Research Article

Developing students' hand hygiene behaviors in a primary school from Turkey: A school-based health education study

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Abstract

Background: Hand hygiene is a cheap, simple, and an effective method that is necessarily implemented in crowded areas such as schools where infectious diseases can spread easily.

Objective: To improve hand hygiene of students from grade 6 to 8 in a primary school from Canakkale, Turkey.

Materials and Methods: This research was conducted in the educational year of 2012–2013 in a primary school, Kepez, Canakkale, Turkey. The subjects consisted of 185 primary school students from grade 6 to 8. Of these, 161 (participation rate = 87%) students participated. It was an educational study devoted to improve skills about hand hygiene. This study was carried out in three steps. First, a self-answered questionnaire and a standard checklist were used before hand hygiene training. Second, after 1 week from this first step, students were trained for improving hand-washing skills. Immediately afterward the training course, researchers observed each student for the assessment of their hand-washing habits and then filled the skill checklist. The last evaluation was made in the third step after 3 months from the training course. Students' hand-washing skill scores before and after the training were compared. Statistical analyses were performed using the SPSS software, version 19.0. A *p*-value of less than 0.05 was considered to be statistically significant.

Results: Of 161 participants, 50.1% were boys and 49.0% were girls with the mean age of 12.6 $\pm$ 0.9 (min 11; max 14) years. Of these participants, 32.3% were from grade 6, 32.3% from grade 7, and 35.4% from grade 8; 98.1% students were living in Kepez and 1.9% were living in village. A statistically significant difference was detected between the first practice, which was made before training, and the second and third practices, which were made after training, in terms of hand-washing skill development ($p < 0.001$). After the training, hand-washing skill scores showed a significant increase than before-training skill scores in both female and male students ($p < 0.001$).

Conclusion: In this study, hand-washing skill training was found to be effective. In addition, students were found to be successful on implementing hand-washing skills in the last practice that was done after 3 months from the training course. However, it should be considered that newly acquired behaviors must be followed once in 6 months or in a year with continuity for these behaviors to be permanent and long standing.

KEY WORDS: Hand hygiene, primary school student, hand hygiene training

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Introduction

Hand hygiene, which is one of the fundamental health behaviors, is the most simple, effective, and cheap way to prevent the spread of infectious diseases.[1–5] Majority of children under the age of 5 years, who are living in countries that have limited sources (for instance, sub-Saharan, African, and South Asian countries), are losing their lives because of preventable "infectious" diseases.[4,6,7]

Personal hygiene practices and protective health services are known to reduce certain infections. According to the World Health Organization (WHO), fundamental hygiene behaviors such as washing hands with soap, removing stools safely, and using clean water are beneficial for improving health.[3] Diseases related to unsafe water and poor sanitation are preventable, especially in developing countries, which are also in the front rank of child diseases. It has been reported that the most important barrier is knowledge level, awareness, and practice in the hand washing.[6] Previous studies have shown that hand hygiene trainings can reduce incidence of infectious diseases and may help protect school health during epidemics.[8,9] Therefore, these trainings should be conducted properly and in continuity by health-care providers in schools.

Because there are lots of students in schools, it is easier for infectious diseases to spread. From this point of view, school is a place where surveys should be conducted.[10] It has been reported that a multidisciplinary approach should be adopted to enhance implementation of hygiene and sanitation in schools.[11] Primary school age is the most important period for turning personal hygiene rules into behavior. Because it is a fact that personal hygiene rules can be turned into behaviors easier in small ages. Kids take their first steps on being healthy individuals by receiving new information from school and adding them to their previous health knowledge gained from their parents. Training personal health habits properly in school age will affect individual's health in next years.[12] Previous studies have indicated that comprehensive hand-washing trainings are very successful in primary-school-age children.[4,5,13–15] This study aimed to improve hand hygiene of grade 6–8 students of a primary school in Kepez, Canakkale.

Materials and Methods

Study Population

A total of 185 students from grade 6 to 8 of a primary school in Kepez, Çanakkale, Turkey, were included into the study. This research was conducted in the educational year of 2012–2013. In this study, sampling method was not used, and it was aimed to comprise all students. Of the 185 students, only 161 (79 girls and 82 boys) participated (accessed rate 87%).

Data Collection

A *self-answered questionnaire* (35 items) was used to analyze students' hand-washing habits, attitudes, knowledge, and descriptive characteristics.

