 292 students were invited to participate with an age span from 10 to 14 years old within sixth, seventh and eighth grade. Participation was voluntary and it was made clear to the students that it would be possible to withdraw at any time. An informed consent form was handed out to each student to be signed by main caretaker prior to the baseline survey (Attachment 4). Eighty-eight percent of the invited students completed the survey giving a total of 259 respondents. The survey was completed in paper form at school and was later entered into an electronic database by the research team. The survey took two school hours to

complete, and the students were given the possibility to ask the researchers questions during that time. Teachers at the schools were also informed prior to the survey to assist the students if they had any problems understanding the questions. The data were manually entered into the statistical software JMP 16.0.0, 23 surveys were excluded because they were left blank. Missing values were re-coded into a blank value, and inspected by using a strategy of exclusion over a 25% missing values for both respondents and questions (Broeck et al., 2005). A total of eighth respondents were excluded reducing the dataset by 3 %, giving 251 respondents for the data analysis, 141 males and 110 females. None of the variables had more than 25% missing values and on that account, none were excluded.

Survey design

The entire baseline survey is 22 pages long, including the introduction and the opportunity to provide feedback about the survey at the end. The survey is divided into ten sections (Table 1).

<i>Section</i>	<i>Subsections and items</i>	<i>Response option or Scale</i>
Sociodemographic Variables	Three items: Age, Sex, and Grade.	-Age written -Check box for grade and sex
Section 1	Eight items about their living condition: the primary source of drinking water, what type of toilet they use, and if they have access to soap.	-Multiple choice w/pictures Four-point frequency scale from 1 to over 5 Binary: Yes/no
Section 2	Seven subsections about daily habits concerning WASH. Twenty items in total	Five-point frequency scale: Every day to not at all - five-point Likert-type scales: Very likely to very unlikely Very important to not at all important Very easy to very difficult Binary: Yes/no Multiple choice
Section 3	Two subsections about personal health practices, asking the respondents to recall hygienic practices in the last 30 days. Nineteen items in total	Five-point frequency scale: Always to never Complete a sentence
Section 4	Six subsections. The respondents are asked about personal health and introduced to the Bristol Stool Chart (visual scale of stool), asking about diarrhea using the illustration of a very watery stool. Respondents are asked to recall the last 30 days. Six items in total	Picture of Bristol stool scale Multiple choice from type 1-7 (Stools) Multiple choice weekdays Recall of last 30 days Binary: Yes/no

		Four-point frequencies scale from 1 to over 7
Section 5	Two items about experiences at school (how well they did at school)	Five-point scale From: “I scored among the very best in my class” to “I scored among the worst in my class”
Section 6	Three subsections about what they remember learning at school and their attitude towards science. Twenty-four items in total.	Binary: Yes/no -True/False/Not sure -From agree to disagree
Section 7	Three subsections about sanitation and hygiene knowledge. In first subsection the respondents are asked to write what they know about sanitation and hygiene. Items about sanitation and hygiene capturing WASH- related knowledge. Twenty-two items in total.	-Written response - True/false/Not sure
Section 8	Eighth subsections about family and home. Eighth items in total.	Yes/no Multiple choice Option to choose between two items “My main caretaker can read” or “My main caretaker cannot read” Level of education from “No formal education” to “College or university” Check box for main caretaker eight types to choose from. Check box for “The other individual that help to take care of you at home”
Section 9	Seven items about main caretaker’s education level, occupational status and how long they worked for money. Two items repeated about intention to wash hands.	Binary: Yes/no How many: Fill number From “They worked six months or more for money” to “they did not work at all for money” -Four-point frequency scale from 1 -over 5
Section 10	Feedback about the survey: Three items	-Five-point Likert type scale From Very easy to very difficult -Language- Written response -Comments – Written Response

The survey was originally developed for the SHINE intervention in Tanzania. A detailed description of the development of the survey is described in project SHINE conceptual paper (Bastien et al., 2015, p. 30). It was later processed to fit the context of SHINE India, some scales were altered, and some scales were added to fit the new scope (Gold-Watts, 2020). The

sections and items chosen for this paper were guided by the research question which focuses on handwashing behavior through the items that captured knowledge, attitudes and practices for handwashing. Some of the items that were excluded was based on this overall scope. The larger SHINE survey was extensive and covered additional variables that were beyond the scope of this study.

As presented in Table 1, the SHINE survey utilized a combination of different scales and response options. The most frequently used scale in the SHINE survey is a five-point Likert scale ranging from agree to disagree. This is the most common scale within survey research and used in many different sectors – from research to commercial use (Sullivan & Artino, 2013). In some of the sections the five point Likert scale was complimented with a “smilyometer”, developed to measure children’s opinion in a illustrative way, which is recommended for surveys among children (Borgers et al., 2000). Several sections utilized a scale of frequencies with numbers, for example in section four about personal health the students were asked “*In the last 30 days, how many days were you absent from school because of illness?*” The four-point scale ranges from “1-2” to “over 7”. Frequencies were also measured by five-point scales ranging from never to always, or from “not at all” to everyday. An example of this is where the students are asked to recall the last 30 days, “*How often did you... ? “Walk outside without shoes on”?* “*Every day, every week, but not every day, not often or not at all.*”. In other sections a five-point Likert scale is used to measure students’ opinions ranging from very likely to very unlikely, or very important to not at all important. In the section that captures behavioral control, the five-point Likert scale ranges from very difficult to very easy. The WASH-related knowledge items were formulated as a statement given a true, false, not sure possibility- illustrated with symbols. The true item was illustrated with a “check box “symbol, the false was illustrated with an “x “symbol and the not sure option with a “question mark” symbol.

Variable selection and development

This article aims to describe the students’ handwashing behavior through WASH-related knowledge, attitudes, and practices (KAP), as well as to identify possible differences between males and females. The exhaustive baseline survey had ten sections focusing on a range of different aspects such as living conditions, personal health practices, caretakers’ educational status and the frequencies of self-reported diarrhea (Table 1). To meet the delimitation of this

study, groups of questions relating to students' handwashing -KAP were selected for analysis. Six sections were selected for further analysis identified as *Sex, behavioral intention-, attitudes-, behavioral control-, practices- towards handwashing*, and WASH-related *knowledge*. For purpose of keeping a focused study, the results from the other sections in the baseline survey were omitted from the analysis.

Development of variables

In the development of the variable capturing attitudes towards handwashing, two items inquiring about treatment of water were excluded so that the variable was only measuring handwashing' attitudes. Cronbach's alpha was used to measure the internal consistency of the sections selected for the development of the variables included in the study. An overview of the items included is presented in table 2 below. In agreement with all authors, the cut-off score for the Cronbach's alpha value was set to 0.7 (Taber, 2018). This guided the final decision to exclude one item in the group capturing *behavioral intention*. The third item had a alpha value of α 0.8036 if item deleted (Table 4. Results). The values indicated that the set of items did not have a satisfying internal consistency. When reviewing the items again two of the items were addressing the intention to use soap/ash when washing hands, and the third item was addressing the intention to wash hands before you eat if a clean toilet were available. The latter was deemed unsuitable for capturing handwashing behavioral intention and therefore removed.

