

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

Kumar Amudha, Mahalakshmy Thulasingham, Bitty Thomas, Bharath Nag, Kanagarethinam Rajarethinam, Jayalakshmy Ramakrishnan

Department of Preventive Social Medicine, Jawaharlal Institute of Post-graduate Medical Education and Research, Puducherry, India

Correspondence to: Mahalakshmy Thulasingham, E-mail: mahalakshmi.dr@gmail.com

Received: March 14, 2018; Accepted: July 25, 2018

ABSTRACT


Background: Handwashing is vital to prevent infections, especially among children of an urban slum. The handwashing habit needs to be inculcated at an early age. **Objectives:** The objectives of this study is (1) to determine the effect of a school-based handwashing promotion program on the knowledge and practice of handwashing among students of age 11–18 years and (2) to explore the facilitating and hindering factor for the behavior change. **Materials and Methods:** It is a sequential explanatory mixed method study done in two schools in an urban slum of Puducherry. The students' baseline knowledge and practice of handwashing were assessed using a self-administered questionnaire and observation checklist. During the school-based handwashing promotion week, the students had interactive health education sessions and poster/essay/elocution competitions. The posters made by the students were displaced in classrooms. Two weeks later, post-test was conducted. Two group interviews were done among the students. Change in knowledge and practice was compared using Chi-square test. Manual content analysis of the transcripts of the group interview was done. **Results:** Around 194 students were involved in the study. With the intervention, knowledge of students improved, particularly the correct duration of handwashing and the role of hand drying. The students learned the six steps of handwashing. After the observation of the handwashing 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. **Conclusion:** Intensive health education program with active involvement of students and reinforcement are essential for behavior change.

KEY WORDS: Hand Disinfection; School-Based Program; Participatory Health Education; Urban Slum Children

INTRODUCTION

The practice of handwashing prevents transmission of infections and lowers the incidence of pneumonia by 50%

and diarrhea by 53%.^[1] Handwashing has “herd effect,” and it benefits everyone in the community by decreasing the transmission of germs in the local environment.^[2] Handwashing with soap decreases one of three episodes of diarrheal illnesses and one of six episodes of respiratory infections.^[2,3] Illness-related absenteeism reduces by 26% among school children who received intervention on handwashing.^[4] Handwashing is critical for children because of their weak immune system, especially for children of urban slums who live in poor sanitary conditions.^[5] Despite the overwhelming importance of handwashing, reaching high levels of compliance in the community is challenging. A study done in a middle school

Access this article online	
Website: http://www.ijmsph.com	Quick Response code 
DOI: 10.5455/ijmsph.2018.0307725072018	

International Journal of Medical Science and Public Health Online 2018. © 2018 Mahalakshmy Thulasingham, et al. This is an Open Access article distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), allowing third parties to copy and redistribute the material in any medium or format and to remix, transform, and build upon the material for any purpose, even commercially, provided the original work is properly cited and states its license.

in Delhi found that knowledge and practice of handwashing were low (22%).^[6] School-based handwashing interventions have the advantage of reaching a large number of children who are in the habit-forming stage.^[7] Behavioral change done at an early age will significantly impact their entire life. It will also affect the future generation. Children are likely to spread the information to their parents and siblings.^[6] School children receive health education as part of the handwashing day, observed on October 15th of every year. Besides, the Government of India has launched a national campaign, Swachh Bharat Abhiyan. Its primary objective is a clean environment with emphasis on developing clean sanitary habits.^[8] Under this program, there is a widespread health

education on sanitation. In the background, this study aims to determine the knowledge and practice of handwashing among urban school children of age 11–18 years. It also aims to determine the effect of a school-based handwashing promotion program on the handwashing behavior among students of age 11–18 years and to explore the factors which facilitated and hindered the change in the handwashing behavior.

