

**EFFECTIVENESS OF HAND WASHING INTERVENTION
ON HEALTH OUTCOMES OF MIDDLE SCHOOL
CHILDREN IN A DISTRICT OF TAMIL NADU - 2018**

DISSERTATION

Submitted to

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M.D. COMMUNITY MEDICINE

(BRANCH – XV)



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ABBREVIATIONS & SYMBOLS

AD	Anno Domini
AGE	Acute Gastro Enteritis
ANM	Auxiliary Nurse Midwife
ARI	Acute Respiratory Infection
BC	Before Christ
CI	Confidence Interval
IEC	Information, Education & Communication
IRR	Incidence Rate Ratio
MDG	Millennium Development Goal
NHFS	National Health Family Survey
PP	Percentage Points
RR	Relative Risk
SD	Standard Deviation
SDG	Sustainable Development Goal
SPSS	Statistical Product and Service Solutions
UNICEF	United Nations Children's Fund
WASH	Water, Sanitation and Hygiene
WHO	World Health Organization

SYMBOLS

χ^2	Chi Square
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Introduction

1. INTRODUCTION

“A heart to resolve, a head to contrive and a hand to execute.”

-Edward Gibbon

Hands are those very useful things at the end of your arms. Our hands help us to do so many things like writing, carrying, holding, communication, daily activities and playing games, much more, which makes our hands special to us. As hands are so important to us, we need to look after them, by protecting our hands and keep them clean. *“Hands are for loving, sharing, working and caring. Reach out your hand and make a friend.”*¹

1.1 HAND WASHING:

“Our Hands, Our Future”

Hand washing protects our own health, but also allows us to build our own future, as well as those of our communities and world. Thinking of future, we strive for continued health, wellbeing and productivity for ourselves, our families and our communities.

Hand hygiene is defined as any method that removes or destroys microorganisms on hands. The most important measure for preventing the spread of pathogens is effective hand washing.¹ Hand washing has been acknowledged globally. Countries all over the world, including Water, Sanitation and Hygiene (WASH) programme by United Nations Children’s Fund (UNICEF) accepted it as a low cost & effective technique in preventing communicable diseases.^{1,2}

Hygiene has long established links with public health, but was not included in any Millennium Development Goal (MDG) targets or indicators.² The explicit reference to hygiene in the text of Sustainable Development Goal (SDG) target 6.2 represents increasing recognition of the importance of hygiene and hand washing and its close links with sanitation.² Of the range of hygiene behaviors considered important for health, hand washing with soap is a top priority in all settings. In 2017, India had 60% proportion of population using basic hand washing facilities at home ².

Despite the importance of hand washing with soap, nearly 900 million children (47%) lacked a basic hygiene service at their school in 2016.² Almost 650 million children (36%) had no hygiene service at their school.² In India 2016, 69% of schools had basic water services, 73% of schools had basic sanitation services and only 54% of schools had basic hygiene services in India ².

Infectious diseases are still the most common and deadly group of diseases for developing world. Clean hands are the single most important factor in preventing the spread of pathogens and reduce the incidence of infections ³.

Most of the school students do not wash their hands before eating and after toilet practice, because they don't know the importance of hand washing. Hand washing helps stop the spread of germs and illnesses.⁴ School students spread germs by touching their eyes and mouth. They can also spread germs by shaking another person's hand, sharing toys and other articles.⁴

Generally school students are receptive to learn new behaviors, when it is taught by their teachers, parents or elders.⁵ When the practice of hand washing is inculcated in their mind they adhere it strictly and develops it as their own behavior⁵. Encouraging children from an early age to wash their hands will help to ensure that this practice becomes a lifelong habit⁶.

School children need to understand why it is important to wash their hands. To do this they need help from their parents, caregivers, and teachers or from a member of staff at their schools. Hand washing is a scientifically proven effective method to protect the school children from the infectious diseases, because frequent hand washing keeps germs away. Teaching proper techniques of hand washing to children will not only help to influence their hand washing practices at home but also at school.^{5,6} The school is a promising venue for hand washing promotion activities and lay foundations for behavior change in long term. The significance of proper hand washing is a very crucial step towards living a healthy life.⁵

As hands are an important mode of transmission of infectious disease and communicable diseases among school-aged children, hand hygiene is critical in reducing illness-related absences and reduce the transmission of respiratory tract infections and gastro intestinal infections.¹ Problem due to improper hand washing among school children are easily preventable through health education. Most of the school children are unaware of the health problems and their impact regarding improper hand washing. For improvement of knowledge and practice of hand washing, health education intervention will be very much useful.

Justification

2. JUSTIFICATION

- Most of the studies which have been done on hand washing have targeted only primary school children.^{4,5} Very limited studies were done among middle school students. Targeting this age group which is the early adolescent stage is important as they try to take informed decision which eventually can bring out a change in behavior.
- Most of the studies on hand washing have been conducted to study the knowledge and practice of hand washing.^{1,4,5} Very few interventional studies have been conducted in India. Most of them had single point intervention and outcome also assessed at a single point of time. However, for any change in behavior, intervention through different channels and at multiple times are required. Hence, outcome also has to be assessed at multiple times.
- So, this study was undertaken to improve effectiveness of hand washing and health outcomes among middle school students through health education intervention at multiple times.

Aims & Objectives

3. AIMS AND OBJECTIVES

The objectives of the study are:

- To assess the effect of health education on knowledge and practice of hand washing.
- To assess the effect of hand washing intervention on health outcomes among study participants.

Review of Literature

4. REVIEW OF LITERATURE

4.1. INTRODUCTION

"Hand washing, when done correctly, is the single most effective way to prevent the spread of communicable diseases. Good hand washing technique is easy to learn and can significantly reduce the spread of infectious diseases in both children and adults"^{1,5}

4.2. HISTORY OF HAND WASHING

Hand washing has been a common practice since the Roman times, yet throughout history, its benefits for the control of infection have been, and remain, frequently overlooked. It was not until 1847 that hand washing was proven to be effective in preventing infection by Dr. Ignaz Semmelweis, a Hungarian doctor working in Vienna General Hospital, who is known as the father of hand hygiene⁷.

In 1846, he noticed that the puerperal fever and sepsis in the maternity ward caused maternal deaths. He found that improper hand washing could be the reason. Then he ordered mandating hand washing with chlorine for doctors. The rates of death in his maternity ward fell dramatically. This was the first proof that cleansing hands could prevent infection⁷.

A few years later in Italy, the Crimean War brought about a new hand washing champion, Florence Nightingale. At a time when most people believed that infections were caused by foul odors called miasmas, Florence Nightingale implemented hand washing and other hygiene practices in the war hospital and achieved a reduction in infections.⁸

In the 1980s, the Centers for Disease Control and Prevention identified hand hygiene as an important way to prevent the spread of infection.⁸ The outbreak of swine flu in 2009 led to increased awareness in many countries of the importance of washing hands with soap to protect oneself from such infectious diseases.⁸

4.3. Why Hand washing is important?

"Hand washing with warm water and soap can greatly reduce the chances of spreading or getting germs. The mechanical action of scrubbing loosens up the dirt and microbes on our hands and the soap picks them up and binds to them so that the water can wash them away".⁹

Some microorganisms are not found consistently on the skin of most persons and are considered to be "transient flora" or "non-colonizing flora."⁹ Such flora can be readily transmitted by the hands unless removed by mechanical friction and soap and water washing or destroyed by the application of an antiseptic hand rub. An example of a microorganism that is considered non-colonizing flora is the gram-negative bacteria, *Escherichia coli*.⁹

In addition to transient flora being on hands, there is also "resident flora" also called, "colonizing flora." These microorganisms are considered permanent residents of the skin on most people and are not readily removed by mechanical friction. General hand washing with plain soap and water removes the transient flora but does not remove or kill most of the resident flora on hands.⁹⁻¹¹

4.4. History and Cleaning Effects of Soap

Soap or other cleaning substances have been around for a long time. Archeological findings during the excavation of ancient Babylon revealed a soap-like material in clay cylinders. Inscriptions on the cylinders indicate that fats were boiled with ashes, which is a method of making soap.¹² Likewise, medical documents from about 1500 B.C. say that Egyptians combined animal and vegetable oils with alkaline salts to form a soap-like material used for treating skin diseases, as well as for washing.¹²

Soap got its name, according to an ancient Roman legend, from Mount Sapo. ¹²Animals were sacrificed on this mountain and rain would wash the mixture of melted animal fat and wood ashes down into the clay soil along the Tiber River. Women found that this clay mixture made their wash cleaner with much less effort.¹²

The famous Roman baths were built about 312 B.C. By the second century A.D., the Greek physician, Galen, recommended soap for both medicinal and

cleansing purposes. After the fall of Rome in 467 A.D., declining bathing habits affected public health. The great plagues of the Middle Ages and the Black Death of the 14th century can be attributed heavily to a lack of personal cleanliness. It wasn't until the 17th century that cleanliness and bathing started to come back into fashion in much of Europe.¹²

Soap works by reducing surface tension so that water can spread and wet surfaces. Soap, working as a surfactant, loosens and holds soil in suspension until it can be rinsed away.¹² Soaps are water-soluble or potassium salts of fatty acids. Soaps are made from fats and oils, or their fatty acids, by treating them chemically with a strong alkali.¹² There are many different brands of soap on the market today in solid bar soaps, gels, liquid soaps, and heavy-duty hand cleaners. These products get their cleaning action from soap, other surfactants or a combination of the two. The choice of cleaning agent helps determine the product's lathering characteristics, feel on the skin and rinsability.¹²

Liquid soaps are formulated for cleaning the hands or body and feature skin conditioners. Some contain antimicrobial agents that kill or inhibit bacteria that can cause odor or disease. Heavy duty hand cleaners are available as bars, liquids, powders, and pastes. These cleaners are formulated for removing stubborn, greasy dirt and may include an abrasive.¹²

4.5. Religious Aspects of Hand washing

Hand washing is not only a hygiene behavior and a means of reducing the transmission and infection of communicable diseases but also a very important

religious act of faith and custom, as it is evident from the various following religions.¹³

Symbolic hand washing, using water but no soap to wash hands is a part of ritual hand washing featured in many religions, including tevilah and netilat yadayim in Judaism, Hinduism, and. Similar to these are the practices of Lavabo in Christianity, Wudu in Islam.¹³

4.6. Global Hand washing Day in India

Indian cricket legend Sachin Tendulkar and his teammates joined an estimated 100 million schoolchildren around the country in lathering up for better health and hygiene as part of the first Global Hand washing Day in October 2008. ‘I wanted to be a part of this campaign because washing hands with soap can keep children safe and healthy and protect them against the deadly disease’, the cricket star said.¹⁴ The campaign is led by the Department of Drinking Water Supply of the Ministry of Rural Development, and the Department of School Education and Literacy of the Ministry of Human Resource Development.

More than 1,600 children die every day in India from diarrhea.¹⁴ But the simple, cost-effective solution of washing hands with soap after defecation and before meals could greatly reduce that number. Proper hand washing with soap can reduce diarrheal cases by almost half and acute respiratory illnesses by 30 percent.^{12,14}

According to the UNICEF, only 53 percent of people in India wash hands after defecation, 38 percent wash hands before eating and only 30 percent wash hands before preparing food.¹⁴ Many people also believe that water alone is sufficient to remove visible dirt from hands. As part of Global Hand washing Day, a five-step hand washing technique, developed in Tamil Nadu state, is being taught to schoolchildren around the country that hands that look clean cannot make them sick.¹⁴

4.7. When to perform

According to World Health Organization (WHO), hand washing has to be performed in different occasions as follows:¹⁵

- **Before, during and after** preparing food
- **Before** eating
- **After** using the toilet
- **After** touching garbage
- **After** touching frequently touched surfaces
- **After** touching an animal, animal feed or animal waste
- **After blowing your nose, coughing.**

4.8. Hand Washing Practices

Hand washing with soap under running water is a very effective medium of reducing the mode of transmission of pathogens into the human system. Often than not, school children may not frequently wash their hands before eating, after

playing, after visiting the lavatory and after touching the surface of substances which can be a medium of disease transmission.¹⁵

Hand washing with soap under running water is a cost-effective approach that can be adopted by individuals and institutions including schools, aimed at reducing infection to the barest minimum. Also, a form of thorough hand washing with soap under running water is highly possible to reduce the risk of certain communicable diseases.¹⁵



Figure 1: Steps of hand washing¹⁵

Source: WHO | Clean hands protect against infection. Who.int. 2019

4.9. Effective Hand Washing

The 2001 U.S. Food and Drug Administration Food Code describes hand washing as:¹⁶

1. Vigorous friction on the surfaces of the lathered fingers, fingertips, areas between the fingers, hands, and arms for at least 10 to 15 seconds, followed by
2. Thorough rinsing under clean, running warm water
3. Immediately following the cleaning procedure with thorough drying of cleaned hands and arms using individual disposable towels, a continuous towel system that supplies the user with a clean towel, or a heated air drying device.

4.10. Drying Hands

Drying hands properly after washing is important for several reasons:¹⁷

- (a) Proper drying helps prevent hands from chapping,
- (b) Recontamination is reduced because damp hands can pick up more bacteria and viruses than dry hands, and
- (c) The drying process further removes bacteria and viruses.