Table 2.
Variable selection

Variable	Description	Scale	Items
Behavioral intention	Three items about what the students plan to do in each scenario. "What do you plan to do?"	From very likely to very unlikely	<p>If soap/ash is available how likely is it that you will wash your hands next time you use the toilet?</p> <p>If soap/ash is available how likely is that you will wash your hands before the next time you eat?</p> <p>If a clean toilet/latrine is available, how likely is it that you will wash your hands before the next time you eat?</p>
Attitudes	Attitudes was captured by four items where the respondents were asked to answer how important is the following?	From very important to not at all important.	<p>Washing hands with water and soap/ash before eating</p> <p>Washing hands with water and soap after eating</p> <p>Washing hands with soap/ash after using toilet/latrine</p> <p>Washing hands with soap/ash after caring for animals</p>

Behavioral control	Behavioral control was captured by two items: What do you think about these statements?	From very difficult to very easy	How difficult is it to wash your hands with soap/ash and water before eating? How difficult is it to wash your hands with soap/ash and water after using the toilet/latrine?
Practices	Practices was captured by eight items – asking the respondents to recall the last 30 days how often did you...?	On a scale from never to always.	Use soap/ash when washing hands? Wash your hands before eating? Wash your hands after using the toilet or latrine? Wash your hands after touching animals? Wash your hands after coughing or sneezing? Wash your hands after playing outdoors? Wash your hands after eating? Wash your hands before preparing food?

Knowledge variable is described in a separate table.

Once the internal consistency was established, the items were grouped and five index variables established: *behavioral intention*, *attitudes*, *practices*, and *behavioral control*. Ten knowledge items were eventually included in the *knowledge* variable (Table 3.). The responses were recoded and given a score of “1” for the correct answer, a score of “0” for not sure, and a score of “-1” for the incorrect answer. The sum of all the answers resulted in the final score for the knowledge variable, giving the students a 10 out of 10 if they answered all items correctly.

Table 3.

Knowledge variable

Description	Nr	Item
Ten statements about sanitation and hygiene that aims to capture WASH related knowledge Respondents check a box for True/false/not sure	1	You may get sick from using an unclean toilet
	2	Getting a worm infection is a matter of bad luck
	3	Washing your hands with soap can help prevent you from getting diarrhea
	4	There is nothing I can do to prevent myself from getting diarrhea
	5	It is important to wash your hands before eating even if they look clean
	6	Washing hands only with water after using the bathroom will protect from diseases
	7	Getting a worm infection does not cause serious harm to your health
	8	Using an unclean toilet/latrine can lead to diseases

- 9 If my hands look clean there is no point in washing them
- 10 Washing hands with only water is enough to protect myself from diseases
-
-

Missing values in the knowledge variable

The knowledge variable did not calculate and report the score from respondents with a missing value in one of the ten items, resulting in 26 missing values in this grouped variable. Several strategies were discussed with the research team on how to treat the missing values. To be able to include the other values, the missing knowledge items was recoded as “0” equal to “not sure”. Most likely, students that did not check the box, did not know the answer to the question or missed the question. Since a value of 0 is neutral, this would not affect the result positively or negatively but make it possible to include the other responses to the items. However, this may affect the total percentage of students getting a high score.

Statistical analyses

After developing the variables, the data were ready for performing the analysis of variance (ANOVA). To test the assumptions, a Shapiro Wilk test with a normal quantile plot was used to assess if the data were normally distributed, and a Levene’s test was performed to meet the assumption of homogeneity of variances. If these assumptions, were violated a nonparametric test using rank sums was appropriate to use. A Mann -Whitney U test is a suitable alternative to a one-way ANOVA when data are not normally distributed; it is also sometimes referred to as the “one-way ANOVA on ranks»(Lærd statistics, n.d). The Kruskal Wallis test is a non-parametric test that does not assume a normal distribution with equal variance and is appropriate when comparing two, or more, unrelated groups (Lærd statistics, n.d).

Results

Internal consistency

As presented in table 4, the Cronbach's alpha value were above 0.8 in *Practices* and *Behavioral control* indicating a highly reliable set of items. Once the Third item in *Behavioral intention* was excluded the Cronbach's alpha value was $\alpha = 0.8036$. In the *Attitude* variable the Cronbach's alpha value was $\alpha 0.7165$, a little lower than the other variables, but still within an acceptable level (Gliem & Gliem, 2003). Overall, these values indicate a reliable set of items for further analysis.

Table 4.
Variable development – Cronbach's alpha

Variable	Description	Scale	Items	Cronbach Alpha	Cronbach Alpha if item deleted
Behavioral intention	Three items about what the students plan to do in each scenario. "What do you plan to do?"	From very likely to very unlikely	If soap/ash is available how likely is it that you will wash your hands next time you use the toilet?	0,6713	0.3807
			If soap/ash is available how likely is it that you will wash your hands before the next time you eat?	*0.8036	0.3688
			If a clean toilet/latrine is available, how likely is it that you will wash your hands before the next time you eat?		0.8036* (Item excluded)
Attitudes	Attitudes was captured by four items where the respondents were asked to answer how important is the following?	From very important to not at all important.	Washing hands with water and soap/ash before eating	0,7165	0.6608
			Washing hands with water and soap after eating		0.6963
			Washing hands with soap/ash after using toilet/latrine		0.5999
			Washing hands with soap/ash after caring for animals		0.6685
Behavioral control	Behavioral control was captured by two items: What do you think about these statements?	From very difficult to very easy	How difficult is it to wash your hands with soap/ash and water before eating?	0,8608	
			How difficult is it to wash your hands with soap/ash and water after using the toilet/latrine?		
Practices	Practices was captured by eight items – asking the respondents to recall the last 30 days how often did you...?	On a scale from never to always.	Use soap/ash when washing hands?	0,8412	0.8423
			Wash your hands before eating?		0.8164
			Wash your hands after using the toilet or latrine?		0.8247
			Wash your hands after touching animals?		0.8078

Wash your hands after coughing or sneezing?	0.8239
Wash your hands after playing outdoors?	0.8174
Wash your hands after eating?	0.8257
Wash your hands before preparing food?	0.8212

Normality and variance

The variables behavioral intention, practices, attitudes, behavioral control, and knowledge were subject to appropriate testing before running the final analysis. Variance was examined with a Levene’s test, and normality with a Shapiro Wilks test.

Table 5.
Levenes test

Behavioral Intention	Practices	Attitudes	Behavioral control	Knowledge
F ratio: 10,8662 P-value: 0,0011*	F ratio: 2,6781 P-value: 0,1031*	F ratio: 26,1181 P-value: <.0001*	F ratio: 24,6425 P-value: <.0001*	F ratio: 4,7504 P-value: 0,0091*

The variance in the two groups, males and females was measured in each variable with a Levenes test. Levene’s test showed unequal variance for all variables, apart from Practices (F(1, 237) 2.678, p = .103); Behavioral intention (F(1, 248) 10.866, p = .001); Attitudes (F(1, 246) 26.118, p < .001); Behavioral control (F(1, 246) 24.643, p < .001; Knowledge (F(1, 249) 4.75, p = .009)(Table 4).