Table 1: Hand washing practices based on steps involved in proper hand washing

Steps of hand washing	Pre-test, n=190 (%)	Post-test, *n=194 (%)
Step 1: Palm to palm	178 (93.7)	194 (100)
Step 2: Right palm over left dorsum with the interlaced fingers and vice versa	125 (65.8)	191 (98.5)
Step 3: Palm to palm with fingers interlaced for finger web	145 (76.3)	179 (92.3)
Step 4: Back of finger to opposing palms with fingers interlocked	85 (44.7)	175 (90.2)
Step 5: Rotational rubbing of left thumb clasped in right palm and vice versa	118 (62.1)	183 (94.3)
Step 6: Rotational movement in palm	64 (33.7)	170 (87.6)
All six steps	18 (9.5)	133 (68.6)

*The difference between post-test and pre-test proportion was statistically significant ($P < 0.001$)

Table 2: Knowledge and practice of hand-washing among the students

Student's knowledge/practice	Pre-test, n=190 (%)	Post-test, n=194 (%)	P
Knowledge of diseases transmitted by poor hand-washing practice			
Diarrhoea	79 (41.6)	137 (70.6)	<0.001
Cold	42 (22.1)	62 (32.0)	0.3
Knowledge on the duration of scrubbing the hand during hand-washing			
At least 20 s (recommended duration)	55 (28.9)	142 (73.2)	<0.001
Knowledge on the importance of hand drying			
Hand drying is important	148 (77.9)	169 (87.6)	0.02
The practice of using soap			
Before eating	57 (30.0)	87 (44.8)	0.004
After toilet use	147 (77.4)	169 (87.1)	0.02

MATERIALS AND METHODS

Study Design

The study was a sequential explanatory type of mixed method study. The quantitative phase assessed the effect of school-based handwashing promotion week using pre–post design. Following the post-test, we did two group interviews among students for obtaining the complete picture of the facilitating and hindering factors for the change in handwashing behavior.

Study Setting

This study was done in Puducherry, South India. Puducherry district has high child literacy rate (89%) and good health indicators such as 100% institutional delivery and low infant mortality rate (11/1000 live births).^[9,10] The study was conducted in two government schools in the service area of the Urban Health and Training Center of a Medical College in Puducherry, in 2014. Most of the students were from an urban slum.

Study Subjects

Students studying in class 6–11 standards in the selected school were included in the study after obtaining informed consent from parents and assent from the students.

Sample Size and Sampling

The sample size was calculated using the proportion of students washing their hands after toilet use as 75% based on the preliminary survey done in the school by the health center. We anticipated that the intervention would increase the handwashing behavior by at least 15%. Using alpha error of 5%, beta error of 10%, and 15% allowance for the incompletely filled questionnaire, we calculated a sample size of 175. Two schools in the service area of the health center were selected according to the availability of the students and after obtaining permission from the school administration. From each school, two classes were feasibly selected, in consultation with the school principal. All the students took part in the intervention.

Study Procedure

The Institute Research and Ethics Committee of Jawaharlal Institute of Post-graduate Medical Education and Research approved the study. The students' baseline knowledge and

self-reported practice of handwashing were assessed using an anonymous, self-administered, pre-designed, pre-tested structured questionnaire in the local language Tamil. While students filled the questionnaire, the investigators were available to clarify the student's doubts and to ensure the completeness of the form. Students then demonstrated how they usually wash their hands. We used observation checklist to note if each student performed the six steps of handwashing. The six steps are mentioned in Table 1. Following the pre-test, handwashing promotion week was observed in the school.