Few studies have been done concerning the effectiveness of different drying agents to further reduce bacterial and viral loads. One study conducted in Canada, compared unbleached paper roll towels with cloth towels and no-touch electric air dryers.¹⁷

Hands of 4 groups of subjects were washed in water alone, rinsed with ethanol and allowed to air dry. The fingers were then inoculated with an *E. coli* and rotavirus suspension and allowed to dry for 20 minutes. One of 4 hand washing agents was then applied to the finger pads for 10 seconds. The 4 hand washing agents used were (a) isopropanol (70% volume/volume), (b) 1:200 aqueous solution of a medicated liquid soap containing 15% (weight/volume) cetrimide (quaternary ammonium) and 1.5% (weight/volume) chlorhexidine gluconate, (c) unmedicated liquid soap, and (d) tap water.¹⁷

The drying of the fingers was accomplished by applying pressure only to either the paper towels or cloth towels for 10 seconds or by holding the fingers under the air dryer for 10 seconds.¹⁷

The results found that no matter what the hand washing agent was, there was a higher reduction of contamination using warm air drying than using either paper or cloth towels. Likewise, there was a higher reduction of contamination with the use of paper towels than with the use of cloth towels. The study also showed that all hand washing agents were more effective against *E. coli* than the rotavirus.¹⁶ Furthermore, tap water alone was found to be nearly as effective a liquid soap in the removal of both test organisms.¹⁷

It must be noted that in the study described, there was only applied pressure and no mechanical friction of either the hand washing agent or the drying agent.¹⁷

4.11. Why wash your hands?

Keeping hands clean is one of the most important steps we can take to avoid getting sick and spreading germs to others. Many diseases and conditions are spread by not washing hands with soap and clean, running water.¹⁸

4.11.1. How germs get onto hands and make people sick?

A single gram of human feces-which is about the weight of a paper clip-can contain one trillion germs.¹⁹ Germs can also get onto hands if people touch any object that has germs on it because someone coughed or sneezed on it or was touched by some other contaminated object. When these germs get onto hands and are not washed off, they can be passed from person to person and make people sick.¹⁹

4.11.2. Washing hands prevents illnesses and spread of infections to others

Hand washing with soap removes germs from hands. This helps prevent infections because:

- People frequently touch their eyes, nose, and mouth without even realizing it. Germs can get into the body through the eyes, nose, and mouth and make us sick.
- Germs from unwashed hands can get into food and drinks while people prepare or consume them. Germs can multiply in some types of foods or drinks, under certain conditions, and make people sick.¹⁹
- Germs from unwashed hands can be transferred to other objects, like handrails, tabletops, or toys, and then transferred to another person's hands.
- Removing germs through hand washing, therefore, helps prevent diarrhea and respiratory infections and may even help prevent skin and eye infections.²⁰

Teaching people about hand washing helps them and their communities stay healthy. Hand washing education in the community⁶:

- Reduces the number of people who get sick with diarrhea by 23-40%
- Reduces diarrheal illness in people with weakened immune systems by 58%
- Reduces respiratory illnesses, like colds, in the general population by 16-21%
- Reduces absenteeism due to gastrointestinal illness in school children by 29-57%

4.11.3. Not washing hands harms children around the world

About 1.8 million children under the age of 5 die each year from diarrheal diseases and pneumonia, the top two killers of young children around the world:²¹ Hand washing with soap could protect about 1 out of every 3 young children who get sick with diarrhea and almost 1 out of 5 young children with respiratory infections like pneumonia,²¹

- Good hand washing early in life may help improve child development in some settings²²
- Estimated global rates of hand washing after using the toilet are only 19%.²³
- Hand washing education and access to soap in schools can help improve attendance.²⁴

4.12. Hand washing helps battle the rise in antibiotic resistance

Preventing sickness reduces the number of antibiotics people use and the likelihood that antibiotic resistance will develop. Hand washing can prevent about 30% of diarrhea-related sicknesses and about 20% of respiratory infections (e.g., colds). Antibiotics often are prescribed unnecessarily for these health issues. Reducing the number of these infections by washing hands frequently helps prevent the overuse of antibiotics—the single most important factor leading to antibiotic resistance around the world. Hand washing can also prevent people from getting sick with germs that are already resistant to antibiotics and that can be difficult to treat.²²

4.13. Water, sanitation and hygiene (WASH) scheme

The global goals have set an ambitious new agenda for sustainable development. The new goal for the water sector, Goal 6, aims to achieve universal, sustainable and equitable access to safe drinking water, sanitation, and hygiene by 2030. In response to the global goals, UNICEF has developed a new strategy for Water, Sanitation and Hygiene (WASH) 2016-2030 that provides a framework to guide our work related to water, sanitation and hygiene. WASH facility in schools are important considerations for school going students for their educational attainment and health. ²³

4.14. Global studies on hand washing, hand hygiene, and health outcomes

Claudia H Lau et al., conducted an interventional study to compare absenteeism rates among elementary students given access to hand hygiene facilities versus students given both access and short repetitive instruction in use, particularly during influenza season when illness-related absences are at a peak. Students from ages 4-14 years were included and classes were systematically assigned to intervention and control group by grade (cluster design). Students in the intervention group also received short repetitive instruction health education in hand hygiene every 2 months. Only absences as a result of respiratory or gastrointestinal illness were used to establish illness-related absenteeism rates. Data were collected and analyzed for 773 students reporting 1,886 absences during the study period (1.73% of total school days). Both the percent total absent days and percent illness-related absent days were significantly lower in the group receiving short instruction during flu season ($p = 0.002$, $p < 0.001$, respectively).

Standardized and brief repetitive instruction in hand hygiene holds the potential to significantly reduce absenteeism.²⁴

Rafiqul Islam et al., conducted a school based interventional study to assess the level of knowledge and practice on hand washing among school children of class 9 and 10 in Dhaka, Bangladesh. There were 51 children enrolled in this study. A structured questionnaire was administered. The baseline and end-line survey conducted based on which a health educational intervention program was planned, implemented and evaluated. The intervention program was conducted through face to face interviews and group discussions using flip charts, pamphlets, brochures, and chalkboard, as a teaching aid. The study showed more than 70 % of children didn't know that proper hand washing can prevent skin diseases and more than 85 % didn't know that cough is prevented by hand washing. After the intervention, every student became familiar with the name of diseases spread through improper hand washing.²⁵

Tri Setyautami et al., carried out a descriptive cross sectional study among sixth grade of elementary students in Selat sub-district, Indonesia. A self-administered questionnaire was administered to 274 students at seven schools randomly selected. Chi-square tests, and multiple logistic regression to explore associations between the various study factors. Nine combinations of hand washing emerged from this study which combined washing hands by using water and soap with two critical events: before eating and after visiting the toilet. Only 40.5% of the respondents washed their hands properly. Availability of clean water

(Adj OR = 4.24, 95% CI = 1.92-9.35) and soap (Adj OR = 5.55, 95% CI = 2.36-13.08) at hand washing stands were found to be significant predictors of proper hand washing when adjusted with other factors.²⁶

Margaret A.K. Ryan et al., executed a study to evaluate the respiratory illness in military recruits, by a simple hand washing program and evaluated at a large Navy training center. Clinical records from 1996 through 1998 were reviewed to determine weekly rates of respiratory illness before and after program implementation (1,089,800 person-weeks reviewed). A supplemental survey was given to a sample of recruits to assess self-reported respiratory illness and compliance with the hand washing program. A 45% reduction in total outpatient visits for respiratory illness was observed after the implementation of the hand washing program. Survey data supported clinical observations, as frequent hand washes self-reported fewer respiratory illness episodes when compared to infrequent hand washes. The implementation of a hand washing program in this population of healthy young adults was associated with a marked reduction in outpatient visits for respiratory illness.²⁷

Azor-Martínez et al., conducted a randomized, controlled study with sample size of 1341 children between 4 and 12 years of age, attending 5 state schools in Almería (Spain), with an 8-months follow up. The experimental group washed their hands with soap and water, complementing this with the use of a hand sanitizer, and the control group followed the usual hand washing procedure. Absenteeism rates due GI were compared between the 2 groups through the

multivariate Poisson regression analysis. 446 cases of school absenteeism due to Acute Gastroenteritis were registered. The school children from the experimental group had a 36% lower risk of absenteeism due to AGE (IRR: 0.64, 95% confidence interval: 0.52–0.78) and a decrease in absenteeism of 0.13 episodes/child/academic year (0.27 of Experimental Group vs 0.40 Control Group/episodes/child/academic year, $P < 0.001$). Pupils missed 725 school days due to AGE and absent days was significantly lower in the Experimental Group (Experimental Group: 0.31%, 95% confidence interval: 0.28– 0.35 vs. Control Group: 0.44%, 95% confidence interval: 0.40–0.48, $P < 0.001$). The use of hand sanitizer as a complement to hand washing with soap is an efficient measure to reduce absent days and the number of school absenteeism cases due to AGE.²⁸

Marufa Sultana et al., carried out a cross sectional, a pretested, semi-structured questionnaire-based study to assess the hand washing knowledge, practice, and other related factors among the selected university students in the city of Dhaka, Bangladesh. Two hundred undergraduate students from four universities were included in this study. The mean (\pm SD) age of the participants was 20.4 (\pm 1.8) years. The majority of the students washed their hands with water, but only 22.5% washed their hands effectively by maintaining the correct steps and frequency of hand washing with water, and soap or hand sanitizer. The mean (\pm SD) score of the participants' hand hygiene practice was 50.81 (\pm 4.79).²⁹

4.15. Indian studies on hand washing, hand hygiene, and health outcomes

Rubanprem Kumar et al., conducted a study to identify the effectiveness of hand hygiene teaching on knowledge and compliance of hand washing among the students at a selected school in Mugalivakkam village, Kancheepuram District. Quantitative quasi-experimental randomized one group pre-test and post-test design study were carried out to find out the effectiveness of hand hygiene teaching on knowledge, compliance and to correlate the level of hand hygiene knowledge with compliance of hand washing among the students. The knowledge was assessed by questionnaire and compliance was assessed by sterile hand swab collection to do the bacteriological culture test in the microbiology laboratory. Among six primary schools in the Mugallivakkam village at Kancheepuram District one primary school was selected using a simple lottery method. Five students from 2nd, 3rd, 4th, and 5th standard were selected using simple random sampling. The total sample size was 20. The 20 primary school students were split into four subgroups of each consisting of five school children. Then structured teaching program on hand hygiene was given using the laptop. Post-test was conducted on knowledge and compliance after three weeks. The mean value of knowledge between the pre-test and post-test showed a vast statistically significant difference at $p < 0.001$ level and there was extremely important difference in the mean score of the various pathogens in the hand flora which was estimated to assess the compliance indicators to hand hygiene between the pretest and posttest at $p < 0.001$ level. This study imposes the importance of suitable health

educational intervention through the proper structure to the school children, for enhancement concerning hand hygiene among them, all over the country.³⁰

A school based educational interventional study was conducted by Ankur Garg et al., in New Delhi, to assess the effect of knowledge on hand washing and behavior among children and parents. The participants were girls of 6th class to 8th class (100 from each class). The intervention carried out on randomly selected 300 students. There were 281 students enrolled in the study. The tools used for data collection were questionnaires and household survey performa; essay, slogan writing competition; poster, classroom interactions. After the health educational intervention, 95% felt that hand should be washed frequently. Overall, there was a significant improvement in the knowledge regarding hand washing and frequency of hand washing practices after the intervention. 42% of children shared this information with their parents. The intervention proved effective in improving awareness and highlights the potential of school for hand washing promotion activities.⁵

Kumar amudha et al., designed this study to determine the effect of a school based hand washing promotion program on the knowledge and practice of hand washing among students age 11–18 years and to explore the facilitating and hindering factor for the behavior change. It was a sequential explanatory mixed-method study done in two schools in an urban slum of Puducherry. The student's baseline knowledge and practice of hand washing were assessed using a self-administered questionnaire and observation checklist. During the school based

hand washing promotion week, the students had interactive health education sessions and poster/essay/elocution competitions. The posters made by the students were displayed in classrooms. Two weeks later, the post-test was conducted. Two group interviews were done among the students. Changes in knowledge and practice were compared using the Chi-square test. Manual content analysis of the transcripts of the group interview was done. Around 194 students were involved in the study. With the intervention, knowledge of students improved, particularly the correct duration of hand washing and the role of hand drying. The students learned the six steps of hand washing. After the observation of the hand washing promotion week, the number of students who used soap for washing hands, especially before eating and after using the toilet, increased. Health talk by the health professionals and active involvement of students facilitated the behavior change. Poorly maintained wash area, peer pressure, and misconceptions hindered the behavior change.⁴

Ashutosh Shrestha et al., conducted an educational intervention study to improve hand washing among school children in Belgaum, Karnataka. The baseline and end-line surveys were done in February 2013 and September 2013. Health education sessions were conducted once a week for six weeks. A paired t-test and McNemar test were used. The mean knowledge score of personal hygiene was 53.86 which increased to 77.54 after health education intervention, which was statistically significant at paired t 5.17, df 6 and $p < 0.01$. The mean practice score of personal hygiene was 41.43 which increased to 60.87 after health education intervention.³¹

Julie A. Nicholson et al., conducted a randomized control trial study in Mumbai among school children in urban communities to evaluate the intervention on hand washing with soap would reduce episodes of diarrhea, ARIs, and school absences. They monitored illnesses, including diarrhea and acute respiratory infections (ARIs), school absences and soap consumption for 41 weeks in 70 low-income communities in Mumbai, India. Outcomes from 847 intervention households and 833 control households were modeled using negative binomial regression. There were fewer episodes of diarrhea and ARIs in the intervention group 6- to 15-year-olds (-30%, 95% CI = -39%, -7%; and -15%, 95% CI = -24%, -6%) and school absences due to illnesses (-27%, 95% CI = -41%, -18%).³²

Priyanka P. Gawai et al., conducted a cross-sectional study in Mumbai to assess hand washing knowledge and practices among primary school children. A pre designed, pre-tested and structured interview schedule was used to conduct interviews among 2283 students. Fifty four percentage of the study population reported a history of illnesses in the past one month, out of which 81.4% reported absenteeism due to illness. Around 34% of children were unaware of the health-related consequences of not washing hands. When asked about the important times when hands ought to be washed, only 18% mentioned after toilet use. Of the 2283 students, a very small percentage of respondents (0.7%) reportedly practiced five steps of hand washing; only 1% practiced four steps of hand washing. Forgetfulness was cited as the primary reason for missing washing hands before eating food (88%) and after toilet use (84%).¹

A village level interventional study was conducted by Adam Biran et al., based on the effect of a behavior-change intervention on handwashing with soap in India (cluster-randomized trial) in Chittoor district in southern Andhra Pradesh, India. School children aged 8-13 years selected and 14 villages (clusters) were selected, stratified by population size (<1200 vs >1200), and randomly assigned in a 1:1 ratio to intervention or control (no intervention). Outcomes were measured by direct observation in 20–25 households per village at baseline and three follow-up visits (6 weeks, 6 months, and 12 months after the intervention). The primary outcome was the proportion of hand washing with soap at key events (after defecation, after cleaning a child's bottom, before food preparation, and before eating) at all follow-up visits. The control villages received a shortened version of the intervention before the final follow-up round. Hand washing with soap at key events was rare at baseline in both the intervention and control groups (1% [SD 1] vs 2% [1]). At 6 weeks' follow-up, hand washing with soap at key events was more common in the intervention group than in the control group (19% [SD 21] vs 4% [2]; difference 15%, $p=0.005$). At the 6-month follow-up visit, the proportion hand washing with soap was 37% (SD 7) in the intervention group versus 6% (3) in the control group (difference 31%; $p=0.02$). At the 12-month follow-up visit, after the control villages had received the shortened intervention, the proportion hand washing with soap was 29% (SD 9) in the intervention group and 29% (13) in the control group.³³

Sandip Kumar Ray et al., conducted a cross-sectional study to find out the extent of germs present in hand, and also the student's perception of hand washing in two schools of Bangalore and Kolkata. It was a questionnaire-based as well as the collection of a swab from hand and performing bacteriological culture in the laboratory. Students' perception about the dirty areas of the hands, it was observed that the majority (78%) felt palm was likely to be dirtier while less than 70% felt that web spaces could harbor dirt. Almost 86% reported that they washed their hands before eating lunch, but only 21.3% said they always used soap while 47.3% never used it. The availability of soap all the time in the school was reported by only 18.4% of students. The swabs of 61% of children showed potential pathogens. The commonest of these was *Staphylococcus aureus* which was seen in 44% samples.³⁴

Tambekar et.al., conducted an epidemiological study about hand hygiene and health among students in Amravati. This study was undertaken to evaluate the number and type of enteric bacterial pathogens associated with hands. A total of 160 hands swab samples of 80 students of kinder garden, primary school, secondary school, under graduate, and post graduate were analyzed. Pathogens were isolated from hands includes *Escherichia coli* (22%), *Pseudomonas aeruginosa* (12%), *Staphylococcus aureus* (15%), *Proteus mirabilis* (11%), *Citrobacter freundii* (10%), *Enterobacter aerogenes* (8%), *Streptococcus sp.* (7%), *Klebsiella sp.* (6%), *Micrococcus sp.* (5%) and *Salmonella typhi* (4%). The prevalence of the bacterial pathogens was high in students of K.G. and primary than those in secondary schools and colleges.³⁵

Harinder Sekhon and Sukhmeet Minhas carried out a school-based survey among children in a government school in a rural area of north India, to assess the status of personal hygiene. The survey was conducted using the Global School-Based Student Health Survey Core Questionnaire Hygiene Module. The total number of students studied in the sample was 350. There were three classes – class I, II and III, each having three sections and a total of 110, 123 and 117 children respectively. All the children adhered to the good habit of washing their hands after using the toilet or latrine, always, or at least most of the time; and also most of the children used soap and water always to wash hands.²⁰

Methodology

5. METHODOLOGY

5.1. Study design:

Quasi experimental study (Before and After intervention study with same group).