Assessing the normality of the data was done by looking at a normal quantile plot for the distribution of the variables, and the Shapiro Wilk test was used as a hypothesis test/Goodness of fit test to check if the variables were normally distributed (Stockemer, 2019). The result of the test is presented below (Table 5). The Shapiro Wilks test revealed that the data were not drawn from a normally distributed population, all variables had a p-value below (p.=<0.05).

Sex	Behavioral Intention	knowledge	Practices	Attitudes	Behavioral Control
Boys	W: 0,7409294 P value: <,0001	W: 0,9682175 P value: 0,0045	W: 0,6611762 P value: <,0001	W: 0,69092 P value: <,0001	W: 0,7521984 P value: <,0001
Girls	W:0,6158562 P value: <,0001	W: 0,96273 P value: 0,0031	W: 0,728904 P value: <,0001	W: 0,59105 P value: <,0001	W: 0,54560 P value:<,0001

Based on this outcome a nonparametric Kruskal Wallis test was utilized to compare the mean rank of the two groups (males and females) for each dependent variable. The assumptions for the Kruskal Wallis were inspected and met prior to the analysis (Lærd statistics, n.d; Lomuscio, 2021).

Behavioral Intention	Practices	Attitudes	Behavioral control	Knowledge
Prob>Chi sq :0,0303 DF 1 Z: 2,16482 Prob>Z: 0,0304*	Prob>Chi sq: 0,9171 DF 1 Z: -0,10310 Prob>Z: 0,9179	Prob>Chi sq: <,0001 DF 1 Z: 3,89888 Prob>Z: <,0001*	Prob>Chi sq: <,0001 DF 1 Z: 4,19699 Prob>Z: <,0001*	Prob>Chi sq: 0,0181 DF 1 Z: 1,95374 Prob>Z: 0,0182

The Kruskal Wallis-Test showed significant differences between males and females with respect to the variables: Behavioral intention ($Z(1, 248) 2.165, p = .03$), Attitudes; ($Z(1, 246) 3.899, p < .001$), Behavioral control; ($Z(1.246) 4.196, p < .001$), and Knowledge; ($Z(1.249)1.953, p = .0182$). Thus, there is sufficient evidence to state that the mean ranks for these variables are unequal across males and females. There is, however, no significant difference in practices between males and females ($Z(1, 237) -.103, p = .917$).

Table 8 Summary of statistics all variables included

Summary statistics total	Behavioral Intention	Knowledge	Practices	Attitudes	Behavioral Control
Median	5	1	4.87	5	5
Mean	4.26	1.17	4.57	4.68	4.31
St dev.	1.14	3.45	.67	.55	1.10
St. Err. mean	.07	.217	.04	.03	.06
N	250	251	239	248	248
Males	Behavioral Intention	Knowledge	Practices	Attitudes	Behavioral Control
Median	5	0	4.87	4.75	4,5
Mean	4.11	0.68	4.54	4.55	4.07
St dev.	1.22	3.13	0.74	0.66	1.23
St. Err. mean	0.10	0.26	0.06	0.05	0.10
N	141	141	134	138	139
Females	Behavioral Intention	Knowledge	Practices	Attitudes	Behavioral Control
Median	5	2	4.87	5	5
Mean	4.44	1.8	4.6	4.83	4.61
St.dev.	0.98	3.73	0.56	0.30	0.80
St.Err mean	0.09	0.35	0.05	0.02	0.07
N	109	110	105	110	109

Table 9. Survey responses from the items included in practices.

Practices	Always	Most of the time	About half the time	Sometimes	Never
Use soap/ash when washing hands?	70.5%	11.6%	3.4%	12%	2.3%
Wash your hands before eating?	89.9%	3.1%	1.9%	3.4%	1.5%
Wash your hands after using the toilet or latrine?	90.7%	3.4%	2.3%	1.5%	1.9%
Wash your hands after touching animals?	80.7%	7.8%	1.9%	5.8%	3.5%
Wash your hands after coughing or sneezing?	63.2%	11.3%	9.7%	9.3%	6.2%
Wash your hands after playing outdoors?	74.4%	12.2%	2.7%	7%	3.5%
Wash your hands after eating?	93.3%	1.9%	1.1%	1.9%	1.5%
Wash your hands before preparing food?	75.3%	12.1%	2.7%	5.8%	3.9%

*Each item calculated by total percent of valid values.

Histogram illustrating the distribution of knowledge scores

The distribution of the highest score from five and above was 5= (n10), 6= (n20), 7= (n6), 8= (n6), 9= (n2), 10= (n1). The lowest response score was -6, the highest score was 10.

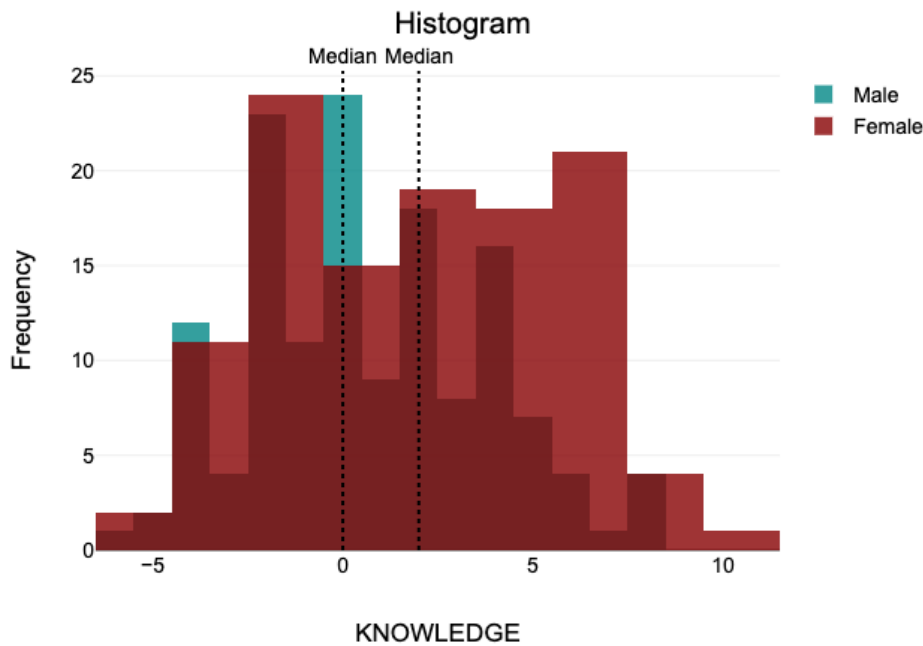


Figure. 1 Distribution of knowledge score males and females from -6 to 10.