A *12-point hand-washing skill checklist*, obtained from Canakkale Onsekiz Mart University, School of Medicine, was implemented by researchers to identify the presence or absence hand-washing skills among students. Students' hand-washing skills were observed before the training, soon after the training, and 3 months after the training using a 12-point hand-washing skill checklist, and results were recorded by observers. Skill checklist scores of each student were coded 0–12 for every three practices. It was accepted that an increase in skill checklist scores corresponded to an improvement in skills related to hand washing. Students' hand-washing behaviors were monitored according to the skill checklist; also, their hand-washing durations were measured using chronometer.

Audiovisual materials were used during hand-washing trainings conducted by the Public Health and Family Medicine specialists. Before and after the training period, existing needs (sinks without towel cupboards, liquid soap, etc.) in the school toilets were identified, and these shortcomings were overcome by the school administration.

Study Design

This study was implemented by researchers from Public Health, Family Practice, Child Health and Diseases and Public Health intern doctors in a primary school. Our interns were trained by Public Health specialists before the study. All practices in the school were performed in three steps, which are as follows:

1. *First practice:* Seven intern doctors from first internship group and researchers performed this first step on December 17, 2012. A 35-item self-answered questionnaire that analyzes students' hand-washing habits, attitudes, knowledge, and defining characteristics was implemented. After survey, each student was taken to bathroom with a researcher and asked to wash their hands. Observers recorded each student's hand-washing skills according to the skill checklist.
2. *Second practice:* Students were trained for hand-washing skills 1 week later from the first practice (December 26, 2012). In the second practice, training films and presentations, which were made by researchers, were used. Training film was made by researchers according to the points in the hand-washing skill checklist. Students were supposed to watch hand-washing film at least twice. In addition, proper hand-washing practice was shown to students at least twice by researchers. Oral information was also given to students during these trainings. Besides, students' questions were answered and discussed. Following the training practice, each student was taken to bathroom with a researcher and their hand-washing skills were watched and recorded according to the skill checklist.
3. *Third practice:* Three months later from the second practice, researchers performed this third step with intern doctors from second Public health internship group. Similar to first and second practices, each student was taken to bathroom with an observer and their hand-washing skills were watched and recorded according to the skill checklist.

Students' hand-washing skills before the training, soon after the training, and 3 months after the training were compared using 12-point hand-washing skill checklist, and the results were recorded by observers. In our study, we also trained grade 1–4 students (n = 390) on January 3, 2013 to teach them hand-washing skills. But, these students were not included into the study scope.

Statistical Evaluation

Statistical analyses were performed using the SPSS software, version 19.0. The variables were investigated using visual (histograms, probability plots) and analytical methods (Kolmogorov–Smirnov/Shapiro–Wilk test) to determine whether or not they are normally distributed. Descriptive characteristics and hand-washing skills were presented as frequency and percentages. Hand-washing skill scores were presented as means and standard deviations. During data analysis, χ^2-test was used to compare these proportions in different groups. Repeated-measures analysis of variance test was used to evaluate the difference between before-training and after-training steps related to the hand-washing skills. In the post hoc evaluation, paired-samples *t*-test with Bonferroni correction was used to adjust for multiple comparisons. For statistical tests, a *p*-value of less than 0.05 was considered to be statistically significant (a *p*-value of less than 0.016 was considered for post hoc evaluation).

Ethics

For this study, written consent was taken from Canakkale Onsekiz Mart University, Human Research Ethical Committee (Date: 20.06.2012, No: 2012/14-05). Written permission was also obtained from the school administration.

Results

In this study, of 161 participants, 50.1% were boys and 49.0% were girls with the mean age of 12.6 ± 0.9 (min 11; max 14) years. Of the participants, 32.3% were from grade 6, 32.3% from grade 7, and 35.4% from grade 8. As shown in Table 1, 98.1% students were living in Kepez (City center) and 1.9% in villages. Although 67.7% of participants' mother's had primary school education and 32.3% had high school education, 53.8% of their father's had primary school or lower education and 46.3% had high school or higher education [Table 2]. In addition, 40% of students' fathers were workers and 21.3% were self-employed whereas 68.6% of their mothers were housewives and 19.2% were workers. Moreover, 82.6% of participants had a nuclear family, which comprised mother, father, and a sibling. Furthermore, 80.7% of them have at least one sibling and 19.3% were singleton. Also, 61.5% of students were living in an apartment and 17.4% were living in a single-floor house. Moreover, they stated that 97.5% of students had toilets in their homes and 2.6% of them had toilets outside their homes.