5.2. Study area:

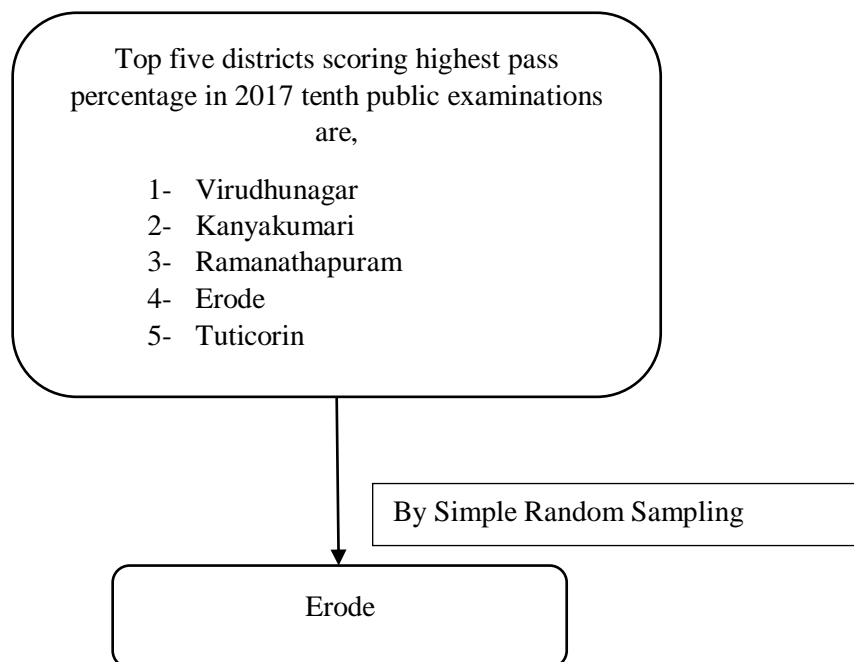


Figure 2: Schematic representation of selection of study area

In Erode district, there are about 409 Government High and Higher Secondary Schools present. By simple random sampling, one Government school was selected.

5.3. Background information:

Erode District lies on the extreme north of Tamil Nadu, situated between 10.36' and 11.58' North Latitude and between 76.49' and 77.58' East Longitude. It is divided into two revenue divisions and 10 taluks.^{37,38} It is the largest district

by area in Tamil Nadu, covering over 8000 square kilometers. As of census 2011, the district had a population of 2,251,744.³⁷

In Erode district there are about 997 Government Primary Schools, 325 Elementary schools, 173 High schools and 236 Higher Secondary schools.³⁹

5.4. Study period:

This study was conducted from June 2018 to January 2019 for a period of eight months. Data collection including pre-test, intervention and post-test was done.

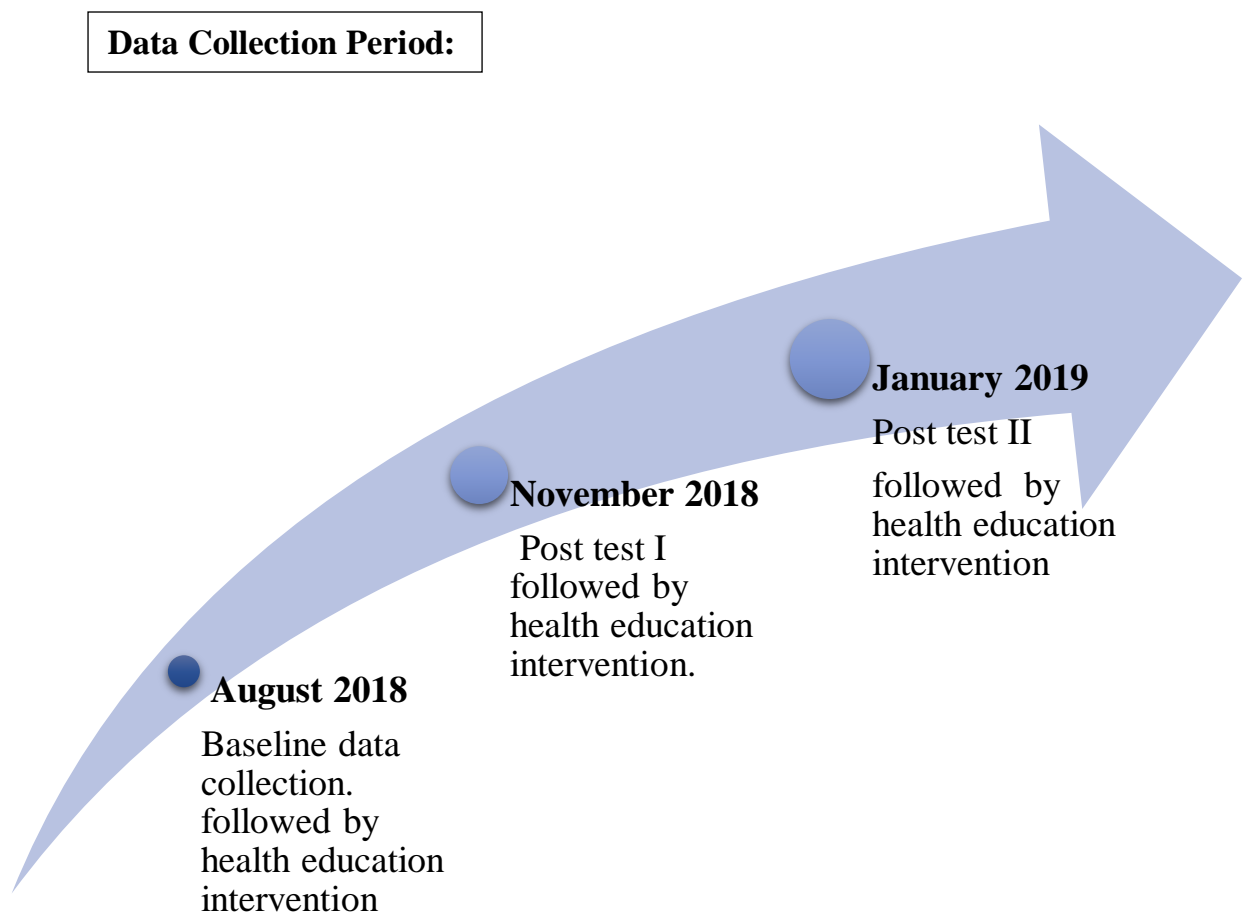


Figure 3: Data collection period

5.5. Study population:

Study participants were the middle school students.

5.5.1. Inclusion criteria:

The middle school students whose parents gave consent and students who had given assent to participate in the study.

5.5.2. Exclusion criteria:

Students who were on long leave and students who were not available for the follow up were excluded from study.

5.6. Sample size:

5.6.1. Sample size calculation:

A sample size is calculated from the study, “Improving hand washing among school children: an educational intervention in South India by Ashutosh Shrestha and Mubashir Angolkar”³¹

The optimum sample size for the study was calculated using a following formula,

$$N = \frac{2 [Z(\alpha/2) + Z(\beta)]^2}{(P_1 - P_2)^2} PQ$$

At 80% Power and Significance level 0.05,

The standard normal deviate for $\alpha = Z_\alpha = 1.96$

The standard normal deviate for $\beta = Z_\beta = 0.842$

$$[Z(\alpha/2) + Z(\beta)]^2 = 7.849$$

$$P = \frac{P_1 + P_2}{2} = 53.14$$

P1- prevalence of correct hand washing practices after intervention

P2- prevalence of correct hand washing practices before intervention

P1=41.67; P2=64.6 from above mentioned study

Q= 100-P = 46.86

$$\text{Sample size} = \frac{2x(1.96+0.84)^2 \times 53.14 \times 46.86}{(22.93)^2} = 74$$

The minimum required sample size is 74 for each group, then N=148

Assuming 10% non- response rate, required sample size was 164.

5.7. Selection of study participants:

In the selected Government school, there were nine sections in middle school which comprised of three English medium and six Tamil medium sections. Five sections were randomly selected to reach out the required sample size of 164.

There were 190 students in those selected five sections. A letter to participate in the study along with the information sheet was given to the parents through the students. They were also given a consent form to be signed if they are extending their willingness for the participation of their ward in the study. Next day, 178 students got permission and returned the consent form with parent signature to participate in the study. Health education intervention regarding hand washing was given to all students irrespective of their willingness to participate in the study. However, the data was not collected from those students whose parents did not give consent to participate in the study.

5.8. Study Tool:

5.8.1. Semi structured Questionnaire (Annexure Enclosed III)

A self-administered, pre-tested and semi structured questionnaire in Tamil was used for data collection. It was a modified questionnaire taken from previous studies and validated by experts. Initially, the questionnaire was drafted in English and then translated to Tamil.

The questionnaire had five sections are as follows:

Section One– Socio demographic profile

Section Two – Illness and health outcome, its duration and School Absenteeism

Section Three – Knowledge regarding hand washing and hand hygiene

Section Four – Awareness about the diseases transmitted through unclean hand

Section Five – Hand washing practices and reasons for not washing

5.8.2. Questionnaire in detail:

1. Section one: Information regarding age of participants, family type, number of family members, religion, parent's education, parent's occupation, total family income from which per capita income was calculated. Socioeconomic status was classified based on B.G.prasad scale. Medium of instruction was also asked.
2. Section two: History of illness- students were asked to self-report if they had suffered from fever, cold, stomach pain, vomiting, diarrhea, skin infection and eye infection in the two months preceding the data collection (baseline, post test I and post test II).

3. Section three assessed the knowledge regarding hand washing & hand hygiene among the study participants. Questions were framed as “Why hand washing is essential?” and “When it is essential to wash hands?” A total of 9 questions were asked pertaining to hand washing and hand hygiene. This section had multiple options and closed ended questions.
4. Awareness about the diseases transmitted through unclean hand was revealed by fourth section of questionnaire. Then had a checklist of 10 diseases and asked them to choose.
5. Section five consists of collected information on practices of hand washing. It had total of five questions with responses measured using likert scale (Always, Sometimes and Never). Then finally reasons for not washing hands was asked.

5.8.3. Pre testing of Questionnaire:

The questionnaire was pre tested among students who belonged to different school which was not part of the study to ascertain the comprehensibility of participants, feasibility and to estimate the average time taken for answering it and based on this which modifications were made.

5.9. Intervention Tool:

Health education was the form of intervention and it aimed in creating awareness regarding hand hygiene, hand washing techniques, hand washing practices and its associated health related events among the study participants. Information Education Communication (IEC) materials were prepared from

January 2018 to June 2018. All the IEC material required for health education was developed by referring standard IEC material like Auxiliary Nurse Midwife training manual, WASH manual, UNICEF training manual and WHO training manual.^{15, 40, 41} IEC material included pamphlets which was made in both English and Tamil. In addition to this health education module was prepared using PowerPoint presentation and deliver using interactive lecture method. All these IEC materials were corrected and finalized by experts from Community Medicine department.

5.10. Data Collection Procedure:

5.10.1.Pre-test session:

Among students whose parents had given consent to participate in the study assent was obtained, after explaining the purpose of the study. The study was conducted in class rooms of the selected school. All ethical principles were adhered during data collection. General instructions on answering the questionnaire was given. Students were given adequate time to fill the questionnaire. After collecting the questionnaire it was checked for completeness. If there were any questions which were left unanswered, the students were revisited and asked to fill the questions. On completing pre-test, health education interventions was given. The total study participants were made into 5 groups, with approximately 40 students in each for delivering the intervention.

5.10.2.Intervention sessions:

Upon completion of pre-test, all the participants were given health education directly by the researcher. The health education was given in three sessions as mentioned below.

1st session:

Through interaction and group discussion for 20 minutes

2nd session: (Annexure VII Enclosed)

IEC materials and pamphlets were used for health education for 15minutes

3rd session:

Lecture using Audio Visual aids (PowerPoint presentation) for 25 minutes and demonstration.

Interactive session, group discussion, demonstration and use of health education materials and pamphlet were done at their respective class rooms and lectures were given in seminar hall which had Audio Visual support and lesson plan is enclosed in annexure VII. Above mentioned sessions were carried out on five different days, for the 5 groups. These intervention sessions were given immediately after the pre-test, post-test I and post-test II. The health education was given in Tamil language to facilitate better understanding among the participants.

It was made sure that all the queries were addressed immediately.

5.10.3. Post-test sessions:

After an interval of two months and four months from baseline, post test I and post test II were conducted respectively, using the same questionnaire. If there were any absentee among students who took part in baseline survey, two attempts at different times were made to visit and collect data from them. Participants who were not available even after two visits were considered to be loss to follow up and were excluded from further analysis.