The handwashing promotion week was planned along with the school principal and teachers. We included interactive health education session, competitions for the posters, elocution, and essay writing. These competitions were intended to foster student participation and self-learning. All the students participated in at least one of these competitions and were given prizes for participation. The posters were displayed on the school notice board and classrooms. Interactive health education session was also held using a video made in local language. The contents of the health education were based on the WHO recommendation on hand washing.^[11] The results of pre-test were incorporated in the health education. Six steps of handwashing were demonstrated. During the session, students were motivated to clarify their doubts. 2 weeks after the observation of handwashing week, the post-test was conducted. Their handwashing technique was noted using the checklist used in the pre-test. Following the post-test, group interviews were done to explore the factors which facilitated and hindered their change in hand washing behavior. Two group interviews were done (one in each school), with 8–10 students in each. Vocal and willing students were included in the interview. The interview guide was prepared and reviewed by a faculty and medical officer-in-charge of the health center. The group interview was done on the premises of the school by the second author who was formally trained in qualitative research. During

the interview, only the investigators and the participants were available in the room to enable free discussion. The interview was audio-recorded after obtaining the permission. Transcript of the interview was done within 2 weeks.

Statistical Analysis

Data entry and analysis were done in SPSS Version 19 and OpenEpi software V3.03. Data were collected anonymously, and hence, pairing of the student's pre- and post-test data was not possible. Hence, the Chi-square test was performed for comparing categorical data of the pre-test and post-test. A $P < 0.05$ was considered as statistically significant. A manual content analysis was done for the qualitative data. We used a set of a priori codes generated after reading the transcripts. The analysis was done by two investigators, and differences were solved through discussion.

RESULTS

In total, 190 students completed the pre-test and 194 completed the post-test. Around 96% of them were girls. The student's age ranged from 10 to 18 years with a mean of 15 years (Standard deviation=2). Around 26% of students' mothers were illiterate, 20% were educated up to primary, 5% had received secondary school education, and the rest 49% of the children's mother had higher secondary or graduate education.

In the pre-test, <50% of students had correct knowledge of diseases transmitted by improper handwashing and duration of scrubbing. The student's knowledge improved with respect to the recommended duration for hand scrubbing, the importance of hand drying, and diseases transmitted by poor handwashing behaviour [Table 2]. Noteworthy, the source of information for the students in our study was mainly

Table 3: Self-reported hand washing practice among students, pre-test $n=190$, post-test $n=194$

Pre-test/post-test	Always	Often	Sometimes	Rarely	Never	P
Before eating						
Pre-test	166 (87.4)	9 (4.7)	7 (3.7)	6 (3.2)	2 (1.1)	0.048
Post-test	181 (93.3)	3 (1.5)	9 (4.6)	1 (0.5)	0	
After toilet use						
Pre-test	144 (75.8)	24 (12.6)	17 (8.9)	5 (2.6)	0	0.002
Post-test	166 (85.6)	21 (10.8)	7 (3.6)	0	0	
After playtime						
Pre-test	128 (67.4)	30 (15.8)	24 (12.6)	4 (2.1)	4 (2.1)	0.327
Post-test	140 (72.2)	25 (12.9)	22 (11.3)	7 (3.6)	0	
After sneezing/coughing						
Pre-test	92 (48.4)	35 (18.4)	43 (22.6)	9 (4.7)	11 (5.8)	0.048
Post-test	109 (56.2)	39 (20.1)	29 (14.9)	14 (7.2)	3 (1.5)	
After reaching home						
Pre-test	100 (52.6)	29 (15.3)	26 (13.7)	16 (8.4)	19 (10)	0.009
Post-test	123 (63.4)	24 (12.4)	27 (13.9)	15 (7.7)	5 (2.6)	

Table 4: Facilitating and hindering factors for change in hand washing behavior as opined by the students