Table 1: Students' sociodemographic characteristics, Canakkale, 2013

Variables	Number	Percent
Gender		
Female	79	49.1
Male	82	50.1
Total	161	100.0
Age (years)		
11	12	7.5
12	67	41.9
13	41	25.6
14	40	25.0
Total	160	100.0
Class		
Grade 6	52	32.3
Grade 7	52	32.3
Grade 8	57	35.4
Total	161	100.0
Settlement		
Kepez (city)	155	98.1
Rural area	3	1.9
Total	158	100.0

Seventeen questions about hand-washing habits were asked to students. According to their answers to these questions, it was reported that 80.5% of them washed their hands before eating, 73.6% after eating, 33.3% before toilet, 91.8% after toilet, and 83.4% of them after they woke up in the morning. Our results indicated that 37.4% students were washing their hands for between 30 s and 1 min, and 24.5% for 25 s. Students were asked about their habits of hand hygiene. Of them, 40% reported that they preferred water or soap, 18% preferred wet napkin, and 16% preferred towel. Moreover, when students were questioned about their knowledge of temperature of water in hand hygiene, 63.5% answered that water needs to be warm. In addition, 71.6% reported that jewelry should be taken off and 97.5% reported that hands need to be dried. When hand-washing practices of students before and after training were compared, a statistically significant improvement in after-training practices was observed in compliance with before-training practices ($p < 0.001$). In the after-training practices, a significant improvement was not found in the "getting adequate soap amount into hand" behavior, which was present in the 12-point hand-washing skill checklist [Table 3].

Between the first practice, which was conducted before training, and the second and third practices, which were conducted after training, a statistically significant difference was observed in terms of hand-washing skill development ($p < 0.001$). After the training, hand-washing skill scores showed a significant improvement than those before the

Table 2: Students' education levels of parents, Canakkale, 2013

Education of parents	Number	Percent
Mother's education		
Primary school and below	109	67.7
High school and above	52	32.3
Total	161	100
Father's education		
Primary school and below	86	53.8
High school and above	74	46.3
Total	160	100

Table 3: Distribution of students according to their hand-washing skill practices, Canakkale, 2013

Hand-washing skills	First practice (before training)		Second practice (after training)		Third practice (after training)	
	n	%	*n*	%	*n*	%
Dip hands into water	74	46.0	131	86.3	124	82.1
Getting adequate soap amount	147	91.3	151	99.3	149	98.0
Use soap on the hands	102	63.4	135	89.4	143	87.2
Rub your left hand's dorsum with your right hand and your right hand's dorsum with left hand	86	53.4	133	87.5	136	89.5
Rub your palms by also cleaning your fingers	83	51.6	127	83.6	129	84.9
Clean hand dorsa by rubbing them to your palms	45	28.0	84	55.3	79	52.3
Rub your both thumbs with your other hand	25	15.5	90	59.2	81	53.3
Do not forget to clean your fingertips	41	25.5	103	67.8	101	66.4
Rinse your hands with water	119	73.9	149	98.0	140	92.1
Dry with disposable paper towel	122	75.8	148	98.0	136	89.5
Use paper towel to turn off the faucet	20	12.4	105	69.1	97	63.8
After process junk paper towel without touching trash	119	73.9	147	96.7	25	15.5

%, Percentage of people who respond correct in each practice.

Table 4: Inspected students' hand-washing skill mean scores according to their gender, class, and parents' educational level, Canakkale, 2013

	First practice (before training) Mean ± SD	Second practice (after training) Mean ± SD	Third practice (after training) Mean ± SD	*p**
Total	6.0 ± 2.4	9.9 ± 1.6	9.6 ± 2.1	0.001
Gender				
Female	6.1 ± 3.0	10.2 ± 1.5	9.9 ± 1.9	0.001
Male	5.8 ± 1.7	9.5 ± 1.7	9.3 ± 2.2	0.001
Class				
Grade 6	6.0 ± 2.5	9.4 ± 1.8	8.9 ± 2.1	0.001
Grade 7	6.4 ± 2.6	9.7 ± 1.5	10.1 ± 2.3	0.001
Grade 8	5.6 ± 2.1	10.4 ± 1.5	9.8 ± 1.6	0.001
Mother's education				
Primary school and below	6.1 ± 2.5	9.8 ± 1.6	9.7 ± 2.1	0.001
High school and above	5.5 ± 2.2	10.1 ± 1.5	9.5 ± 2.1	0.001
Father's education				
Primary school and below	6.0 ± 2.3	9.7 ± 1.7	9.8 ± 1.8	0.001
High school and above	6.0 ± 2.6	10.1 ± 1.6	9.4 ± 2.4	0.001