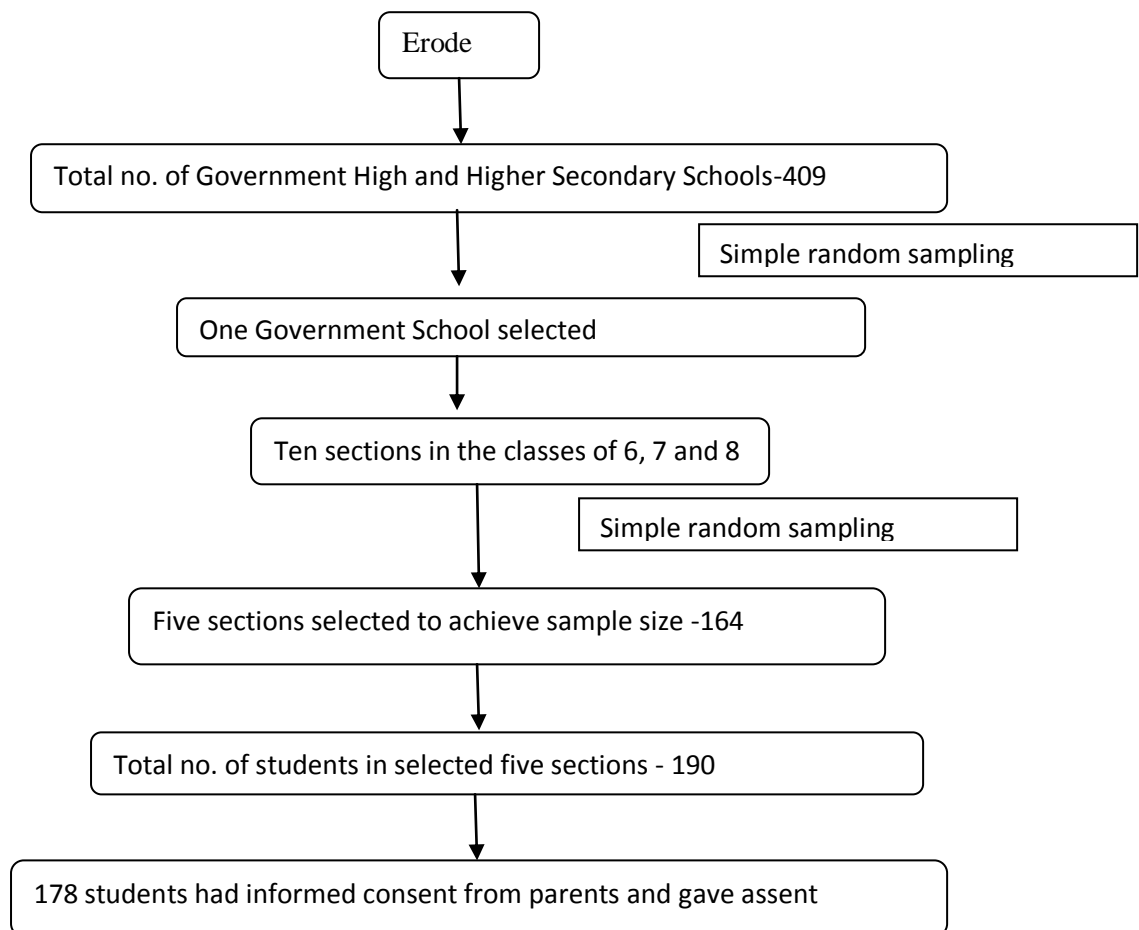


Figure 4: Sampling Method

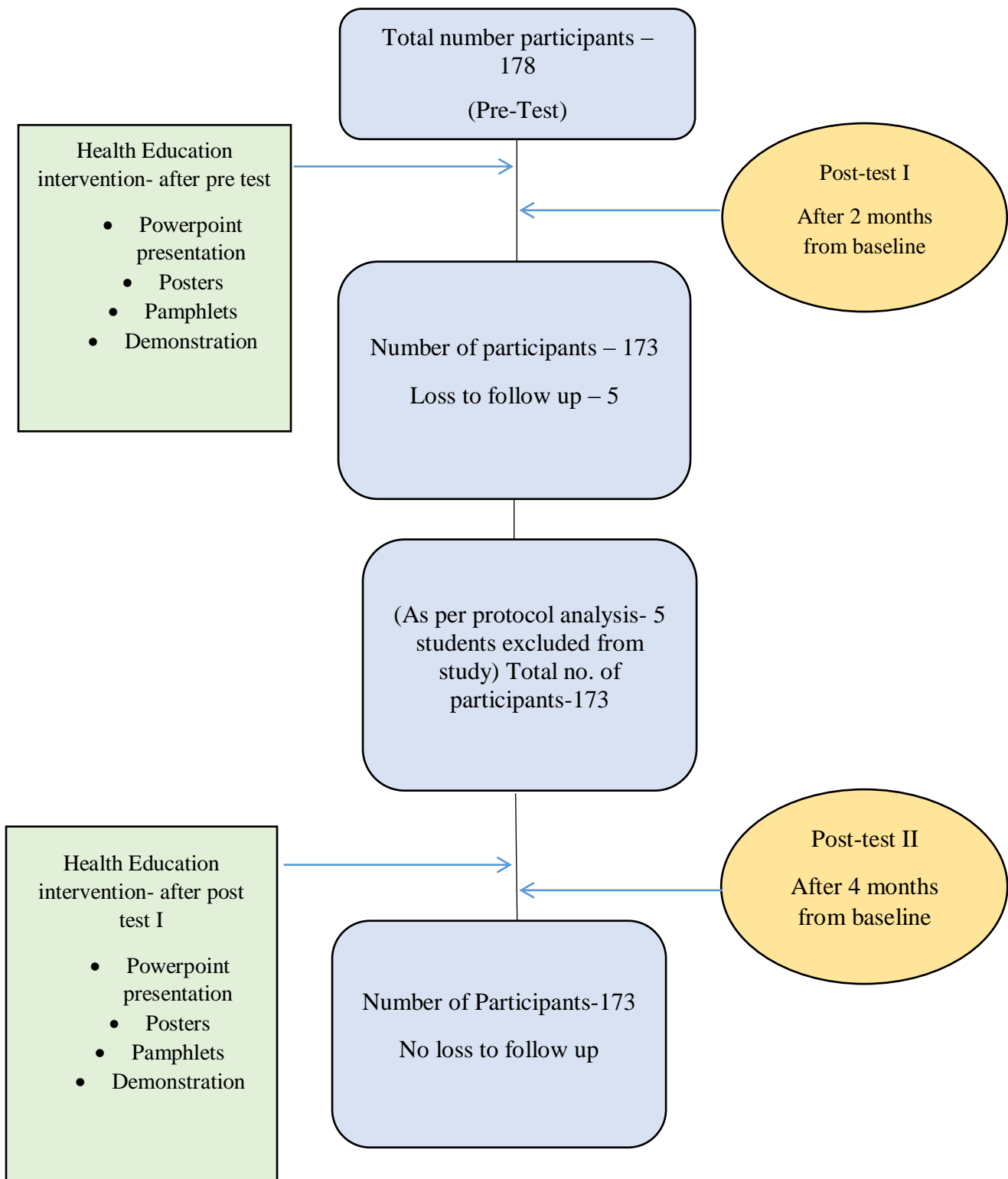


Figure 5: Schematic representation of study design

5.11. Definition of study variables:

1. Age: Age was taken in completed years
2. Religion : was noted as Hindu, Christian, Muslim and others
3. Educational status:
 - a) Illiterate - a person who cannot read or write in any language
 - b) Primary school education- a person who had a formal school education up to fifth standard
 - c) Middle school education – a person who had a formal school education up to eighth standard
 - d) High school education- a person who had a formal school education up to tenth standard
 - e) Higher secondary school education- a person who had a formal school education up to 12th standard
 - f) Degree/diploma – a person who has completed any degree or a diploma course
4. Socio-economic status: socio-economic status was recorded based on Modified B.G.Prasad's classification.^{42,43} (Annexure VI)
5. Type of Family: It was recorded as either nuclear or joint family.⁴⁴

Nuclear Family: The family consisting of married couples and their dependent children.

Joint Family: It consist of number of married couples and their children who live together in the same household. All the men are related by blood and the

women of the household are their wives, unmarried girls and widows of the family kinsmen.

6. Knowledge on hand washing:

Awareness about the need of hand washing and when hand washing is essential. Awareness regarding the diseases transmitted through the unclean hands.

7. Health outcomes:

Students who reported with 'yes' for any of the illness asked in the questionnaire is considered as having suffered the illness. Number of days the students were absent due to the illness was taken as school absenteeism.

8. Practice of hand washing:

Practices of hand washing on different occasions and the reasons for not practicing washing hands.

5.12. DATA COLLECTION AND METHODS:

Data collection was done in the study area after obtaining permission from the Director, Institute of Community Medicine and The Dean, Madras Medical College, and ethics approval of Institutional Ethics committee.

- The study protocol was submitted and written permission to conduct the study was obtained from the School Head Master of the selected school.
- After explaining about the purpose of the study, informed consent was obtained from parents and assent from the students.

- The study participants were fully explained about the study in Tamil language and were also informed that they can withdraw from the study at any time.
- All the ethical principles were adhered. Confidentiality was ensured throughout the study.

5.13. Data analysis:

All the data collected were coded and entered in Microsoft Excel Sheet which was rechecked and analyzed using Statistical Package for Social Sciences (SPSS) version 16. Descriptive statistics were expressed as mean and standard deviation for continuous variable and frequencies and proportion for categorical variable. Cochran's Q test was used to test the difference for repeated measurements, when the dependent variable was dichotomous. Friedman test was used to test the differences in before intervention and after intervention when the dependent variable being measured is ordinal. If Friedman test is significant, to examine where the differences actually occur, Post hoc analysis with Wilcoxon Signed Rank tests was used on different combinations of the related groups. The p-value <0.05 was taken as the statistically significant level.

Results

6. RESULTS

In the present study, totally 178 students were enrolled for study. During follow up, 173 participants were available for both post-test assessments. The 5 students who were lost to follow up were excluded for the data analysis. Hence, the number of participants were 173 students respectively. Health educational intervention was given directly by researcher.

Results of this study are presented under the following headings:

1. Distribution of study participants based on socio-demographic characteristics
2. Baseline knowledge regarding hand hygiene and hand washing
3. Knowledge about disease transmission
4. Baseline practices about hand washing and reasons for not washing hands
5. Comparison of baseline and follow-up knowledge regarding hand washing and hand hygiene
6. Comparison of baseline and follow-up practices regarding hand washing practices
7. Comparison of health outcomes like history of illness, school absenteeism due to illness and number of days on leave due to illness before and after health educational intervention

Table 1: Socio Demographic Characteristics

Variables	Frequency (N =173)	Percentage (%)
Age		
13 years	60	34.7
14 years	97	56.1
15 years	16	9.2
Religion		
Hindu	161	93.1
Muslim	7	4
Christian	5	2.9
Fathers Educational Status (N=167)*		
Illiterate	29	16.8
Primary Education	70	40.5
Middle School Education	48	27.7
Secondary School Education	13	7.5
Diploma And Degree	7	4
Mothers Educational Status(N=171)*		
Illiterate	35	20.2
Primary Education	56	32.4
Middle School Education	58	33.5
Secondary School Education	21	12.1
Diploma And Degree	1	0.6

Fathers Occupation(N=167)*		
Unskilled Workers	116	67.1
Semi-Skilled/Skilled Workers	49	28.3
Unemployed	2	1.2
Mothers Occupation(N=171)*		
Unskilled Workers	107	61.8
Semi-Skilled/Skilled Workers	32	18.5
Unemployed	32	18.5
Medium of Instruction		
Tamil	145	83.8
English	28	16.2
Socio Economic Classification(as per Modified B.G.Prasad's classification)		
Upper Class	46	26.6
Upper Middle Class	49	28.3
Middle Class	35	20.2
Lower Middle Class	33	19.1
Lower Class	10	5.8
Number of Family Members		
Two Members	7	4
Three To Five Members	125	72.3
More Than Five Members	41	23.7

Type of family		
Nuclear family	125	72.3
Joint family	48	27.7
*N less than 173 because father/mother died		

The socio demographic profile of study population shown in Table 1. Among the 173 study participants, 56.1% of the study population belonged to the age of 14 years, with mean age of 13.7 years with SD 0.614. The age wise distribution of study participants are given in Table 1.

Among the participants, almost 72.3% belonged to nuclear family and most of them had three to five family members. Among the participants 93.1% were Hindu by religion.

Regarding parents education, 79.7% and 78.6% of participants father and mother were literate respectively. In this educational status of father revealed that 40.5% were primary school and 27.7% were middle school level of education. The educational status of mother revealed that 32.4% and 33.5% were from primary and middle school level of education.

Regarding occupation, 95.4% and 80.3% of participant's father and mother were employed respectively. Most of the students were having Tamil as the medium of instruction. B.G Prasad classification is used in both urban and rural areas and is based on per capita monthly income. Socio economic status was classified based on Modified B.G Prasad scale and is given in the Table 1. Most of the participants i.e. 28.3% of study participants belonged to upper middle class.

Table 2: Baseline knowledge about when to perform hand wash (N=173)

Occasions To Wash Hands (N=173)	Yes N (%)
Before Eating	138 (79.8)
After Eating	165 (95.4)
After Toilet Use	144 (83.2)
After Playing	133 (76.9)
After Touching Dirt / Garbage	145 (83.8)
After Coming From Outdoors	132 (76.3)

Pre-test knowledge assessment about when to wash hands among the study participants are given in Table 2. Almost 79.8% students knew that they have to wash hands before eating and only 76.9% knew that they have to wash hands after playing.

Table 3: Baseline knowledge about why it is essential to wash hands

Why is it essential to wash hands (N=173)	Yes N (%)
To prevent from falling sick	135 (78)
To remove germs	132 (76.3)
To remove dirt	128 (74)
Don't know	13(7.5)

Pre-test knowledge assessment of participants about the importance of hand washing is given in Table 3. About 78% of the study participants were aware that hand washing with soap was to prevent from falling sick.

Table 4: Knowledge about disease transmission (N=173)

Diseases	Frequency (N)	Percentage (%)
Diarrhea	139	80.3
Common cold	93	53.8
Worm infestation	86	49.7
Pneumonia	69	39.9
Swine flu	66	38.2
Typhoid	65	37.6
Skin infections	63	36.4
Jaundice	60	34.7
Eye infections	48	27.7

The awareness regarding the diseases transmitted through unclean hands was assessed among the participants and given in Table 4. About 80.3% and 53.8% were aware about the diarrheal diseases and respiratory tract infections. Among the participants 39.9% and 38.2% answered that pneumonia and swine flu transmitted through unclean hands. About 49.7% were aware about worm infestations.

Table 5: Baseline Practice on hand washing

Questions Asked About Hand Washing Practices (N=173)	Always N (%)	Sometimes N (%)	Never N (%)
Hand Wash Before Eating Food	130 (75.1)	39 (22.5)	4 (2.3)
Wash Hands With Soap After Toilet Use	140 (80.9)	27 (15.6)	6 (3.5)
Wash Hands With Soap After Playing	100 (57.8)	52 (30.1)	21 (12.1)
Wash Hands With Soap After Touching Dirt/Garbage	111 (64.2)	45 (26)	17 (9.8)
Wash Hands With Soap After Coming From Outdoors	78 (45.1)	58 (33.5)	37(21.4)

Baseline practices about hand washing among the study participants is given in Table 5. Almost 75.1 % and 80.9% always washed hands before food and after toilet usage respectively. About 30.1% and 26% sometimes washed hands with soap after playing and after touching dirt and garbage respectively. About 21.4% and 12.1% never washed hands after coming from outdoors and after playing respectively.

Table 6: Baseline reasons for not washing hands with soap with water (sometimes or never)

Reasons (N=118)*	Frequency (N)	Percentage (%)
Forgetfulness	53	44.9
Laziness	33	28
Lack of water	23	19.5
Lack of soap	9	7.6
*out of 173 students, 118 students did not wash hands with soap with water (sometimes or never)		

Pre-test practice assessment of reasons for not washing hands is given in Table 6. Among the study participants those who answered sometimes or never washed hands, 44.9% mentioned forgetfulness, followed by laziness is 28% as the main reason for not adhering to hand washing practices. Some of students mentioned lack of water (19.5%) and soap (7.6%) as reasons for not washing hands.

Table 7: Comparison of awareness on the need for hand washing at two months and four months interval after intervention (N=173)

Questions on why it is essential to wash hands	Pre-test (%) Baseline study (N=173)	Post-test I (%) (After 2 months) (N=173)	Percentage points difference (pre-test & post-test I)	Post-test II (%) (After 4 months) (N=173)	Percentage points difference (pre-test & post-test II)	Cochran's Q test statistics	p- value
To prevent from sickness	135 (78)	151 (87.3)	9.3	159 (91.9)	13.9	26.35	<0.001*
To remove germs	131 (75.7)	144 (83.2)	7.5	158 (91.3)	15.6	19.53	<0.001*
To remove dirt	128 (74)	149 (86.1)	12.1	158 (91.3)	17.3	24.94	<0.001*
Don't know	15 (8.7)	9 (5.2)	3.5	3 (1.7)	7	11.36	0.003*
* statistically significant							

At pre-test about 78% and 75.7% of students were aware about that hand washing with soap prevents from falling sick, removes germs from hand. After intervention by health education, the awareness improved to 87.3% & 83.2% at post-test I and 91.9% & 91.3% at post-test II, which is statistically significant($p < 0.001$). At the end of four months after intervention, the awareness increased by 13.9 percentage points (PP) regarding to prevention from falling sick, 15.6 PP for removing germs and 17.3 PP for removing dirt.