Themes	Categories	Codes
Facilitating factors for change in handwashing behavior	Health education by health professionals	Credibility of the message Giving examples improves comprehension
	Display of poster/art of the students	Interesting Reinforcement of the message
	Active involvement of students	Listened carefully the health education message given by friends Interesting to watch my friends painting and drawings
Hindering factors for change in handwashing behavior	Student factors	Laziness of students Fear of being teased by peers
	Infrastructure of wash area in school	Insufficient taps Dirty wash area Non-availability of soap in schools
	Poor knowledge	On the importance of handwashing Misconceptions
Dissemination of the message their family	Reaction of parents	Only a few listened actively
	Reaction of siblings	Listened and changed behavior
Suggestions to improve the behavior	Poster to be placed near the black board	
	Reinforcement by teachers	

doctors (71%). Teachers were the source of information for only 36.8% of them. In the pre-test, 87% of students always washed their hands before eating, 76% after toilet use, and 48% after sneezing or coughing. After the intervention, there was a positive shift in the handwashing behavior. The percentage of students who washed their hands rarely or never decreased with a corresponding increase in better handwashing behavior. This was found to be statistically significant. The improvement in handwashing behavior after toilet use, sneezing, and reaching home was statistically significant [Table 3]. During the pre-test, only 9% followed all the steps of handwashing. The most common steps which were missed were the Step 4 (back of fingers to opposing arm with fingers interlocked) and the Step 6 (rotational rubbing, backward and forward with clasped fingers of right hand in left palm, and vice versa). In the post-test, 69% of students followed all the steps of handwashing. Handwashing promotion week improved the practice of using soap before eating by 15% and after toilet use by 10% [Table 1].

The themes, categories, and codes of the group interview are summarized in Table 4. Students mentioned their understanding was better when the health messages were given by the health professionals as they gave many examples. They felt that health professionals are credible as they would narrate their experiences. They appreciated the various competitions held for the students during the handwashing promotion week. A student told *"My poster was put on the notice board. I was proud of it"*. One of the hindering factors mentioned by the students was the fear that their peers will tease them *"Don't show-off too much."* The students commented that some students have the misconception that they have to wash hands only when it is visibly dirty. Inadequate and poorly maintained wash area also demotivated students from washing hands.

With regard to dissemination of health message to their family, students opined that their siblings actively listened to them. One student commented, *"Only half of our parents listened to us and of them, only half gave importance to the message and changed their behaviour"*. Students suggested that the teachers should regularly reinforce the health messages. Student's opined *"The poster that we made for the art competition should be placed next to the blackboard. We will be constantly seeing it. This will remind and motivate us to wash hands."* [Table 4].

DISCUSSION

We studied the effect of an interactive school-based handwashing promotion week on the knowledge and practice of handwashing. With the intervention, knowledge of students improved particularly the correct duration of handwashing and the role of hand drying. The intervention positively changed the handwashing behavior among students. The students learned the six steps of handwashing. After the observation of the handwashing promotion week, the number of students who used soap for washing hands, especially before eating and after using the toilet, increased.

Students, in our study, had poor knowledge regarding diseases transmitted due to improper handwashing as compared to that observed in Delhi.^[6] In the pre-test, only one-fourth of the children knew the recommended duration of handwashing in the pre-test. In spite of the inclusion of handwashing in the school curriculum, the knowledge of students was poor. This emphasizes that intensive and repeated health education programs on major health issues are needed to improve the health literacy of students. Active involvement of the student in health education has a greater

impact on the students.^[12] Our intervention actively engaged the students and student also voiced this in the focus group discussion (FGD).

In the pre-test, 87% and 76% of students reported that they “always” wash hands before eating and after using the toilet, respectively. Although it was better than that observed in Karnataka.^[13] The hand washing practice was not universal. In our study, students did not scrub their hands for the recommended duration or followed all the six steps of handwashing. It is essential to wash hands with correct technique for the right duration using appropriate materials followed by hand drying.^[11]

After the handwashing promotion week, the frequency of handwashing increased. Furthermore, the number of students washing hands using the correct technique for the right duration improved. It showed that children were receptive to behavior changes. Health educating children will have an added benefit as they will act as change agents in the society.^[14,15] The participants of our study in the FGD narrated the instances of sharing the health message with their family. They commented that siblings well received the information than their parents. Swachh Vidyalaya initiative of the Government of India addresses the hindering factor for behavior change by improving handwashing infrastructure at the school.^[16]

The possibility of social desirability bias is a limitation of the study. However, it was minimized by collecting the information anonymously. Another limitation was that we could not pair the pre- and post-test responses of the students. It was overcome by larger sample size, which was adequate for an unpaired analysis.