Discussion

This study aimed to describe the students' handwashing behavior through WASH-related knowledge, attitudes, and practices (KAP), and to identify possible differences between males and females. The results indicate a significant difference in mean ranks between males and females for behavioral intention, attitudes, behavioral control, and knowledge. However, there were not differences in the variable practices, which could indicate that males and females in this study may have different knowledge, attitudes, and intention to wash hands, but in terms of their actual practices, they do not differ.

The survey responses revealed a high proportion of males and females that reported always washing their hands after going to the toilet, with a total of 90.7% recalling practices the last 30 days. Similarly, 89.9% reported always washing their hands before eating. While these results may indicate proper handwashing practices, only 70.5% reported always using soap

when washing their hands. One of the possible explanations for this is that students did not have access to soap at school (Gold-Watts, 2020). Alternatively, the importance of using soap when washing hands may be underestimated. Burton et al. emphasize that using soap when washing hands is far more efficient than using only water, but many still perceive it as unnecessary (Burton et al., 2011). The median for attitudes were high (Mdn=5, males Mdn=4.75, females Mdn=5), indicating that many students thought it was very important to wash hands. This suggests that many students had positive attitudes toward HWWS. Likewise, medians in behavioral intention were high (Mdn=5, Males Mdn=5, females Mdn=5). There is although an uncertainty around the role of attitudes prediction of behavior (Ajzen & Fishbein, 1980; Glasman & Albarracín, 2006). While social norms and social desirability are widely recognized to influence WASH behavior (Dreibelbis et al., 2013).

Several systematic reviews on hygiene and health found that handwashing with soap at crucial times may reduce the risk of illnesses like diarrhea and other fecal-oral transmitted diseases (Freeman et al., 2014; Martin et al., 2018; Staniford & Schmidtke, 2020). However, the estimated prevalence of handwashing with soap after being in contact with fecal material is approximately 19% worldwide (Freeman et al., 2014), and in 2020, 670 million still had no handwashing facilities at all (United Nations children's Fund, 2021). This shows that interventions focusing on water, sanitation, and hygiene is necessary on a large and small scale. School-based interventions that use different approaches to address the targeted behavior have been more successful than approaches that focus on only outcome such as reduction in disease (Ginja et al., 2021). The responses from this study may indicate that the student's handwashing practices were better than the global estimate, but the results from the different variables are mixed. The findings may indicate that especially handwashing with soap could improve from baseline.

However, with regards to practices, students were asked to recall the last 30 days, which may be susceptible to recall or self-report bias (Stockemer, 2019). One type of self-report bias is the tendency to answer questions after what the social norm is, also called social desirability, this is a common limitation in studies that use self-reported survey data (Althubaiti, 2016; Stockemer, 2019). Two systematic reviews on handwashing behavior and WASH effectiveness reports that handwashing rates with soap are overestimated when using a self-report method (Biran et al., 2008; Ramesh et al., 2015). The findings in this study may be subject to the same overreporting, since the survey was carried out at school; the setting is

very similar to taking a test, it is not unthinkable that some students could be overreporting their handwashing practices as they may know what the "correct" answer is. Some studies use an objective observer to measure handwashing rates instead of self-reporting (Burton et al., 2011); this is, on the other hand, more comprehensive, expensive, and labor intensive. Using an observer does not eliminate bias either. The presence of a researcher at home or school may affect handwashing behavior (Biran et al., 2008; Lewis et al., 2018).

The literature reveals a different emphasis on the role of knowledge when seeking to change behavior. While some state that behavior will change if knowledge about the problem is increased, several studies and theory emphasize that even though an individual knows how to practice proper handwashing and why one should do it, this is not sufficient to change behavior alone (Bandura, 2004; Ginja et al., 2021). Risk assessment is often affected by many other aspects than only what is learned (Fishbein & Guinan, 1996). According to social cognitive theory, an individual needs to have self-efficacy, knowledge about risks and benefits, outcome expectations, and goals to change behavior. In addition, the structural and social environment needs to facilitate the wanted behavior (Bandura, 2004). In social cognitive theory, knowledge is described as a precondition for change. However, merely knowing the risks of getting an illness without having the mean to do something about it leads to low motivation to act (Bandura, 2004). The findings in this study may indicate that knowledge about handwashing and risk perception is somewhat low, with only 18% of the respondents getting a score from five and above. Only one respondent of the 251 had all ten items correct. The distribution of the highest score from five and above was 5= (n10), 6= (n20), 7= (n6), 8= (n6), 9= (n2), 10= (n1). The lowest response score was -6, the median for males (Mdn =0) and females(Mdn=2). These findings indicates that WASH related knowledge could improve from baseline, suggesting that the students could benefit from an intervention like SHINE that uses approaches like implementing changes to school curricula. An interesting observation is that the scores from the knowledge items contrasts with the findings in the other variables using Likert type scales. Surveying children can present many challenges, and the development of surveys and suitable scales for children and adolescents is still in need of more recent and specific methodology recommendations (Borgers et al., 2000; Larsson et al., 2018). There is an increasing body of peer reviewed literature on how to conduct and involve children in the research process, many going under the umbrella participatory research (Hart, 1992; Huang et al., 2016; Larsson et al., 2018; Shier, 2001), but few go into details of how to developing surveys targeting different age groups (Larsson et

al., 2018). A study by Christian et al. (2010) about data collection strategies for children and adolescents managed to include children in developing and evaluating questionnaires, putting the children at the center of the research process. While their findings are interesting they do not imply specific methods for future development, targeting children and adolescents in different age groups (Christian et al., 2010).

Another central WASH related challenge is gender inequality in schools, especially affecting young females. WASH challenges disproportionately affect males and females across the globe, especially in areas affected by poverty, for example, affecting school attendance for girls (Khanna & Das, 2016; Ministry of Human Resource Development, n.d.; UN Women, 2018). School girls are mainly affected by the lack of proper sanitation and hygiene facilities (UN Women, 2018). There is a need for more research about gender inequity in WASH, especially in school settings. Furthermore, in light of literature and numerous reports on gender inequity related to WASH (Swedish International Development Cooperation Agency, 2019; UN Women, 2018; Water Aid, n.d), it is interesting to find differences in all variables between males and females except self-reported practices. Girls in India are dropping out of school because of lack of proper WASH facilities, where they often do not have a private place to tend to menstrual hygiene (Department of drinking water & sanitation, 2021). While many schools have separate toilets for girls after national campaigns, many of these toilets are poorly maintained, lacking water or lock on doors, which do not facilitates sustained use (Ministry of Human Resource Development, n.d.). Moreover, when not having a place to wash hands or trash bins near these facilities they are not making hygiene practices easy for school children.