Table 8: Comparison of awareness about when to hand washing at two months and four months interval after intervention (N=173)

Questions on when to wash hands	Pre-test (%) Baseline study (N=173)	Post-test I (%) (After 2 months from pre-test) (N=173)	Percentage points difference (pre-test & post-test I)	Post-test II (%) (After 4 months from pre-test) (N=173)	Percentage points difference (pre-test & post-test II)	Cochran's Q test statistics	p-value
Before eating	138 (79.8)	154 (89)	9.2	165 (95.4)	15.6	20.86	<0.001*
After toilet	144 (83.2)	159 (91.9)	8.7	166 (96)	12.8	17.62	<0.001*
After playing	133 (76.9)	152 (87.9)	11	162 (93.6)	16.7	24.11	<0.001*
After touching dirt / garbage	145 (83.8)	148 (85.5)	1.7	161 (93.1)	9.3	7.48	0.024*
After coming from outdoors	132(76.3)	141 (81.5)	5.2	142 (82.1)	5.8	2.36	0.30
* statistically significant							

About 79.8% and 83.2% of students were aware regarding washing hand before eating and after toilet use at the pre-test. After intervention of health education, the knowledge of hand washing before eating and after toilet use improved to 89% & 91.9% at post-test I & 95.4% & 96% at post-test II. At the end of 4 months, there was 15.6 PP, 12.8 PP, 16.7 PP, 9.3 PP, 5.8 PP increase from baseline with respect to being aware on hand washing before eating , after toilet usage, after playing, after touching dirt/garbage and after coming from outdoors respectively.

Table 9: Comparison of Practice of hand washing with soap and water at two months and four months interval after intervention (N=173)

Questions on hand washing with -	Pre-test (%) Baseline study (N=173)	Post-test I (%) (After 2 months from pre-test) (N=173)	Percentage points difference (pre-test & post-test I)	Post-test II (%) (After 4 months from pre-test) (N=173)	Percentage points difference (pre-test & post-test II)	Cochran's Q test statistics	p- value
soap and water	85 (49.1)	126 (72.8)	23.7	138 (79.8)	30.7	45.88	<0.001*
water only	88 (50.9)	47 (27.2)	23.7	35 (20.2)	30.7		
* statistically significant							

About 49.1% of students washed hands with soap and water before intervention (pre-test). After intervention by health education it increase to 72.8% at post-test I and 79.8% at post-test II. The difference was statistically significant by Cochran's Q test ($\chi^2=45.88$, $p<0.001$). At the end of four months, the practice of hand washing with soap increased by 30.7 PP.

Table 10 A: Comparison of practices about hand washing before eating at two months and four months interval after intervention (N=173).

Hand wash before eating	Pre-test (%) Baseline study (N=173)	Post-test I (%) (After 2 months from pre-test) (N=173)	Post-test II (%) (After 4 months from pre-test) (N=173)	Friedman test statistics	p- value
Always	130 (75.1)	151 (87.3)	157 (90.8)	18.01	<0.001*
Sometimes	39 (22.5)	19 (11)	16 (9.2)		
Never	4 (2.3)	3 (1.7)	0		
* statistically significant					

Table 10 B: Post hoc analysis with Wilcoxon Signed Rank tests

Wilcoxon Signed Rank Test	Pre-test – post-test I	Pre-test – post-test II	Post-test I – Post-test II
Z	-2.616	-3.906	-1.328
p value	0.009*	<0.001*	0.184
*statistically significant			

Comparison of pre-test and follow up post-test I & post-test II on practices of hand washing before eating among study participants is given in Table 10 A and Table 10 B. There is a statistically significant difference in the practices of hand washing before eating $\chi^2 = 18.01$, p-value <0.001. Post hoc analysis with Wilcoxon Signed Rank tests is done with a Bonferroni correction applied, resulting in a significance level set at p<0.017.

There is a statistically significant improvement in the hand washing practices between pre-test & post-test I ($Z=-2.616$, $p=0.009$) and between the pre-test & post-test II ($Z=-3.906$, $p<0.001$) among study participants. However, there is no significant differences between the post-test I & post-test II ($Z=-1.328$, $p=0.184$)

Table 11: Comparison of practices about hand washing by soap after toilet use at two months and four months interval after intervention (N=173)

Hand wash with soap after toilet	Pre-test (%) Baseline study (N=173)	Post-test I (%) (After 2 months from pre-test) (N=173)	Post-test II (%) (After 4 months from pre-test) (N=173)	Friedman test statistics	p- value
Always	140 (80.9)	150 (86.7)	144 (83.2)	1.82	0.401
Sometimes	27 (15.6)	17 (9.8)	27 (15.6)		
Never	6 (3.5)	6 (3.5)	2 (1.2)		

Comparison of pretest and follow up post-test I & post-test II practices of hand washing with soap after toilet usage among study participants is given in Table 11. There is a no significant difference in the practices of hand washing with soap after toilet usage $\chi^2 = 1.82$, $p\text{-value} = 0.401$.

Table 12: Comparison of practices on hand washing with soap after playing at two months and four months interval after intervention (N=173)

Hand wash With soap after playing	Pre-test (%) Baseline study (N=173)	Post-test I (%) (After 2 months from pre- test) (N=173)	Post-test II (%) (After 4 months from pre- test) (N=173)	Friedman test statistics	p- value
Always	100 (57.8)	100 (57.8)	108 (62.4)	3.93	0.140
Sometimes	52 (30.1)	55 (31.8)	59 (34.1)		
Never	21 (12.1)	18 (10.4)	6 (3.5)		

Comparison of pre-test and follow up post-test I & post-test II practices of hand washing with soap after playing among study participants is given in table 12. There is a no significant difference between the pre-test and follow up post-tests I&II in the practices of hand washing with soap after playing $\chi^2 = 3.93$, p-value=0.140.

Table 13 A: Comparison of hand washing practices with soap after touching dirt / garbage at two months and four months interval after intervention (N=173)

Hand wash with soap after touching dirt / garbage	Pre-test (%) Baseline study (N=173)	Post-test I (%) (After 2 months from pre-test) (N=173)	Post-test II (%) (After 4 months from pre-test) (N=173)	Friedman test statistics	p- value
Always	111 (64.2)	136 (78.6)	127 (73.4)	12.12	0.002*
Sometimes	45 (26)	30 (17.3)	41 (23.7)		
Never	17 (9.8)	7 (4)	5 (2.9)		
* statistically significant					

Table 13 B: Post hoc analysis with Wilcoxon Signed Rank tests

Wilcoxon Signed Rank Test	Pre-test – post-test I	Pre-test – post-test II	Post-test I – Post-test II
Z	-3.212	-2.599	-.741
p value	0.001*	0.009*	0.459
*statistically significant			

Comparison of pre-test and follow up post-test I & post-test II practices of hand washing with soap after touching dirt and garbage among study participants is given in Table 13 A and Table 13 B. There is a statistically significant difference in the practice of hand washing with soap after touching dirt and garbage, $\chi^2 = 12.12$, p-value - 0.002. Post hoc analysis with Wilcoxon Signed Rank tests is done with a Bonferroni correction applied, resulting in a significance

level set at $p < 0.017$. There is a statistically significant improvement in the hand washing practices between pretest & posttest I ($Z = -3.212$, $p = 0.001$) and between the pre-test & post-test II ($Z = -2.599$, $p = 0.009$) among study participants. However, there is no significant differences between the post-test I & post-test II ($Z = -0.741$, $p = 0.459$).

Table 14 A: Comparison of hand washing practices with soap after coming from outdoors at two months and four months interval after intervention

(N=173)

Hand wash with soap after coming from outdoors	Pre-test (%) Baseline study (N=173)	Post-test I (%) (After 2 months from pre-test) (N=173)	Post-test II (%) (After 4 months from pre-test) (N=173)	Friedman test statistics	p- value
Always	78 (45.1)	89 (51.4)	107 (61.8)	13.39	0.001*
Sometimes	58 (33.5)	65 (37.6)	53 (30.6)		
Never	37 (21.4)	19 (11)	13 (7.5)		
* statistically significant					

Table 14 B: Post hoc analysis with Wilcoxon Signed Rank tests

Wilcoxon Signed Rank Test	Pre-test – post-test I	Pre-test – post-test II	Post-test I – Post-test II
Z	-2.183	-3.909	-2.048
p value	0.029*	<0.001*	0.041
*statistically significant			

Comparison of pre-test and follow up post-test I & post-test II practices of hand washing with soap after coming from outdoors among study participants is given in Table 14 A and Table 14 B. There is a statistically significant difference in the practices of hand washing with soap after coming from outdoors, $\chi^2 = 13.39$, p-value - 0.001. Post hoc analysis with Wilcoxon Signed Rank tests is done with a Bonferroni correction applied, resulting in a significance level set at $p < 0.017$. There is no significant differences between the pretest & posttest I ($Z = -2.183$, $p = 0.029$) or between the post-test I & post-test II ($Z = -2.048$, $p = 0.041$), despite an overall improvement in pretest and follow up posttests. There is a statistically significant improvement in the practices of hand washing with soap after coming from outdoors in the post-test I & post-test II, ($Z = -3.909$, $p < 0.001$).

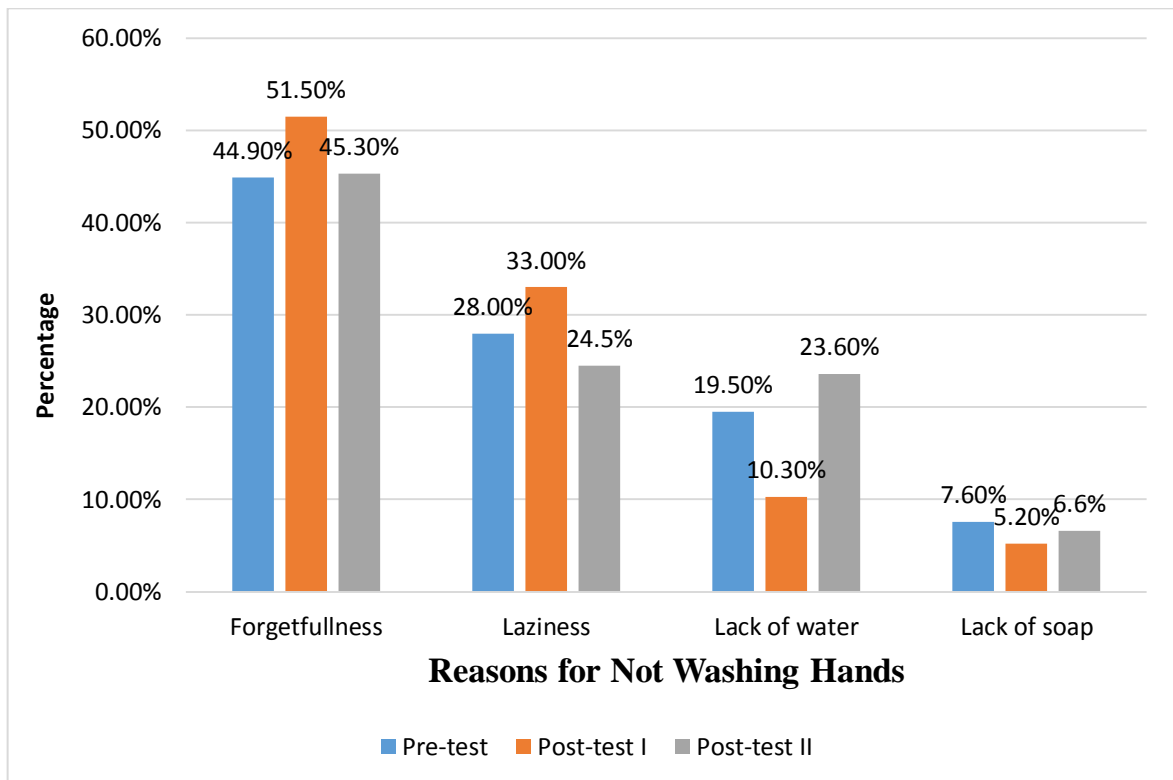


Figure 6: Reasons for not washing hands at two months and four months interval after intervention

Above figure 6, shows that the forgetfulness was the most common reasons mentioned by the study participants for not washing hands at pre-test and post-tests. Initially 19.5% of students mentioned that they not washing hands due to lack of water availability at pre-test. But after intervention it is 10.3% at post-test I and which increased to 23.6% at post-test II. Thus, lack of water is one of main reason for not washing hands in post-test II.

Table 15: Comparison of history of illness and school absenteeism before and after intervention at two months and four months interval after intervention (N=173)

	Pre-test (%) Baseline study (N=173)	Post-test I (%) (After 2 months from pre-test) (N=173)	Post-test II (%) (After 4 months from pre-test) (N=173)	Cochran's Q test statistics	p- value
History of Illness	132 (76.3)	113 (65.3)	89 (51.4)	25.56	<0.001
School absentees due to illness	104 (60.1)	64 (37)	49 (28.3)	36.46	<0.001

About 76.3% had a history of illness,60.1% were absent due to illness at baseline study. After the hand washing health educational interventions, it decreased to 65.3% and 51.4% at two months and four months after intervention. The difference was statistically significant by Cochran's Q test ($p<0.001$).

Table16 A: Comparison of duration of leaves on days at two months and four months interval after intervention

No. of days on leave due to sickness	Pre-test (%) Baseline study (N=104)	Post-test I (%) (After 2 months from pre-test) (N=64)	Post-test II (%) (After 4 months from pre-test) (N=49)	Friedman test statistics	p- value
Less than 3 days	70 (40.5)	50 (28.9)	33 (19.1)	26.86	<0.001*
3 – 7 days	24 (13.9)	14 (8.1)	15 (8.7)		
More than 7 days	10 (5.8)	0	1 (0.6)		
*statistically significant					

Table 16 B: Post hoc analysis with Wilcoxon Signed Rank tests

Wilcoxon Signed Rank Test	Pre-test – post-test I	Pre-test – post-test II	Post-test I – Post-test II
Z	-3.684	-5.082	-1.844
p value	<0.001*	<0.001*	0.65
*statistically significant			

Comparison of pre-test and follow up post-test I & post-test II duration of leave due to illness among study participants is given in Table 16 A and Table 16 B. There is a statistically difference in the number of days on leaves due to illness $\chi^2 = 26.86$, p-value <0.001. Post hoc analysis with Wilcoxon Signed Rank tests is done with a Bonferroni correction applied, resulting in a significance level set at p<0.017. After hand washing intervention by health education there is a

statistically significant decrease on duration of leave at pre-test & post-test I ($Z=-3.684$, $p<0.001$) and also decreases between the pre-test & post-test II ($Z=-5.082$, $p<0.001$) among study participants.

Table 17: Comparison of causes of illness at two months and four months interval after intervention

Diseases	Pre test (N=132)	Post-test I (%) (After 2 months from pre-test) (N=113)	Post-test II (%) (After 4 months from pre-test) (N=89)
Fever	53.80%	48.60%	33.50%
Cold	49.10%	45.10%	32.90%
Stomach pain	33.50%	24.30%	12.10%
Vomiting	20.80%	5.80%	8.70%
Diarrhea	12.10%	4.60%	5.20%
Eye infections	8.70%	8.70%	6.40%
Skin infections	6.90%	4%	6.40%

From the Table 17, fever (53.8%) and cold (49.1%) were the most common causes of illness before intervention. After intervention on hand washing by health education, there are a gradual decrease in the causes of illness after two months and four months after intervention.

Discussion

7. DISCUSSION

The present study aimed

- To assess the effect of health education on hand washing knowledge and practices.
- To assess the effect of hand washing intervention on health outcomes among study participants.