CONCLUSION

Our study found that knowledge and practice of handwashing of students improved following the observation of handwashing promotion week in the school. Intensive health education program, active involvement of students, and reinforcement are essential for behavior change.

REFERENCES

1. Luby SP, Agboatwalla M, Feikin DR, Painter J, Billhimer W, Altamirano A, *et al.* Effect of handwashing on child health: A randomised controlled trial. *Lancet* 2005;366:225-33.
2. Ejemot RI, Ehiri JE, Meremikwu MM, Critchley JA. Hand washing for preventing diarrhoea. *Cochrane Database Syst Rev* 2008;1:CD004265.
3. Rabie T, Curtis V. Handwashing and risk of respiratory infections: A quantitative systematic review. *Trop Med Int Health* 2006;11:258-67.

4. 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 Pediatr* 2012;12:52.
5. Katukiza AY, Ronteltap M, van der Steen P, Foppen JW, Lens PN. Quantification of microbial risks to human health caused by waterborne viruses and bacteria in an urban slum. *J Appl Microbiol* 2014;116:447-63.
6. Garg A, Taneja DK, Badhan SK, Ingle GK. Effect of a school-based hand washing promotion program on knowledge and hand washing behavior of girl students in a middle school of Delhi. *Indian J Public Health* 2013;57:109-12.
7. Mobley CE, Evashevski J. Evaluating health and safety knowledge of preschoolers: Assessing their early start to being health smart. *J Pediatr Health Care* 2000;14:160-5.
8. Government of India. Swachh Bharat Mission-Gramin. Available from: <http://www.swachhbharatmission.gov.in/SBMCMS/about-us.htm>. [Last accessed on 2018 Feb 15].
9. Puducherry (Pondicherry) District Population Census 2011, Puducherry Literacy Sex Ratio and Density. Available from: <http://www.census2011.co.in/census/district/482-puducherry.html>. [Last accessed on 2018 Feb 15].
10. Registrar General India. Sample Registration System Bulletin; 2016. Available from: http://www.censusindia.gov.in/vital_statistics/SRS_Bulletin_2014.pdf. [Last accessed on 2018 Feb 15].
11. World Health Organization. Guidelines on Hand Hygiene in Health Care. World Health Organization; 2009. Available from: <http://www.who.int/gpsc/5may/tools/9789241597906/en/>. [Last accessed on 2018 Feb 15].
12. Lopez-Quintero C, Freeman P, Neumark Y. Hand washing among school children in Bogotá, Colombia. *Am J Public Health* 2009;99:94-101.
13. Shrestha A, Angolkar M. Improving hand washing among school children: An educational intervention in South India. *Al Ameen J Med Sci* 2015;8:81-5.
14. Bowen A, Ma H, Ou J, Billhimer W, Long T, Mintz E, *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.
15. Rosen L, Brody D, Zucker D, Manor O, Meier M, Rosen B, *et al.* Spreading the handwashing message: An alternative to traditional media campaigns. *Am J Infect Control* 2010;38:562-4.
16. Ministry of Human Resource Development. Swachh Vidyalaya Puraskar; 2017-18. Available from: <http://www.swachhvidyalaya.com/>. [Last accessed on 2018 Feb 15].

How to cite this article: Amudha K, Thulasingham M, Thomas B, Nag B, Rajarethinam K, Ramakrishnan J. How does school based hand-washing promotion program affect the hand-washing behavior of students at the urban slums in Puducherry, South India? *Mixed method design* 2018;7(11):874-878.

Source of Support: Nil, **Conflict of Interest:** None declared.