School should be a place where all students have equal access to clean water, sanitation, and hygiene facilities. The schools included in this study had handwashing facilities placed over 50yards from the toilets, and many did not have a door or locks. This may inhibit proper hygiene practices and make it difficult for menstruating girls to dispose of sanitary pads and wash their hands afterwards. Targeting the right groups is an important factor when planning and implementing WASH interventions in the future, also, addressing this gap could contribute to improving gender equality in schools (UN Women, 2018). This could in turn reduce school drop-outs and increasing health and wellbeing for young girls (Ministry of Human Resource Development, n.d.). Moreover, to achieve a sustained adoption of behavioral change there is an need for facilities that are equally sufficient for both genders also referred to as “habit-enabling environments” (Martin et al., 2018). The findings in this

study are in line with other WASH research that emphasizes the need for school-based interventions to raise awareness about WASH and the risks of getting sick if contaminated with fecal-oral pathogens (Ginja et al., 2021). Studies like SHINE incorporates these elements and at the same time uses empowering approaches that equip young people with the tools needed for change, including several aspects of WASH challenges in schools for both males and females.

Limitations

Some of the limitations linked to school-based WASH interventions are the setting or context, type of school (private or public) and possible language barriers. The two schools in this study are private, where many students have a scholarship. This may result in a highly motivated group of students normally performing well in school; thus, their performance and knowledge level may be different from students attending a public school. Findings in this study cannot be generalized to other situations but can provide a description of how these adolescents perceive the importance to wash hands with soap, their risk assessment in relation to getting an illness like diarrhea, handwashing practices, their intention to wash hands and their behavioral control related to handwashing. Nevertheless, the baseline data was collected to compare the effect of the SHINE intervention with follow ups, rather than to make a general description of this population. Another possible limitation of this study may be that the survey was in English. Even though the schools use English actively in teaching and the students are early introduced to English in kindergarten, and at school, it is not their mother tongue. The more complex language gets, the more difficult it gets to interpret the true meaning of some items. However, one of the strengths in planning and designing SHINE was that the survey was piloted in Tamil. Moreover, the research team used a substantial amount of time in the field beforehand to ensure that the schools and teachers could predict if there were any problem in understanding the questions. Also, the researchers were present when the survey was carried out, and the students had the possibility to ask questions at any time.

Conclusion

The survey responses revealed a high rate of students reporting always washing their hands after going to the toilet; the findings do suggest, however, that there was room for

improvement regarding hygienic practices such as washing hands with soap. The two schools did not have access to soap at school, which could explain why many students reported that it was "Very important" to wash hands with soap, but only 70,5% reported doing so.

The knowledge score may suggest that the targeted population could benefit from an intervention like SHINE that combines different methods to achieve behavioral change to improve and maintain good health for adolescents. Although it is not possible to draw any further conclusions from these results to other populations, it may be interesting to compare to follow-ups.

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1430 ÅS

Our date: 06.07.2017

Our ref.: 53162/5/STM/LR

Your date:

Your ref.:

CONFIRMATION

With reference to assessment from NESH, received 03.07.2017 for the project:

53162

Project SHINE (Sanitation and Hygiene INnovation in Education) a school and community-based project to improve water, sanitation and hygiene in Sri Puram/rural India

As explained in the receipt of notification, issued 12.06.2017, phase 2 of the project was not included as this part was awaiting an ethical assessment from NESH. This confirmation is a receipt of notification for part two of the project.

Background

The research project is a collaboration involving The Norwegian University of Life Sciences, University of Calgary, Sri Narayani Hospital and Research Centre and Sri Narayani College & School of Nursing. The Norwegian University of Life Sciences is the responsible data controller. The Data Protection Official for Research presupposes that the responsibility for processing personal data has been formally clarified between the institutions. We recommend that the division of responsibilities is formalized in a contract that includes structure of liabilities, who initiated the project, use of data and ownership.

Transfer of personal data to third countries that do not have an adequate level of protection may take place without prior approval from the Data Protection Authority, provided that the recipient of the information is a data processor and the basis for the transfer is the EU's standard contract. The data controller shall notify the Data Protection Authority of the transfer by submitting a completed and signed standard contract. The transfer may take place once the notification has been submitted:
<https://www.datatilsynet.no/English/Regulations/Personal-Data-Regulations/Transfer-of-personal-data-to-other-countries/>

The project group

Shere Lee Bastien, project leader, NMBU
Anise Gold-Watts, NMBU
Jennifer Hatfield, University of Calgary
Balaji Nandagopal, Sri Narayani Hospital and Research Centre
Lalitha Purushothaman and Sujatha Vijayakumar, Sri Narayani College & School of Nursing

Purpose

«Project SHINE (Sanitation and Hygiene INnovation in Education) is a pilot study designed to improve water, sanitation, and hygiene (WASH) through the application of participatory science and social entrepreneurship in schools and communities. The study will examine the following (1) What are the student's and community's perceived facilitators and barriers to WASH-associated behaviors? (2) How can the co-learning and empowerment process generate health promotion strategies? (3) Are students who participate in SHINE more likely to improve their WASH-associated knowledge, attitudes, and practices and as a result, less likely to self-report diarrhea incidence than students who did not participate in Project SHINE?»

The data material

Phase 2 involves the following data gathering activities:

SHINE intervention implementation: September 2017 -February 2018

Semi-structured qualitative interviews and focus group discussions with teachers: September 2017

Teacher diaries: September-February 2018

Teacher Think Tanks: September 2017

Student questionnaires: September 2017, February (2018), and August (2018)

The school-based intervention focuses on knowledge sharing and mutual learning that encourages youth to develop culturally relevant tools and strategies to improve health, self-esteem, self-efficacy, social cohesion and connectedness. The study design of the intervention will be a three group, non-equivalent control group study with a design that includes a pretest-posttest with one follow-up.

The questionnaire will be administered to student participants in the study. It will include questions about water, sanitation and hygiene-associated knowledge, attitudes, and practices, intention to perform tasks, and environmental determinants that assess student's ability to perform a specific behavior. The questionnaire will also include other prompts with the purpose of collecting demographic information such as questions about religion, caste, socioeconomic status, age, gender, and school.

There will be registered sensitive information relating to racial or ethnic origin, or political opinions, philosophical or religious beliefs and health.

The researchers have decided to withdraw the School Observation Tool and Handwashing Form. They will be observing the school facilities and infrastructure, but not the latrine area directly, as was originally planned.

Teacher diaries will help the research team to assess implementation fidelity of the intervention and identify obstacles in implementation, and gaps in resources. In-depth semi-structured qualitative interviews and focus group discussions will be used to assess fidelity in the process evaluation, develop the knowledge base for understanding community norms and practices associated with WASH, identify obstacles in implementation, and assist in evaluating change in health promotion leadership capacity and self-efficacy among students. Teacher think tanks will be used to help incorporate teacher feedback into the intervention design and implementation.

Sample and recruitment

There will be 4 schools recruited by the research team at NMBU to participate in the study and students and teachers will be purposively sampled by the school principal. Schools will be selected based on location, cooperation, and indicated interest. Project SHINE is meant to be incorporated into the existing science/health curriculum and is an adaptation of an intervention that was implemented with secondary school students in Tanzania.

Students (n=360) must attend one of four schools in the Vellore District; be in grades 7, 8, or 9; must assent to participate and obtain active parental consent. Teachers (n≈10) must teach at one of the four schools pre-selected to participate in SHINE.