7.1. Socio demographic profile of the study population:

In the present study, majority of the participants (56.1%) were 14 years of age with mean age of 13.7 years. The highest percentage of them belonged to Hindus (93.1%) which can be attributed to Hinduism being the predominant religion of the country.³⁶ In the present study 79.7% and 78.6% of participants' fathers and mothers were literate. The literacy rate of Erode district given by National Family Health Survey 2015-16 (NFHS – 4) and which is 88% & 73.2% for men and women respectively.⁴⁵ On assessment of occupational status it was found that most of the participants' fathers (67.1%) were unskilled workers. Socio economic status of the participants was classified based on B.G.Prasad scale.^{42,43} Most of the participants belonged to the upper middle class (28.3%). Majority of the students (83.8%) had Tamil as their medium of instruction. Regarding the type of family, majority of the students (72.3%) were from nuclear family.

7.2. Baseline Knowledge regarding hand washing and hand hygiene:

In the present study, on assessment of knowledge 78% of participants responded that they wash their hands to prevent from falling sick, 76.3% said that washing hands remove germs, 74% mentioned that hand washing helped in removal of dirt from their hands. Awareness about hand washing was higher in present study, when compared with the study conducted by Priyanka P. Gawai et al, at Mumbai schools.¹ In that study only 26.6% of participants responded that they wash their hands to prevent from falling sick, 39.2% to remove germs and 44% to remove dirt.

According to UNICEF, washing hands before eating food and after toilet use were two most critical moments of hand washing. In this study, 79.8% were aware about washing hands before eating and 83.2% were aware about washing hands after using toilet. In present study, knowledge about washing hands after playing was 76.9%, after touching the dirt/ garbage was 83.8% and after coming from outdoors was 76.3%. In the study conducted by Priyanka P. Gawai et al at Mumbai schools and Damayanthi et al at rural area of Bangalore, the knowledge about the hand washing among their children was low when compared with the present study.^{1,46} The students had good awareness regarding the hand washing and their uses when compared to studies from other parts of the country. This could be because students were taught on hand washing and its importance in class seventh under the Samacheer Kalvi. In present study, students had good knowledge regarding diseases transmitted due to improper hand washing. 80.3% were aware that diarrhea was the most common disease transmitted through

improper hand washing. Followed by common cold (53.8%), worm infestation (49.7%), pneumonia (39.9%) and swine flu (38.2%). In present study, participants had good knowledge when compared with the studies observed at Garg, et al at Delhi, Kumar Amudha et al and Bangladesh by Farzan et al, at Puducherry.^{5, 4, 47}

7.3. Baseline Practices regarding Hand Washing:

Although 79.8% of students were aware that hand washing is must before eating food, only 75.1% reported practising hand washing every time before eating food. Similarly 83% were aware that hand washing is must after toilet use. But only 80% practiced it. In this study, 57.8% students practiced hand washing after playing, 64.2% after touching garbage/dirt and 45% after coming from outdoors. In a study by Priyanka P. Gawai et al, at Mumbai, also reported that there was a gap between awareness and practices of hand washing.¹

Even though students had awareness regarding hand washing, it was practiced by a lesser number. Out of those students who reported not washing hands, 44.9% mentioned forgetfulness as the main reason, followed by laziness (28%). This could be because the students did not perceive the importance of hand washing though they were aware to wash hands. In contrast, lack of water (19.5%) and lack of soap (7.6%) has been mentioned by very few students. In the study conducted by, Merenu et al and Setyautami et al were forgetfulness was the most common reason for not practicing the hand washing.^{26,42}

7.4. Effect of intervention on knowledge:

Following the baseline study and health educational intervention, an interval of two months and four months were given and then post-test I and post-test II were conducted. Post-test questionnaire assessed participant's knowledge, practices of hand washing and health related outcomes.

In this study, there was a statistically significant increase in knowledge among the study participants in two months and four months after intervention from baseline study. After intervention by health education, the percentage of the awareness about health related consequences of not practicing hand washing like sickness and contamination by germs, increased in two months after intervention 87.3% & 83.2% respectively and in four months after intervention by 91.1% & 91.3% respectively.

The present study showed that knowledge on washing hands before meal and after defecation increased and was statistically significant ($p < 0.001$). In this study, there was 15.6 percentage points and 12.8 percentage points increase in awareness of hand washing before food and after toilet use at the end of four months after intervention.

In the study conducted by Shrestha A & Angolkar M at Karnataka there was 31.3 percentage points and 12.5 percentage points increase in awareness of hand washing before food and after toilet use after six months following health educational intervention .³¹

Then knowledge about washing hands by soap after playing and after touching dirt/garbage also increased in two months after intervention and four months after intervention, which was statistically significant ($p < 0.001$). Our findings were similar to a study conducted by Garg, et al among school students at Delhi.⁵ There was a statistically significant increase in the knowledge regarding the importance and methods of hand washing before intervention to after intervention.

There was a statistically significant improvement in the overall knowledge with respect to the importance of hand washing, diseases transmitted through contaminated hands and methods of hand washing after the educational intervention.

7.5. Effect of intervention on hand washing practices:

After intervention by health education, the practice of hand washing increased significantly in present study. There was a positive shift in the hand washing practices. The percentage of students who washed their hands sometimes or never decreased with a corresponding increase in percentage of students who washed hands always.

The improvement in hand washing practice after health educational intervention. There was an increase of 15.7 percentage points before eating, 2.3 percentage points after toilet use, 4.6 percentage points after playing, 9.2 percentage points after touching dirt / garbage and 16.7 percentage points after coming from outdoors in proportion who practiced hand washing after four

months following baseline. Whereas in a study conducted by Kumar Amudha et al at Puducherry, 5.9 percentage points increase in before eating, 9.8 percentage points increase in after toilet use and 10.8 percentage points increase in after playing, there was also a statistically significant improvement in hand washing practices after health educational intervention.⁴ In a study conducted by Shrestha A & Angolkar M 12.5 percentage points increase in before eating, 11.4 percentage points after toilet use and 20.8 percentage points increase in after playing after six months of from baseline.³¹ When compared with these above studies, they were given a single post intervention after baseline study. In present study, the knowledge practice gap decreased after health educational intervention at two months and four months from baseline. This due to the repeated interventional measures and with respect to soap usage, the present study found that 49% of participants used soap for hand washing at the baseline which improved significantly following intervention to 79.8% with p-value ($p < 0.001$). This was similar to the study conducted at Delhi by Garg. et al which was also a school based interventional study.⁵ This study also reported that there was significant improvement in usage of soap in hand washing after intervention and in the study by Shrestha A & Angolkar M and Asiedu MS et al in Ghana hand washing practice of school children with soap increased after intervention.^{31,50}

In a study conducted by Priyanka P. Gawai et al, at Mumbai, found that forgetfulness (88.7%) and laziness (43.7%) were the most common reasons for not washing hands. In the present study forgetfulness (44.9%), laziness (28%),

lack of water (19.5%) and lack of soap (7.6%) were found to be the common reasons for not washing hands.¹

These reflects the behavioral problems towards hand washing. As a reminder schools should display posters to increase hand washing compliance. In the present study, lack of water and soap has been mentioned by very few students. Lopez-Quintero et al also asserted that several developing countries consistently reported lack of soap and unavailability of water.¹⁰ After intervention by health education, there was a significant improvement in the hand washing compliance after intervention followed in two months and four months. Due to two points interventions the increase in the hand washing practices. Where forgetfulness was the most common one but the laziness was decreased and students started practicing the hand washing. It attained because due to the repeated interventions on health education. Where in other studies like Priyanka P. Gawai et al, Shrestha A & Angolkar M , Lopez-Quintero et al and Asiedu MS et.al in Ghana only one time followed after intervention.^{1,10,31,50} All over the world, the main reason for low rates of hand washing is simply because it has not been formed as a habit.

7.6. Effect of intervention on health outcomes:

This study demonstrates that regular hand washing and hygiene may be useful in reducing illness-related absences. In our study 76.3% of the participants had a history of illness during the past two months of baseline study. Among them, 60.1% reported absenteeism due to illness. Among these absentees, 40%

had taken leave for more than a day due to illness. This was similar to the study by Weitzman M et al⁵¹ and Neuzil KM et al⁵², where absenteeism was a major problem among school-aged children, with approximately 75% of all school absences attributed to illness.^{51, 52}

From the Table 17, before intervention it was also seen that out of those who had health problems, majority had fever (53%) , followed by respiratory symptoms like cold (49.1%) and gastrointestinal symptoms like stomach pain (33.5%), vomiting (20.8%) and diarrhea (12.1%). And some of the participants had eye infections (8.7%) and even some of the students suffered from typhoid (1.7%). Our present study was similar to the study conducted by Priyanka P. Gawai et al, at Mumbai, where more than half (54%) of the students had history of illness.¹ Among them, (81.6%) reported absenteeism due to illness. Majority of the students had fever (75%), followed by respiratory symptoms like cold/cough (32.9%) and gastrointestinal symptoms (16.8%).

As hands are an important mode of transmission of infectious disease among school-aged children, hand hygiene is critical in reducing illness related absences. Thus hand washing interventions may reduce the illness-related absences among school students. After the hand washing intervention by health education, there was a significant ($p < 0.001$) reduction in the history of illness and illness related absenteeism among participants. There was 31.8 percentage points reduction in absenteeism among the students after four months health education intervention from baseline.

In a health educational intervention study by Claudia H Lau et al, conducted during influenza season in Chicago schools, when hand hygiene instruction was added to existing hand hygiene practices there was a reduction in illness-related absenteeism rate which was 27%.²⁴ In a study conducted by Bowen et al in Chinese schools, large scale hand washing promotion program was significantly reduced the illness related absenteeism.⁵³

In this present study after the health educational intervention there was 20 percentage points reduction in fever, 16 percentage points reduction in cold and 20 percentage points reduction in gastrointestinal symptoms after four months from baseline. Curtis and Cairncross suggested hand washing promotions can reduce the risk of diarrhea by 47%. A study by Nicholson et al, also suggested that the intervention reduced episodes of diarrhea and ARIs in school children.^{32,54} Whereas in the study by Rafiqul Islam et al, at Bangladesh among school students the incidence of respiratory infections decreased significantly when compared with the baseline data.²⁵ A study in Karachi, Pakistan by Luby SP et al, had demonstrated that regular hand washing and bathing with soap is effective in preventing both diarrhea and pneumonia.⁵⁵ Montessori et al , previously made a link between infection control measures, such as hand washing, and reduction in the transmission of kerato-conjunctivitis in an eye care clinic.⁵⁶

The hand washing practice was not universal. Hand washing practices and frequency of school children with soap increased after health educational intervention in our study. It showed that students were receptive to behavior changes. The goal of this school based intervention program was to improve hand hygiene among the school children with being on hand washing with soap in crucial points like before eating and after toilet use.

Summary & Conclusion

8. SUMMARY & CONCLUSION

A school based health educational interventional study was done to assess the awareness and effectiveness of health education intervention on hand washing practices and their health outcomes among Government school students in Erode district, Tamilnadu.

By Simple random sampling, one Government higher secondary school in Erode district, was selected. A semi structured pre tested questionnaire was used to collect information regarding, socio demographic profile, illness, its duration and school absenteeism, knowledge regarding hand washing awareness about diseases transmitted through unclean hand. Hand washing practices and reasons for not washing was also studied. The information on spread of infection, hand hygiene and practices of hand washing was provided through health education sessions and also by visual and verbal reminders. Health educational interventions like IEC materials, pamphlets, lecture using audio visual aids and demonstration were given on three occasions: once after baseline data collection and two more health education sessions after an interval of two months and four months respectively from the baseline. After the health educational intervention at the above mentioned three occasions post-test I and post-test II data collection were done. Intervention was carried out on 178 students (at baseline) and 173 students (after post test I and post test II) were part of the final analysis due to loss to follow up.

From baseline study, 79.8% were aware about washing hands before eating and 83.2% were aware about washing hands after using toilet. In practice, only 75.1% reported practicing hand washing every time before eating food and 80% practicing after toilet use. The findings led to the conclusion, knowledge regarding hand washing was found to be good but while in practice there was a gap between knowledge and practices at baseline study. More than half (76.3%) of the study population reported a history of illnesses in the past two months and of which 60.1% reported absenteeism due to illness. The health educational intervention in this study was successful in increasing knowledge and awareness and also reduce the gap between knowledge and practice. After health educational intervention, 15.6 percentage points and 12.8 percentage points increase in awareness of hand washing before food and after toilet use at the end of four months after intervention. With regards to practice of hand washing, increase of 15.7 percentage points before eating, 2.3 percentage points after toilet use, 4.6 percentage points after playing, 9.2 percentage points after touching dirt / garbage and 16.7 percentage points after coming from outdoors were seen after four months following baseline which was statistically significant. There was 31.8 percentage points reduction in absenteeism among the participants after four months of health education on hand washing intervention.

This study proves that repeated interventions using multiple channels can help improve the knowledge and also reduce the knowledge- practice gap regarding hand washing.

Limitations

9. LIMITATIONS

1. The study included that the observations were based on self-reported data by the students and the study design did not include any controls.
2. The findings may not generalize to all the children in Erode as the study did not include children attending non- government schools and also in rural areas.

Recommendations

10. RECOMMENDATION

1. A well informed continuous, school health education programme should be delivered to students at early age itself.
2. Visual and verbal reminders.
3. Visual and verbal reminders at strategic locations should be made mandatory to support curricular learning.
4. The facilities related to proper hand washing such as clean water and soap should be made available in certain places in schools in toilets, to enable and encourage students to wash their hands properly at any time.
5. Further studies on involving Teacher led education on hand hygiene and hand washing practices can be done and compared with peer group intervention.
6. A qualitative research involving Focus Group Discussion (FGD) can be conducted to understand about their attitude of hand washing and health outcomes
7. Further studies can be conducted to compare between the urban and rural schools.

References

11. REFERENCES

1. Gawai PP, Taware SA, Chatterjee AS, Thakur HP. A cross sectional descriptive study of hand washing knowledge and practices among primary school children in Mumbai, Maharashtra, India. *Int J Community Med Public Health* 2016;3:2958-66.
2. Hygiene and Hand Washing Statistics- UNICEF DATA [Internet]. UNICEF DATA. 2019 [cited 11 September 2019]. Available from: <https://data.unicef.org/topic/water-and-sanitation/hygiene/>
3. Aiello AE, Coulborn RM, Perez V, Larson EL. Effect of hand hygiene on infectious disease risk in the community setting: A meta-analysis. *Am J Public Health* 2008;98:1372-81.
4. Amudha K, Thulasingam M, Thomas B, Nag B, Rajarethinam K, Ramakrishnan J. How does school based hand-washing promotion program affect the handwashing behavior of students at the urban slums in Puducherry, South India? Mixed method design 2018;7(11):874-878.
5. Garg A, Taneja DK, Badhan SK, Ingle GK. Impact of a School-Based Hand Washing Promotion Program on Knowledge and Hand Washing Behavior of Girl Students in a Middle School of Delhi. *Indian Journal of Public Health*. 2013;57(2):109-112.
6. Curtis V, Danquah L, Aunger R. Planned, motivated and habitual hygiene behaviour: an eleven country review. *Health Educ Res*. 2009;24(4):655-73.
7. Best M, Neuhauser D. Ignaz Semmelweis and the birth of infection control. *Qual Saf Health Care* 2004;13:233-4.
8. Clean Hands Count [Internet]. Centers for Disease Control and Prevention. 2019 [cited 12 September 2019]. Available from: <https://www.cdc.gov/features/handhygiene/index.html>
9. Larson E. APIC guidelines for handwashing and hand antisepsis in health care settings. *American Journal of Infection Control*. 1995;23(4):251-269.