SD, standard deviation.
*p**, repeated-measures test.

training in both female and male students ($p < 0.001$) [Table 4]. When hand-washing skills of male and female students were compared, results showed that mean score of female students was higher than that of male students'. Once students' hand-washing habits were examined according to classes, major differences were found in all three classes after training, which was in the study scope. A significant association was found between students' hand-washing habits and their mothers' educational level. A significant improvement in hand-washing skill mean scores between practices was found among students whose mothers had primary school education or were undergraduates than those whose mothers had high school or higher education ($p < 0.001$). In addition, a relationship was found between students' hand-washing skill mean scores and their fathers' educational level ($p < 0.001$).

Discussion

In this study, improving proper hand hygiene behavior was aimed with the training, which was implemented on grade

6–8 students of a primary school in Çanakkale. In our study, proficiency-based learning method was adopted. In addition, students' practices according to the hand-washing skill control list were watched before and after the intervention. Similar approaches were preferred for developing hand hygiene behavior studies in the literature.[4,16,17] Our results indicated that there was a statistically significant difference between first (before training) and second and third practices performed after hand hygiene training related to hand-washing skills ($p < 0.001$).

In a study from Konya, variables such as being a female student, having high education level, and living at city center have increased proper hand-washing habit.[18] In our study, mean score of hand-washing skill has been found to improve statistically significantly among both female and male students in the after-training practices compared to the before-training practices ($p < 0.001$). When hand-washing skills of boys and girls were compared, results showed that mean score of girls was more than that of boys. Once students' hand-washing habits were examined according to classes, a significant difference was found in all three classes, which was in the study scope after training. In the previous studies, the intervention trainings, which were conducted to bring in a fundamental health behavior such as hand washing among primary school students, have been seen to be effective for developing knowledge and skills.[13,15,19]

Nearly all students in our study (98.1%) were living in apartment or single-floor house [Table 1]. Whereas 67.7% of participants' mother's had primary school education and 32.3% had high school education, 53.8% of their father's had primary school or lower education and 46.3% had high school or higher education [Table 2]. Song et al.[20] investigated that how family factors affect hand-washing habits, and they indicated that family's high education level affects kids to wash their hands more precisely who already have hand-washing habit. Previous studies showed that family factor is effective on children's health behaviors, and families are role model for developing emotions, behaviors, and thoughts in their children.[21] In our study, students whose mothers had primary school education and were undergraduates had higher hand-washing skill mean scores than students whose mothers had high school or higher education in before and after the training evaluations ($p < 0.001$). Also, a relationship was found between students' hand-washing habits and their fathers' educational level ($p < 0.001$).

In our study, hand-washing skill mean scores in the second practice of students whose parents had high school or higher education were found to be higher than those whose parents had primary school education or were undergraduates. However, a decline in hand-washing skill mean score in the third practice was more in students having parents with high education. This finding may be because these students may have carelessly acted on washing hands accurately as they rely on their knowledge and skills.

In our study, second practice and evaluation were made by researchers after training. One of them was on December 26, 2012 and the last one was conducted 3 months from the second practice. It has been observed that students kept performing according to the 12-points in the skill checklist at the end of the third practice, which was done to monitor students' acquired behaviors with the hand-washing skill training. Monitoring and evaluating acquired behaviors once in 6 months or a year will enhance the function of these school health educations. We conducted the third practice 3 months after hand-washing training because of lack of staff and opportunities, and also because most students changed their schools due to the change in Turkish primary education curriculum by the end of the academic year 2012–2013. After the training in the second practice, an important statistical difference was observed in terms of hand-washing skill development compared to before training ($p < 0.001$). In the third practice that was conducted 3 months from the training, it was observed that except for two points on the skill checklist, scores for others were decreasing consistently. Skills that consistently improved in the third practice were "rub your left hand's dorsum with your right hand and your right hand's dorsum with left hand" and "rub your palms by also cleaning your fingers" [Table 4]. Different from the improvement in these hand-washing skills, it was observed that the last skill (after process junk paper towel without touching trash) in the checklist decreased markedly at the third practice after the training. We considered that this decline may be a result of absence of garbage can with pedal in every toilet or being broken. In the Columbia study, 33.6% of the students reported that they only wash their hands with clean water and soap before eating and after toilet always or frequently. Authors have indicated that students cannot develop healthy behaviors in many schools because of insufficient cleaning materials and other environmental factors.[22]