The schools will assist with recruiting students. We presuppose that the school forward information about the project to the parents so that the duty of confidentiality is upheld. The Data Protection Official presupposes that the recruitment process is done in a way that fulfils the requirement of voluntarily participation and confidentiality.

Information and consent

The sample will receive written information about the project, and give their consent to participate. The researchers will obtain parental consent for children under the age of 15, cf. email received 02.05.2017. Information must be provided in a language that the participants fully understand. If information is given orally, we recommend that participants give oral consent. NESH has assessed the project and find that the approach is ethically justifiable and in accordance with good research practice, presupposed that the project follows a procedure for obtaining active consents. The information letter received 24.05.2017 is well formulated.

Please note that when children actively participate in research, participation is always voluntary, even though parents have given their consent. Children should be given information adapted to their age, and it must be made sure that they understand that their participation is voluntary and that they can withdraw at any time.

Information security

The Data Protection Official presupposes that the researchers follow internal routines of The Norwegian University of Life Sciences regarding data security. If personal data is to be stored on portable storage devices, the information should be adequately encrypted.

End of project

Estimated end date of the project is 01.08.2021. According to the notification form all data collected for research purposes will be made anonymous by this date. Making the data anonymous entails processing it in such a way that no individuals can be recognised. This is done by:

- deleting all direct personal data (such as names/lists of reference numbers)
- deleting/rewriting indirectly identifiable data (i.e. an identifying combination of background variables, such as residence/work place, age and gender)
- deleting digital audio/video files and photographs

Use of the data material for further research studies will require a new notification to the Data Protection Official.

Other approvals/licenses

The Data Protection Official presupposes that research is conducted in line with laws, regulations and guidelines in India. We also presuppose that the project is carried out in accordance with the ethical approval from the Indian Institutional Review Board and the ethical evaluation from NESH (ref. nr. 2017/169).

Please do not hesitate to contact us if you have questions.

Yours sincerely,



Katrine Utaaker Segadal



Siri Tenden Myklebust



INFORMATION SHEET YOUTH 12-16 (- 18) YEARS:

Project SHINE (Sanitation and Hygiene INnovation in Education: a school project to improve water, sanitation and hygiene

BACKGROUND AND PURPOSE

Your school is one of the schools participating in a research study about sanitation and hygiene, diarrheal disease, and different ways of preventing it. Permission to conduct the study has been granted by the Institutional Review Board in India and the school head master. You are invited to take part the research project, which help to ensure that the program we design will meet the needs of young people and communities in the Vellore Area.

Poor sanitation and hygiene practices may result in transmission of diarrheal diseases, which are one of the leading causes of death in children under five. In India, more than 334,000 children die from diarrheal attributable diseases each year making this a public health issue of great importance. This project is designed to empower youth and communities in Tamil Nadu to develop and sustain health promotion strategies to prevent these diseases.

ABOUT THE STUDY

If your parents have consented to your participation in the study, and if you decide to take part you may either:

- Participate in the project lessons and activities as part of your school curriculum over the course of six months with two follow-ups.
- OR
- Continue your school curriculum as usual with four visits by researchers to ask you questions about your sanitation and hygiene knowledge, attitudes, and practices.

We will ask you to complete a questionnaire at four different times about your knowledge, attitudes, and practices related to sanitation, hygiene and diarrheal diseases. Research staff will be in the classroom when you answer the questionnaire and can answer any questions you may have. We may also ask you to participate in an audio-recorded individual interview or group discussions to develop an understanding of your knowledge, beliefs and behaviors related to sanitation, hygiene and diarrheal diseases. We may also observe you at school and during school lessons and take photographs and videos as part of the study for the purposes of demonstrating project activities and engagement. These photographs may be used in future project publications, and other project documents such as posters and brochures, in both print and electronic media.

POSSIBLE BENEFITS AND DISADVANTAGES

You will benefit by increasing your knowledge and participating in a fun educational activity that teaches you about health and social entrepreneurship.

If any of the questions make you feel uncomfortable, research staff will be available to either discuss with you or if you wish, refer you to someone else such as a teacher or health care worker.

WHAT WILL HAPPEN TO THE INFORMATION ABOUT YOU?

- You will not be able to put your name on the questionnaire. Only researchers will be able to track your answers through a secret unique number. This number will be password protected so, only the research team will have access therefore **NO ONE** other than the research staff may see the answers that you give on the questionnaire.
- Parents, teachers, and other school staff will **NOT** know how you answered questions on the questionnaires.
- Only trained research staff will have access to the audiotapes and transcripts of the discussions.
- Parents, teachers, and other school staff will **NOT** know how you answered these questions.
- No information will be given to anyone about any individual student's involvement with any activities. We will use the results of the study to improve the project so that it meets the needs of young people.

PARTICIPATION

Taking part in this study is completely voluntary. If you choose not to participate in the study, there will be no negative consequences. You do not have to answer any questions that you do not want to. You can also withdraw from the project at anytime without providing a reason. If you have any questions about this issue contact, Dr. Sheri Bastien at +47 67 23 00 00 or sheri.lee.bastien@nmbu.no.

THANK YOU!

Attachment 3
Knowledge items

Variable	Description	Scale	Items	Excluded*	
Knowledge	Nineteen items developed to capture the respondent's sanitation and hygiene knowledge	Asking the respondent to check a box for each statement: True/false/not sure	1.	You may get sick from using an unclean toilet	
			2.	Getting a worm infection is a matter of bad luck	
			3.	Washing your hands with soap can help prevent you from getting diarrhea	
			4.	I know what water treatment is	Item Nr 4 excluded
			5.	There is nothing I can do to prevent myself from getting diarrhea	
			6.	If my friends do not wash their hands before eating, I will not either	Item Nr 6 excluded
			7.	I feel like there are many people I can talk to about sanitation and hygiene related challenges	Item Nr 7 excluded
			8.	It is important to wash your hands before eating even if they look clean	
			9.	Washing hands only with water after using the bathroom will protect from diseases	Item nr 9 excluded
			10.	It is ok to drink from the same cup as my friends	Item nr 10 excluded
			11.	If my friends do not use a toilet, I will not either.	Item nr 11
			12.	If someone washes their hands without soap it can lead to serious diseases	Item nr 12 excluded
			13.	Getting a worm infection does not cause serious harm to your health	
			14.	Using an unclean toilet/latrine can lead to diseases	
			15.	It is not dangerous for my health to play near garbage/trash and wastewater	Item Nr 15
			16.	If my hands look clean there is no point in washing them	
			17.	I feel like there are many people I can talk to about sanitation and hygiene related challenges	Item Nr.17 excluded
			18.	Washing hands with only water is enough to protect myself from diseases	
			19.	If I had a worm infection, I would find this very serious	

Note* Total nine items excluded



Project SHINE (Sanitation Hygiene INnovation in Education)
STUDENT QUESTIONNAIRE

INTRODUCTION

Please help us by completing this questionnaire and by answering ALL questions. The following questions will ask about what you know about water, sanitation, and hygiene and your habits, health, and household.