10. Larson E. A Causal Link between Handwashing and Risk of Infection? Examination of the Evidence. *Infection Control and Hospital Epidemiology*. 1988;9(1):28-36.
11. Lopez-Quintero C, Freeman P, Neumark Y. Hand Washing Among School Children in Bogotá, Colombia. *American Journal of Public Health*. 2009;99(1):94-101.
12. Ashraf, S., Islam, M., Alam, M. U., Das, B. K., Afroz, A., Nizame, F. Luby, S. P. (2012). Soapy water: A low-cost solution for hand washing promotion. *American Journal of Tropical Medicine and Hygiene*, 87(5), 429-435.
13. WHO Guidelines on Hand Hygiene in Health Care: First Global Patient Safety Challenge Clean Care Is Safer Care. Geneva: World Health Organization; 2009. 17, Religious and cultural aspects of hand hygiene. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK143998/>
14. Star cricketer Sachin Tendulkar promotes handwashing in India [Internet]. UNICEF. 2019 [cited 12 September 2019]. Available from: https://www.unicef.org/infobycountry/india_45974.html
15. WHO | Clean hands protect against infection [Internet]. Who.int. 2019 [cited 12 September 2019]. Available from: https://www.who.int/gpsc/clean_hands_protection/en/
16. FDA Center for Food Safety and Applied Safety and Nutrition. Handwashing - related research findings. Food safety education. 2019 [cited 12 September 2019] Available from: www.foodsafety.gov/~dms/fsehandw.html
17. Ansari S, Springthorpe V, Sattar S, Tostowaryk W, Wells G. Comparison of cloth, paper, and warm air drying in eliminating viruses and bacteria from washed hands. *American Journal of Infection Control*. 1991;19(5):243-249.
18. Rabie T, Curtis V. Handwashing and risk of respiratory infections: a quantitative systematic review. *Trop Med Int Health*. 2006;11(3):258-67.
19. UNICEF. Pneumonia and diarrhoea. Tackling the deadliest diseases for the world's poorest population 2012. Available from: http://www.unicef.org/eapro/Pneumonia_and_Diarrhoea_Report_2012.pdf

20. Sekhon H, Minhas S. A school based survey on hygiene in a rural area of northern India. *International Journal of Pharma Research and Health Sciences*. 2014;2(2):179-84.
21. Divya S, CR Saju, CJ Navya, Joshy VM, Jini MP, Radhamani MV. A study on selected behavioral factors of mothers influencing acute diarrhoea in under- five children in a rural part of Kerala, India. *Int J Community Med Public Health* 2016;3:2211-6.
22. Mathur P. Hand hygiene: Back to the basics of infection control. *The Indian Journal of Medical Research*. 2011;134(5):611.
23. UNICEF. Water, Sanitation and Hygiene. https://www.unicef.org/wash/3942_43084.html Accessed on 14 August 2019
24. Lau CH, Springston EE, Sohn MW, Mason I, Gadola E, Damitz M, et al. Hand hygiene instruction decreases illness-related absenteeism in elementary schools: a prospective cohort study. *BMC Pediatrics*. 2012;12:52.
25. Hossain S, Banu B, Ahmed KR, Khanom K. Educational Intervention on Hand Washing among the School Children in a Rural Area of Bangladesh Educational Intervention on Hand Washing among the School Children in a Rural Area of Bangladesh. *European academic research - Vol. II, Issue 10 / January 2015*
26. Setyautami T, Sermsri S, Chompikul J. Proper hand washing practices among elementary school students in Selat sub-district, Indonesia. *J Public Heal Dev*. 2012;10(2):3-20.
27. Ryan MAK, Christian RS, Wohlrabe J. Handwashing and Respiratory Illness Among Young Adults in Military Training. 2001;21(2):79–83.
28. Azor-Martínez E, Cobos-Carrascosa E, Gimenez-Sanchez F, Martínez-López J, Garrido-Fernández P, Santisteban-Martínez J et al. Effectiveness of a Multifactorial Handwashing Program to Reduce School Absenteeism Due to Acute Gastroenteritis. *The Pediatric Infectious Disease Journal*. 2014;33(2):e34-e39.
29. Sultana M, Alam Mahumud R, Razzaque Sarker A, Mahmud Hossain S. Hand hygiene knowledge and practice among university students: evidence from Private Universities of Bangladesh. *Risk Management and Healthcare Policy*. 2016 Feb 12;9:13-20.

30. A RKS, Aruna S, Sasikala M. Effectiveness of hand hygiene teaching on knowledge and compliance of hand washing among the students at a selected school in Mugalivakkam village , Kancheepuram District. IOSR Journal of Nursing and Health Science 2014;3(4):56–60.
31. Shrestha A, Angolkar M. Improving hand washing among school children: an educational intervention in South India. Al Ameen J Med Sci. 2015;08(01):81–5.
32. Nicholson JA, Naeeni M, Hoptroff M, Matheson JR, Roberts AJ, Taylor D, et al. An investigation of the effects of a hand washing intervention on health outcomes and school absence using a randomised trial in Indian urban communities. Tropical Medicine and International Health 2014;19(3):284–92.
33. Biran A, Schmidt W, Varadharajan KS, Rajaraman D, Kumar R, Gopalan B, et al. Effect of a behaviour-change intervention on handwashing with soap in India (SuperAmma): a cluster-randomised trial. Lancet Glob Heal. 2(3):e145–54.
34. Ray SK, Amarchand R, Srikanth J, Majumdar KK. A study on prevalence of bacteria in the hands of children and their perception on hand washing in two schools of Bangalore and Kolkata. Indian J Public Health 2011;55:293-7.
35. Tambekar DH, Shirsat SD, Kakde SR, Ambekar KB. Hand hygiene and health : an epidemiological study of students in. Afr. J. Infect. Diseases. 2009;3:26-30.
36. Govt. of India. District Census Handbook, 2011, Office of the General and Census Commissioner, India. Available at: <http://www.censusindia.gov.in/2011census/dchb/DCHB.html>
37. Erode District official website. Available at: http://erode.tn.nic.in/About_Erode_District.html Accessed on 28th June 2019
38. District at Glance. Erode district data Available at: http://erode.tn.nic.in/District_at_Glance.html Accessed on 27th June 2019.
39. Govt. of Tamilnadu. Data on school Available at: <https://tnschools.gov.in> Accessed on 25th July 2019
40. Govt. of India (2013). ANM Training Manual, National health mission, Ministry of Health and Family Welfare, New Delhi. <http://nhm.gov.in/nrhm-components/training-material.html> Accessed on 20th July 2019

41. Govt. of India. WASH & Health Practitioners Training Manual, Water supply & sanitation collaborative council, Ministry of Drinking Water and Sanitation, New Delhi.
42. Singh T, Sharma S. Socio-economic status scales updated for 2017. *Int J Res Med Sci.* 2017 Jul;5(7):3264-3267
43. Prasad BG. Social classification of Indian families. *J Indian Med Assoc.* 1961; 37:250-1.
44. Park K. Park's textbook of Preventive and social Medicine. 25 th ed. Jabalpur: M/s Banarsidas Bhanot; 2019
45. International institute for population sciences, Mumbai. The National Family Health Survey 2015-16. *Rchiips.org.* 2019 [cited 13 September 2019]. Available from: http://rchiips.org/nfhs/FCTS/TN/TN_FactSheet_610_Erode.pdf
46. Damayanthi M N, Ranganatha S C. Effectiveness of Health Education On Knowledge Regarding Personal Hygiene Among School Children in Rural Field Practice Area of Medical College. *Annals of Community Health.* 2016;4(4):8
47. Farzan M, Zerine I, Kabir M, Pavel M, Hossain M. Health Education Intervention on Hand Washing in a selected Primary School Children. *BJDRE [Internet].* 3Jul.2013 [cited 13Sep.2019];2(1):7-1
48. Merenu I, Uwakwe K, Diwe K, Duru CB, Chineke H. Knowledge, Attitude and Practice of Hand-washing amongst Residents of Orlu Metropolis. *International Invention J Medicine and Medical Sciences.* 2015;2(7):101-9
49. Greene EL, Freeman MC, Akoko D, Saboori S, Moe C, Rheingans R. Impact of a School-Based Hygiene Promotion and Sanitation Intervention on Pupil Hand Contamination in Western Kenya: A Cluster Randomized Trial. *Am J Trop Med Hyg.* 2012; 87(3):385-393.
50. Steiner-Asiedu M, Van-Ess SE, Papoe M, Setorglo J, Asiedu DK, Anderson AK. Hand Washing Practices among School Children in Ghana. *Current Research Journal of Social Sciences.* 2011; 3(4):293-300
51. Weitzman M, Klerman LV, Lamb G, Menary J, Alpert JJ: School absence: a problem for the pediatrician. *Pediatrics* 1982, 69:739–746.

52. Neuzil KM, Hohlbein C, Zhu Y: Illness among schoolchildren during influenza season: effect on school absenteeism, parental absenteeism from work, and secondary illness in families. *Arch Pediatr Adolesc Med* 2002, 156:986–991.
53. Bowen A, Ma H, Ou J, et al. A cluster-randomized controlled trial evaluating the effect of a handwashing-promotion program in Chinese primary schools. *Am J Trop Med Hyg* 2007;76:1166–73
54. Curtis V, Cairncross S. Effect of washing hands with soap on diarrhoea risk in the community: a systematic review. *Lancet Infect Dis* 2003;3:275–81.
55. Luby S, Agboatwalla M, Painter J, Altaf A, Billhimer W, Hoekstra R. Effect of Intensive Handwashing Promotion on Childhood Diarrhea in High-Risk Communities in Pakistan. *JAMA*. 2004;291(21):2547.
56. Montessori V, Scharf S, Holland S, Werker DH, Roberts FJ & Bryce E Epidemic keratoconjunctivitis outbreak at a tertiary referral eye care clinic. *American Journal of Infection Control* 1998;26, 399–405

Annexures

ANNEXURE – 1

INFORMATION SHEET

Title of the study:

“Effectiveness of Hand washing intervention on health outcomes of middle school children in a District of Tamil Nadu - 2018”

This study is planned to assess the hand washing knowledge and practice among middle school children through health education intervention.

In this study, questions will be asked regarding your Socio demographic details, impact of hand washing and associated health problems, knowledge and practice of hand washing and the infections spread due to the improper hand washing.

The privacy of the participants in the research will be maintained throughout the study. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared.

Taking part in this study is voluntary. You are free to decide your child's participation in this study or to withdraw at any time. Your decision will not result in any loss of benefits to which your child is otherwise entitled.

The results of the study may be intimated to you at the end of the study period or during the study if anything is found abnormal which may aid in the management or treatment or prevention.

ஆய்வு தகவல் தாள்

இந்த ஆய்வில் சுகாதார நலகல்வி மூலம் நடுநிலைப்பள்ளி குழந்தைகள் மத்தியில் கை கழுவுதல் அறிவு மற்றும் நடைமுறையில் ஏற்படும் மாற்றங்களை மதிப்பீடு செய்ய திட்டமிடப்பட்டுள்ளது. இந்த ஆய்வில், சமூக விவரங்கள், கை கழுவுதல், அதன் தொடர்புடைய உடல்நலப் பிரச்சினைகள் மற்றும் தவறான கை கழுவுதல் காரணமாக பரவும் தொற்றுகள் பற்றிய விவரங்கள் அறியப்படும்.

இந்த ஆய்வின் முடிவுகளை அல்லது கருத்துக்களை வெளியிடும் போதோ அல்லது ஆய்வின் போதோ தங்களது குழந்தையின் பெயரையோ அல்லது அடையாளங்களையோ வெளியிட மாட்டோம் என்பதையும் தெரிவித்துக்கொள்கிறோம்.

இந்த ஆய்வில் தங்கள் குழந்தை பங்கேற்பது தங்களுடைய விருப்பத்தில் பேரில் தான் இருக்கிறது. மேலும் தங்கள் குழந்தை எந்நேரமும் இந்த ஆய்விலிருந்து வெளியேறலாம் என்பதையும் தெரிவித்துக்கொள்கிறோம்.

இந்த ஆய்வின் முடிவுகளை ஆய்வின் போது அல்லது ஆய்வின் முடிவின் போது தங்களுக்கு அறிவிப்போம் என்பதையும் தெரிவித்துக்கொள்கிறோம்.

ANNEXURE – 2

INFORMED CONSENT FORM

“Effectiveness of Hand washing intervention on health outcomes of middle school children in a district of Tamil Nadu – 2018”

Name of the participant:

Age/Sex:

Study ID No:

Date:

- (1) I have been explained in detail about the study and its procedure. I confirm that I had completely understood the study and have had the opportunity to ask questions
- (2) I understand that my child’s participation in the study is voluntary and that I am free to withdraw my child at any time, without giving any reason, without their medical care or legal rights being affected.
- (3) I understand that the principal investigator, others working on the investigator’s behalf, the Ethics Committee and the regulatory authorities will not need my permission to look at my child’s health records both in respect of the current study and any further research that may be conducted in relation to it, even if I withdraw my child from the trial. I agree to this access. However I understand that my child’s identity will not be revealed in any information released to third parties or published.
- (4) I agree not to restrict the use of any data or results that arise from this study provided such a use is only for scientific purpose(s).
- (5) I agree my child’s participate in the above study.

Signature of investigator

Signature of the parent

Date:

Date:

ஆய்வு ஒப்புதல் கடிதம்

பெயர்:

ஆய்வு சேர்க்கை எண்:

வயது:

தேதி:

பால்:

1. இந்த ஆய்வின் விவரங்களும் அதன் நோக்கங்களும் முழுமையாக எனக்கு தெளிவாக விளக்கப்பட்டது. எனக்கு விளக்கப்பட்ட விஷயங்களை நான் புரிந்து கொண்டு நான் எனது சமதத்தைத் தெரிவிக்கிறேன்.
2. இந்த ஆய்வில் பிறரின் நிர்பந்தமின்றி என் சொந்த விருப்பத்தின் பேரில் தான் என் குழந்தை பங்கு பெறுகிறான் மற்றும் இந்த ஆய்விலிருந்து எந்நேரமும் வெளியேறலாம் என்பதையும் அதனால் எந்த பாதிப்பும் ஏற்படாது என்பதையும் நான் புரிந்து கொண்டேன்.
3. இந்த ஆய்வின் விவரங்களை கொண்ட தகவல் தாளை பெற்றுக்கொண்டேன். நான் என்னுடைய சுயநினைவுடன் மற்றும் முழு சுதந்திரத்துடன் இந்த மருத்துவ ஆய்வில் என் குழந்தையை சேர்த்துக்கொள்ள சம்மதிக்கிறேன்.
4. ஆய்வாளர் மற்றும் அவரை சார்ந்தவர்களோ நெரிமுறைக்குழு உறுப்பினர்களோ என் குழந்தை இந்த ஆய்விலிருந்து விலகினாலும் என்னுடைய அனுமதியின்றி என் குழந்தையின் உடல்நிலை குறித்த தகவல்களை இந்த ஆய்விற்கோ இது தொடர்பான வேற ஆய்விற்கோ பயன்படுத்திக்கொள்ள முடியும் என்று புரிந்து கொண்டு சம்மதம் அளிக்கிறேன். ஆனாலும் என் குழந்தையின் அடையாளம் வெளியிடப்பட மாட்டாது என்பதை புரிந்து கொள்கிறேன்.
5. இந்த ஆய்வின் தகவல்களையும் முடிவுகளையும் அறிவியல் நோக்கத்திற்காக பயன்படுத்துவதற்கு நான் அனுமதிக்கிறேன். இந்த ஆய்வில் என் குழந்தையை பங்குப்பெற நான் சம்மதிக்கிறேன்.