The WHO and the Centers for Disease Control and Prevention publications emphasized that hand hygiene has key role among the infection control methods, which should be considered to reduce the spread of pathogens.[1–3] It has been reported that performing trainings devoted to provide and develop hand hygiene on a continuous and regular basis will be beneficial to protect school health and to reduce absenteeism during epidemic periods.[23] Although washing hands with soap for 15 s reduces the bacteria on the skin at the rate of 0.6–1.1 log10, washing for 30 s leads to a 1.8–2.8 log10 reduction.[24] Drying hands after washing is important to remove microorganisms nonetheless temperature of water does not have an effect, in fact skin irritation can occur if water temperature is 40°C and above.[25] Our results indicated that 37.4% of the students were washing their hands for between 30 s and 1 min, 24.5% for 25 s, and 97.5% reported that hands need to be dried. Moreover, 63.5% of the students said that water needs to be warm for washing hands. In a study from Konya, 99.2% of the students stated that they have used water and soap while washing their hands, 0.2% used alcohol, and 0.6% used wet napkin for cleaning. In the same study, it was found that students have washed their hands for on average 41.8 ± 39.1 s with water and soap.[18] In our study, when students were asked about their habits of hand hygiene, 40%

of them said that they preferred water or soap, 18% preferred wet napkin, and 16% preferred towel. Because the preference of soap and water was low in our study, the importance of soap and water use for hand hygiene was emphasized with the help of a seminar and a film screening in trainings and students were encouraged to use soap and water more often. Although 71.6% students in our study reported that jewelry should be taken off, in some studies that have been conducted in Ankara, with an increase considering to before training period, 76.7%, 85.7%, 90.1%, and 91.6% students reported that jewelry should be taken off.[4,13,14,19]

When before-training and after-training practices of students were compared, a statistically significant improvement was observed in after-training practices in compliance with before-training practices ($p < 0.001$). An intervention study among 184 students of grade 6–8 in Ankara reported that students who were given hand-washing training had a higher frequency of implementing the hand-washing stages after the training than the control group.[14] In another study from Ankara, before and after the education program was used and frequency of implementing hand-washing stages correctly showed an increase compared to before training period.[13] The guide published by the WHO has suggested to structure hand hygiene training program with behavioral change models and include teaching, practice, and evaluating practical implementation stages.[1–3] Previous studies have indicated that using interactive training methods (awarding, game, demonstration, etc.) and practical exercises as education techniques are effective to create a behavioral change about hand hygiene.[26,27] In our study, slide presentations, brochures, and educational films prepared by researchers according to the guides were used. In educational films, each stage of proper hand washing was told and presented by researchers to the students in the classrooms accompanied by classroom teachers. Both students and teachers were asked to apply the hand-washing stages while watching the film, and students' questions were answered by the researchers. Acquiring and bringing of a new skill with continuity and turning it into a behavior is an exciting task and required more time and observation. We have considered that student-centered approaches and methods including demonstrations are more productive as educational techniques.

Conclusion

In this study, it was observed that improving hand-washing skill training, which was oriented at primary education grade 6–8, is effective. In our study, a research was applied 3 months later from the training to follow skill and behavior development properly. Besides, it was observed that students apply hand-washing skills successfully also in this research. However, it is important that newly learned behaviors need to be permanent and long standing. Thus, it will affect the presented training positively when these gained behaviors are followed once in 6 months or in a year and provided continuity. Most effective and encouraging factor in this study that makes students apply these proper hand-washing practices after training is school administration's and teacher's sensitiveness about the topic and demonstration of the prepared films on screens at both classes and school corridors. Furthermore, school administration should put up hand-washing posters on each sink in every toilet from which students are visually benefited. As in Canakkale sample, we endorse that continuity of academic consultancy practices that begin in schools will help making observations about school health.

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