This is not a test. We want to learn about what students your age know about water, sanitation, and hygiene, and how/what students learn about science in school. We are trying to find out better ways of improving sanitation and hygiene and preventing the spread of diseases among young people and communities in the Vellore district. Your responses are very important to us and will hopefully help develop effective programs to keep young people in Tamil Nadu healthy.

The answers you give us on this questionnaire will be kept private. Your teachers, neighbors, family and other students will not see your answers. No one will ever know what you say unless you tell them. Your name will never be used.

Please be as honest as you can in your answers.

It is important for us to know what you really think in order to develop the best programmes.

Remember, that it is ***voluntary for you to participate in this study***. This means that you can decide to participate or not. You can withdraw from the study at any time.

If you have any questions or are unsure about a question please raise your hand and ask the project staff present in the classroom.

Please do not write your name on this questionnaire. You will receive a identification number to write down.

Please write the identification number here:

Identification Number _____

THANK YOU VERY MUCH FOR YOUR PARTICIPATION!

Directions: Color in the circle of the answer you want to give.

Example:



Please take your time and answer carefully.

ALL ABOUT YOU

The first three questions ask for some background information about you.

1. How old are you?

(Please fill in your age in number years in the box)

2. Are you a girl or a boy?



Girl



Boy

3. What grade are you in?

6

7

8

ALL ABOUT YOUR HOME

The next eight questions are about where you live.

1. What is the main source of drinking water for members of your household?

(Choose ALL answers that apply)



Tap or piped
water



Rainwater



Lake or pond



Water truck



Water vendor



Dug well



Tube well or
borehole

2. How does your household throw away the household waste (trash or garbage)?
(Choose ALL answers that apply)

- On the ground or around the house
- In the bush
- Waste pit
- Other (Please specify)

3. What kind of toilet do members of your household usually use?
(Choose ALL answers that apply)

- Flush or pour toilet
- Pit latrine
- Composting toilet
- Bucket toilet
- No facility/bush/field
- Other (Please specify)

4. Do you share this toilet with other households?

Yes

No

5. How many households use this toilet?
(You can choose one answer)

1

2-3

4-5

Over 5

6. Do you have a place for hand washing in your home (tap, basin, etc.)?

Yes

No

7. Do you have soap/ash in your home for hand washing?

Yes

No

8. Do you have soap/ash in your home for bathing?

Yes

No

THINKING ABOUT YOUR DAILY HABITS

The next seven questions will ask you about your personal habits.

1. During the past 30 days, how often did you...

(Please choose ONLY one answer for each of the following questions)

	Everyday	Every week, but not everyday	Not often	Not at all
Walk outside without shoes on?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eat fruit or vegetables without washing them first?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Go to the toilet/latrine without washing your hands after?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eat food without washing your hands first?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Defecate outside and not use a latrine when one was available?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Eat meat that was not cooked all the way through?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. What do you plan to do?

(Please choose ONLY one answer for each of the following questions)

	Very likely	Somewhat likely	Not sure	Somewhat unlikely	Very unlikely
If soap/ash is available, how likely is it that you will wash your hands the next time you use the toilet/latrine?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If soap/ash is available, how likely is that you will wash your hands before the next time you eat?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If a clean toilet/latrine is available, how likely is it that you will use a latrine/toilet instead of defecating in the open?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

3. How important is it to do the following?

(Please choose ONLY one answer for each of the following questions)

	Very important	Important	Not sure	Slightly important	Not at all important
Washing hands with water and soap/ash before eating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Washing hands with water and soap/ash after eating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Washing hands with water and soap/ash after using toilet/latrine	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Washing hands with water and soap/ash after caring for animals	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Treating water before washing/bathing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Very important	Important	Not sure	Slightly important	Not at all important
Treating water before drinking	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4. What do you think about these statements?

(Please choose ONLY one answer for each of the following questions)

	Very difficult	Difficult	Not sure	Easy	Very easy
How difficult is it to wash your hands with soap/ash and water before eating?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
How difficult is it to wash your hands with soap/ash and water after using the toilet/latrine?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

5. The last time you defecated, did you use a latrine?

Yes No

6. The last time you defecated at home, did you use a latrine?

Yes No

7. What is your main source of information about water, sanitation, and hygiene?

(Please choose ONLY one answer)

- | | |
|---|---|
| <input type="radio"/> Mother/female guardian | <input type="radio"/> Medical doctor/health care professional |
| <input type="radio"/> Father/male guardian | <input type="radio"/> Newspapers/magazines |
| <input type="radio"/> Sibling (brother or sister) | <input type="radio"/> Pamphlets/fliers/billboards |
| <input type="radio"/> Other family member (aunt, uncle or grandparents) | <input type="radio"/> Radio/TV |
| <input type="radio"/> Friend/young person of same age | <input type="radio"/> Internet/social media |

Religious leader

Other (Please specify)

Teacher

ALL ABOUT HEALTH

The next two questions will ask you about your personal health practices.

1. Please complete the following sentence.

During the past 30 days, how often did you...

(Please choose ONLY one answer for each of the following statements)

	Never	Sometimes	About half the time	Most of the time	Always
Use soap/ash when washing your hands?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wash your hands before eating?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wash your hands after using the toilet or latrine?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wash your hands after touching animals?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wash your hands after coughing or sneezing?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wash your hands after playing outdoors?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wash your hands after eating?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wash your hands before preparing food?	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2. In the last 30 days, how often do you discuss the following topics with your parents/guardians/friends?








(Please choose ONLY one answer for each of the following statements)

	Never	Sometimes	About half the time	Most of the time	Always
Washing hands after playing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bathing	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Clipping and cleaning fingernails	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cleaning teeth	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Washing hands with soap/ash after urinating and defecating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Preventing flies from coming near food	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Contaminated water	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Washing fruits and vegetables	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Building/improving sanitary toilets/latrines	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Improving water storage and treatment	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
What you learn at school	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

The next six questions will ask you about your personal health.

The picture below is a way to describe the shapes and types of poo or what doctors call stools.

*webmd.com

Type 1		Separate hard lumps, like nuts (hard to pass)
Type 2		Sausage-shaped but lumpy
Type 3		Like a sausage but cracks on its surface
Type 4		Like a sausage or snake, smooth and soft
Type 5		Soft blobs with clear-cut edges (passed easily)
Type 6		Fluffy pieces with ragged edges, a mushy stool
Type 7		Watery, no solid pieces, entirely liquid

1. Which type of poo is diarrhea? (You can select one or more answers)

- Type 1
- Type 2
- Type 3
- Type 4
- Type 5
- Type 6
- Type 7

2. In the last week, on which days did your poo look like **Type 7**?

(Please choose ALL days that apply)

Monday

Tuesday

Wednesday

Thursday

Friday

Saturday

Sunday

3. On the day(s) when your poo looked like **Type 7**, did it ever look that way 3 or more times in the same day?

Yes

No

4. In the last 30 days, how many days were you absent from school because of illness?
(Please choose ONLY one answer)

- 1-2
- 3-4
- 5-6
- Over 7

5. During any of those days away from school, did your stools (poo) look like **Type 7**?
(Please choose ONLY one answer)

Yes

No

6. How many days?

- 1-2
- 3-4
- 5-6
- Over 7

SCHOOL AND EDUCATION

The next two questions are about your experience at school.