ஆராய்ச்சியாளர் கையொப்பம்

பெற்றோர் கையொப்பம்

தேதி:

தேதி:

ANNEXURES-III

QUESTIONNAIRE

1. Name
2. Age
- 3.

Educational status	Father	Mother
Illiterate		
Primary school		
High school		
Higher secondary school		
Graduate		

- 4.

Occupation	Father	Mother
Unskilled		
Semi-skilled/skilled		
Don't know		
Stay at home		

5. Monthly Income of the family :
6. Religion:
7. School Medium: Tamil / English
8. Household members in the family :
9. Family type: a) Nuclear family b) Joint family
10. History of illness in past three month a)yes b)no
11. If yes, mention the symptoms of illness

S.No	Symptoms	Yes	No	Episodes
1	Fever			
2	Cold / cough			
3	Stomach ache			
4	Vomiting			
5	Loose motion			
6	Skin			
7	Eye			
8	Passing worms			
9	Jaundice			
10	Typhoid			

12. Missed school in past 3months because of any illness a) yes b) no

13. If yes , How may days _____

14. Why is it essential to wash hands

To prevent from falling sick	
To remove germs	
To remove dirt	

15. When is it essential to wash hands

Before eating	
After eating	
After toilet use	
After playing	
After touching dirt / garbage	
After coming from outdoors	

16. Which are the disease/diseases transmitted through unclean hand

Diarrhea	
Pneumonia	
Common cold	
Swine flu	
Worm infestation	
Eye infections	
Skin infections	
Jaundice	
Typhoid	

17. How do you wash your hands

- a) With Water only
- b) With Soap and water

Hand washing practices:

18. Do you Hand wash before eating food

- a) Always
- b) Sometimes
- c) Never

19. Do you wash hands with soap after toilet use

- a) Always
- b) Sometimes
- c) Never

20. Do you wash hands with soap after playing

- a) Always
- b) Some times
- c) Never

21. Do you wash hands with soap after touching dirt/garbage

- a) Always
- b) Some times
- c) Never

22. Do you wash hands with soap after coming from outdoors

- a) Always
- b) Some times
- c) Never

23. What are the Reasons for not washing hands with soap with water

(sometimes or never)

- a) Forgetfulness
- b) Laziness
- c) Lack of water
- d) Lack of soap

கேள்வித்தாளை

1. பெயர்:
2. வயது:
- 3.

கல்வித் தகுதி	அப்பா	அம்மா

4.

தொழில்	அப்பா	அம்மா

5. குடும்பத்தின் மாத வருமானம்?
6. மதம்:
7. தமிழ் / ஆங்கிலவழிக்கல்வி
8. குடும்பநபர்கள் மொத்த எண்ணிக்கை:
9. குடும்ப வகை: தனி குடும்பம்/ கூட்டுக்குடும்பம்
10. கடந்த மூன்று மாதங்களில் உடல்நலகுறைவு ஏதேனும் ஏற்பட்டுள்ளதா? அ) ஆம் ஆ) இல்லை
11. ஆம் எனில்,

	அறிகுறிகள்	ஆம்	இல்லை	எத்தனை முறை
1	காய்ச்சல்			
2	சளி / இருமல்			
3	வயிற்று வலி			
4	வாந்தி			
5	வயிற்று போக்கு			
6	தோல் சம்மந்தப்பட்ட			
7	கண் சம்மந்தப்பட்ட			
8	மலத்தில்புழுக்கள்கழித்தல்			
9	மஞ்சள் காமாலை			
10	டைபாய்டு			

12. கடந்த மூன்று மாதங்களில் உடல்நலகுறைவால் பள்ளிக்கு செல்லாமல் இருந்துள்ளீர்களா? அ) ஆம் ஆ) இல்லை
13. ஆம் எனில், எத்தனை நாட்கள்:
14. எதற்காக கை கழுவுதல் வேண்டும்

கிருமிகளை நீக்குவதற்கு	
உடல் நலக்குறைவு வராமல் தடுப்பதற்கு	
அழுக்குகளை நீக்குவதற்கு	

15. எப்பொழுதெல்லாம் கை கழுவுதல் வேண்டும்

சாப்பிடும் முன்பு	
சாப்பிட்ட பின்பு	
கழிப்பறை உபயோகித்தப் பின்பு	
விளையாடிய பின்	
அழுக்கு/குப்பைகளை தொட்ட பின்	
வெளியில் சென்று வந்த பின்பு	

16. சுத்தமற்ற கைகளினால் பரவக்கூடிய நோய்கள் யாவை?

வயிற்று போக்கு,	
நிமோனியாச் சளி,	
சளி / இருமல்	
பன்றிக் காய்ச்சல்,	
குடற்புழு	
தோல் சம்மந்தப்பட்ட	
கண் சம்மந்தப்பட்ட	
மஞ்சள் காமாலை	
டைபாய்டு	

17. நீங்கள் எதை வைத்து கைகளை சுத்தம் செய்வீர்? i) தண்ணீர் உபயோகித்து,ii) தண்ணீர் மற்றும் சோப்பு

		எப்பொழுதும்	சில நேரங்களில்,	எப்பொழுதும் இல்லை
18.	நீங்கள் உங்கள் கைகளை சாப்பிடும் முன் சுத்தம் செய்வீர்களா?			
19.	நீங்கள் கழிவறை பயன்படுத்தியப் பின் சோப்பு கொண்டு கைகளைக் கழுவுவீர்களா?			
20.	விளையாடிய பின் சோப்பு கொண்டு உங்கள் கைகளைக் கழுவுவீர்களா?			
21.	அழுக்கு/குப்பைகளை தொட்ட பின் சோப்பு கொண்டு உங்கள் கைகளைக் கழுவுவீர்களா?			
22.	நீங்கள் வெளியில் சென்று வந்த பின்பு சோப்பு கொண்டு உங்கள் கைகளைக் கழுவுவீர்களா?			

23. சோப்பு மற்றும் தண்ணீர் கொண்டு உங்கள் கைகளை சுத்தம் செய்யாதற்கு காரணங்கள் என்ன?

- I. மறதி,
- II. சோம்பேறித்தனம்,
- III. தண்ணீர் இருப்பதில்லை,
- IV. சோப்பு இல்லை

ANNEXURE – IV

INSTITUTIONAL ETHICS COMMITTEE MADRAS MEDICAL COLLEGE, CHENNAI 600 003

EC Reg.No.ECR/270/Inst./TN/2013
Telephone No.044 25305301
Fax: 011 25363970

CERTIFICATE OF APPROVAL

To
Dr.Thamarai Kannan.R
1st Year Post Graduate in M.D. Community Medicine
Institute of Community Medicine
Madras Medical College
Chennai

Dear Dr.Thamarai Kannan.R.,

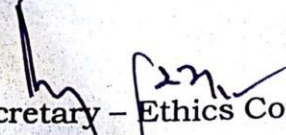
The Institutional Ethics Committee has considered your request and approved your study titled **"EFFECTIVENESS OF HAND WASHING INTERVENTION ON HEALTH OUTCOMES OF MIDDLE SCHOOL CHILDREN IN A DISTRICT OF TAMIL NADU 2018" - NO.10122017**

The following members of Ethics Committee were present in the meeting hold on **12.12.2017** conducted at Madras Medical College, Chennai 3

- | | |
|--|----------------------|
| 1. Prof.P.V.Jayashankar | :Chairperson |
| 2. Prof.R.Narayana Babu,MD.,DCH., Dean,MMC,Ch-3 | : Deputy Chairperson |
| 3. Prof.Sudha Seshayyan,MD., Vice Principal,MMC,Ch-3 | : Member Secretary |
| 4. Prof.N.Gopalakrishnan,MD,Director,Inst.of Nephrology,MMC,Ch | : Member |
| 5. Prof.S.Mayilvahanan,MD,Director,Inst. of Int.Med,MMC, Ch-3 | : Member |
| 6. Prof.A.Pandiya Raj,Director, Inst. of Gen.Surgery,MMC | : Member |
| 7. Prof.Shanthy Gunasingh, Director, Inst.of Social Obstetrics,KGH | : Member |
| 8. Prof.Remma Chandramohan,Prof.of Paediatrics,ICH,Chennai | : Member |
| 9. Prof. Susila, Director, Inst. of Pharmacology,MMC,Ch-3 | : Member |
| 10.Prof.K.Ramadevi,MD., Director, Inst. of Bio-Chemistry,MMC,Ch-3 | : Member |
| 11.Prof.Bharathi Vidya Jayanthi,Director, Inst. of Pathology,MMC,Ch-3: | Member |
| 12.Thiru S.Govindasamy, BA.,BL,High Court,Chennai | : Lawyer |
| 13.Tmt.Arnold Saulina, MA.,MSW., | :Social Scientist |
| 14.Thiru K.Ranjith, Ch- 91 | : Lay Person |

We approve the proposal to be conducted in its presented form.

The Institutional Ethics Committee expects to be informed about the progress of the study and SAE occurring in the course of the study, any change in the protocol and patients information/informed consent and asks to be provided a copy of the final report.


Member Secretary - Ethics Committee

ANNEXURE – V



Urkund Analysis Result

Analysed Document:	EFFECTIVENESS OF HAND WASHING INTERVENTION ON HEALTH OUTCOMES OF MIDDLE SCHOOL CHILDREN IN A DISTRICT OF TAMIL NADU - 2018.docx (D57221954)
Submitted:	10/18/2019 10:36:00 AM
Submitted By:	rtkannan11@gmail.com
Significance:	10 %

Sources included in the report:

https://en.wikipedia.org/wiki/Hand_washing
<https://www.livechennai.com/detailnews.asp?newsid=37246>
<https://docplayer.net/55711026-Factors-influencing-hospital-infection-prevention-and-control-practices-among-medical-staff-in-kisii-level-five-hospital-kisii-county-kenya.html>
https://www.ccohs.ca/oshanswers/diseases/washing_hands.html

CERTIFICATE

This is to certify that this dissertation work titled **“Effectiveness of hand washing intervention on health outcomes of middle school children in a district of Tamil Nadu - 2018”** of the candidate **Dr. Thamarai Kannan .R** with registration number **201725003** for the award of **M.D. Degree** in the **BRANCH XV - COMMUNITY MEDICINE**. I personally verified the urkund.com website for the purpose of plagiarism check. I found that the uploaded thesis file contains from introduction to conclusion pages and result shows **10 Percentage** of plagiarism in the dissertation.

Guide and Supervisor sign with seal

ANNEXURE VI

Modified BG Prasad's scale January 2017

Socioeconomic class		Per capita monthly income (in Rs.)	
		In 1961	In 2017
I	Upper class	≥ 100	≥ 6254
II	Upper middle class	50-99	3127-6253
III	Middle class	30-49	1876-3126
IV	Lower middle class	15-29	938-1875
V	Lower class	<15	<938

ANNEXURE VII

Key to Master Chart

Label	Coding
Educational status	1- Illiterate 2- Primary school 3- High school 4- Higher secondary school 5- Graduate
Occupation	1- Unskilled 2- Semi-skilled/skilled 3- Don't know 4- Stay at home
Religion	1- Hindu 2- Christian 3- Muslim
School medium	1- Tamil 2- English
House hold members	1- Two members 2- Three to Five members 3- More than five members
Type of Family	1- Nuclear family 2- Joint family
Hand washing practices:	1- Never 2- Sometimes 3- Always
Reasons for not washing hands	1- Forgetfulness 2- Laziness 3- Lack of water 4- Lack of soap

ANNEXURE IX

LESSON PLAN / PAMPLETS / POSTERS

Name of the facilitator: Dr.Thamarai Kannan R

Class: Middle school children

Duration: 25 minutes

Number of Learners: 40

Venue: Seminar Hall

Topic: **Hand Washing**

Specific Learning Objectives:

At the end of the session the learners must be able to

1. Describe importance of hand washing and its uses
2. Enumerate the diseases transmitted through unclean hands
3. Enlist the hand washing steps
4. Enumerate the occasions to wash hands
- 5.

Teaching- Learning method: Lecture

Teaching aid: Power point presentation, LCD projector, posters

Sl.No.	Content	Domain	Time
1	Set Induction	Cognitive	2 minutes
2	Hand washing <ul style="list-style-type: none">• Importance of hand washing• Diseases transmission through unclean hands• When to perform hand washing• Steps of hand washing	Cognitive	20 minutes
3	Summary	Cognitive	3 minutes

References:

1. WHO | Clean hands protect against infection [Internet]. Who.int. 2019 [cited 12 September 2019]. Available from: https://www.who.int/gpsc/clean_hands_protection/en/
2. UNICEF. Pneumonia and diarrhoea. Tackling the deadliest diseases for the world's poorest population 2012. Available from: http://www.unicef.org/eapro/Pneumonia_and_Diarrhoea_Report_2012.pdf

PAMPLETS / POSTERS
STEPS OF HAND WASHING

கை கழுவுதல் முறைகள்



Step-1

உள்ளங்கை



Step-2

பின்பக்கம்



Step-3

விரல் இடுக்குகள்



Step-4

விரல் மடிப்புகள்



Step-5

கட்டை விரல்



Step-6

நகக்கண்கள்



Step-7

மணிக்கட்டு

**சாப்பிடுவதற்கு முன்பும்,
கழிவறையை பயன்படுத்திய
பின்பும் கைகளை கழுவுவது
யிகவும் அவசியமானது**



Step-1

Rub palms together



Step-2

Rub the back
of both hands



Step-3

Interlock fingers
and rub the
hands together.



Step-4

Interlock fingers and
rub the back of fingers
of both hands



Step-5

Rub thumb in a rotating manner
followed by the area between
index finger & thumb.



Step-6

Rub fingertips
on palm for both hands



Step-7

Rub both wrists in
a rotating manner
rinse and dry thoroughly.

PAMPLETS / POSTERS



எப்பொழுதும் வேண்டும் இந்தப்பழக்கம்
சாப்பிடுவதற்குமுன்பும், மலம் கழித்த
பின்பும் சோப்பினால் கைகளை
நன்கு கழுவவேண்டும்



Stop Germs! Stay Healthy! Wash Your Hands

WHEN?

- Before, during, and after preparing food
- Before eating food
- Before and after caring for someone who is sick
- Before and after treating a cut or wound
- After using the toilet
- After changing diapers or cleaning up a child who has used the toilet
- After blowing your nose, coughing, or sneezing
- After touching an animal, animal feed, or animal waste
- After handling pet food or pet treats
- After touching garbage

HOW?

- **Wet** your hands with clean, running water (warm or cold), turn off the tap, and apply soap.
- **Lather** your hands by rubbing them together with the soap. Be sure to lather the backs of your hands, between your fingers, and under your nails.
- **Scrub** your hands for at least 20 seconds. Need a timer? Hum the "Happy Birthday" song from beginning to end twice.
- **Rinse** hands well under clean, running water.
- **Dry** hands using a clean towel or air dry them.

Keeping hands clean is one of the most important things we can do to stop the spread of germs and stay healthy.



For more details on handwashing, visit CDC's Handwashing Website at www.cdc.gov/handwashing

POSTER