1. Last year, how well did you do in school compared to the others in your class?
(Please choose the best answer that fits)

- I scored among the very best in my class
- I scored better than average
- I scored about average
- I scored below average
- I scored among the worst in my class

2. Have you ever repeated a school year due to failing exams?

Yes

No

The next three questions are about what you have been taught in class during this school year.

1. Please read each statement carefully. If the statement is true then choose true, if the statement is false, then choose false. If you are not sure if the statement is true or false, please choose not sure.

(Please choose ONLY one answer for each of the following statements)



True



False



Not sure

During the school year,
my teacher taught me
about the importance
of hand washing

During the school year,
my teacher taught me
about how to avoid
diarrhea

During the school year
my teacher taught me
about where to get
treatment for diarrhea

2. Here is a list of statements about health education and promotion.

Please read each statement carefully. How much do you agree with the following statements? If you agree with a statement then choose agree, if you disagree with a statement, then choose disagree. If you are not sure if you agree or disagree with the statement, please choose 'neither agree nor disagree'.

(Please choose ONLY one circle for each of the following statements)



Teachers at my school encourage students to join in health education classes and activities

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

At my school there are after school and extracurricular activities which include sanitation and hygiene education

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

In health education classes at my school, students feel free to ask questions

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

I think health education classes for young people my age are very important

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

Young people my age are involved in planning local health education and promotion programs

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------

In my neighborhood, young people my age participate in health promotion activities

<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
-----------------------	-----------------------	-----------------------	-----------------------	-----------------------



In my neighborhood, young people my age are involved in setting priorities concerning youth

In my neighborhood, people work together to solve problems

In my neighborhood, people enjoy discussing different ways to solve problems

There are groups or organizations I can join to help people in my neighborhood

3. Here is a list of statements about science.

Please read each statement carefully. How much do you agree with the following statements? If you agree with a statement then choose agree, if you disagree with a statement, then choose disagree. If you are not sure if you agree or disagree with the statement, please choose 'neither agree nor disagree'.

(Please choose ONLY one answer for each of the following statements)



I think that learning science is important because I can use it in my daily life



Agree



Slightly agree



Neither agree
nor disagree



Slightly
disagree



Disagree

In science, I think that it is important to learn to solve problems

I think that science is boring

I enjoy learning about science

The science I learn relates to my life

Getting a good science grade is important to me

I think that learning about science can help me get a good job in the future

I think about how the science I learn will be helpful to me

I like science that challenges me

I do not think the science I learn about in school is helpful in my everyday life

I get frustrated because I find science too difficult to learn

The next three questions are about sanitation and hygiene knowledge.




1. List 3 things that you know about sanitation and hygiene.

1.	<input type="text"/>
2.	<input type="text"/>
3	<input type="text"/>

2. Here is a list of statements about sanitation and hygiene.

Read each statement then think about which statements are true and which ones are false. If you think that the statement is correct, then choose true. If you think that the statement is not correct, then choose false. If you are not sure if the statement is true or if it is false, please choose not sure.

(Please choose ONLY one answer for each of the following statements)

	 True	 False	 Not sure
You may get sick from using an unclean toilet	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Getting a worm infection is a matter of bad luck	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Washing your hands with soap can help prevent you from getting diarrhea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I know what water treatment is	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
There is nothing I can do to prevent myself from getting diarrhea	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If my friends do not wash their hands before eating, I will not either	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>



True



False



Not sure

I feel like there are many people I can talk to about sanitation and hygiene related challenges

It is important to wash your hands before eating even if they look clean

Washing hands only with water after using the bathroom will protect from diseases

It is okay to drink from the same cup as my friends

If my friends do not use a toilet, I will not either

3. Here is a list of statements about sanitation and hygiene.

Read each statement carefully, then think about which statements are true and which ones are false.

If you think that the statement is correct, then choose true. If you think that the statement is not correct, then choose false. If you are not sure if the statement is true or if it is false, please choose not sure.

(Please choose ONLY one answer for each of the following statements)



True



False



Not sure

If someone washes their hands without soap it can lead to serious diseases



True



False



Not sure

Getting a worm infection does not cause serious harm to your health

Using an unclean toilet/latrine can lead to diseases

It is not dangerous for my health to play near garbage/trash and waste water

If my hands look clean, then there is no point in washing them

I feel like there are many people I can talk to about sanitation and hygiene related challenges

Washing hands with only water is enough to protect myself from diseases

If I had a worm infection I would find this very serious

ALL ABOUT YOUR FAMILY

The next eight questions are about your life at home.

1. Does your family own animals?

Yes

No

2. If **YES**, which kind of animals does your family own?

(Choose ALL answers that apply)



Cattle



Dog



Cat



Goat



Pig



Other:



3. Who looks after you at home?

(Please choose the best answer that describes the person who takes care of you the most)

- Mother/female guardian
- Father/male guardian
- Relative (aunt, uncle, cousin)
- Grandmother
- Grandfather
- Siblings (brother or sister)
- Friend
- Someone else (not a family member)

4. Can your main caretaker read and write?

My main caretaker can read



My main caretaker cannot read



5. What is the highest education level your main guardian completed at school?

(You can choose one answer)

- No formal education
- Some primary school
- Primary school
- Secondary school
- College or university

6. Do you have another guardian at home?

Yes

No

7. Mark the answer describing the other individual who also helps take care of you at home
(Please choose the best answer that fits)

- Mother/female guardian
- Father/male guardian
- Relative (aunt, uncle, cousin)
- Grandmother
- Grandfather
- Siblings (brother or sister)
- Friend
- Someone else (not a family member)

8. What is the highest education level your other guardian completed at school?
(You can choose one answer)

- No formal education
- Some primary school
- Primary school
- Secondary school
- College or university

The next seven questions will be about the people in your household who are responsible for providing for the family.

1. Did any adults in your household work during the last year?

Yes

No

2. How many?

(Please fill in the number of adults in your household that worked in the last year in the box below)

3. How much did the main head of household work for money during the last year?

(Please choose the best answer that fits)

- They worked six months or more for money
- They worked 3-5 months for money
- They worked less than 3 months for money
- They did not work at all for money

4. How many households use this toilet?

(You can choose one answer)

1

2-3

4-5

Over 5

5. Do you have a place for hand washing in your home (tap, basin, etc)?

Yes

No

6. Do you have soap/ash in your home for hand washing?

Yes

No

7. Do you have soap/ash in your home for bathing?

Yes

No

GIVE US SOME FEEDBACK

The last three questions are about your experience with this questionnaire

1. How difficult was it for you to fill in this questionnaire?

(You can choose one answer)

Very easy

Somewhat easy

Neither easy nor
difficult

Somewhat difficult

Very difficult

2. What is the language you speak at home?

3. Any other comments:

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