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# Comparison of the Effect of Booklet, Practical Teaching, and Integrated Booklet and Practice Methods on Primary Students' Attitude, Knowledge, and Practice

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## ABSTRACT

Proper hand washing is a determining factor in preventing contagion of infectious diseases. This sutdy aimed to compare students' attitude, knowledge, and practice about proper hand washing via a booklet, practical teaching, and integrated booklet and practice methods. In this quasi-experimental study, we divided 96 students of 10 selected primary schools in Tehran Province, Iran, into three groups in December 2019, selected via cluster random sampling. We collected the data by a researcher-made questionnaire, including demographic information (8)and hand washing-related questions (21). We measured the students' knowledge and practice about hand washing by using pre and post-test.The data were analyzed by SPSS 18 using paired t-test(for categorical variables), independent t-test,ANOVA, and descriptive statistics. A p≤0.05 was considered significant. The mean of students' age in the booklet method was 8.91±1.93 years. The mean knowledge scores of students before and after booklet method were 32.32±6.98 (moderate level) and 69.60±4.66 (good level), respectively. The most important source of information for the students in the booklet method was the media(84%, 27). A significant relationship was found in the three methodsbetween mean knowledge scores, and before and after learning(p<0.001).

**Keywords**: "Attitude"; "Hand washing"; "Primary school"; "Teaching methods"; "Tehran"

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## INTRODUCTION

Healthcare workers (HCWs) are at the front line of, and their constant exposure to infected patients and contaminated surfaces can putthem at risk for acquiring and transmitting the infection. According to the definition of the World Health Organization (WHO), hygiene practices are followed in order to maintain health and prevent the spread of the disease [1].Teaching health-related courses in schools such as hand hygiene promotes the behavior and attitude of the student's family and eventually advances public health [2-3]. Hand hygiene interventions reduce the prevalence of respiratory and gastrointestinal infections among students [4]. Hand hygiene and disinfecting application interventions simultaneously are effective intervention in schools [5].The behavior change wheel (BCW) interventionis a framework for the systematic design and development of behavior change interventions, which also incorporates factors such as the capability of a student to change, or whether a student realistically has the opportunity to change [6]. The phases include design, feasibility/piloting, assessment, and performance, respectively [7].Healthcare personnel such as health educators in schools are at exposed to respiratory diseases, and their constant exposure to infected students and contaminated surfaces can put them at risk for obtaining and transmiting the infection [8]. In schools, this highlights the distress of performancing respiratory and hand hygiene and applying peroperindividual personal propective mobilizations such as wearing masks. Hand washing with alcohol handrub (ABHR) formulation with at least 60% ethanol, as the most cost-effective method against infection cross-transmission, is broadly applied in the world.Recent research has shown that hand hygiene interventions can offer a good opportunity to reduce microbial pollutants. For instnace, the effect of access to waterless hand sanitizer on improving student hand-hygiene behavior in primary schools in Nairobi, Kenya [9]; the effect of behavior-change intervention on hand washing with soap in India [10]; and the influence of food safety education on handwashing practices in school canteens food handlers are reported [11]. Proper hand washing is a determining factor in preventing contagion of infectious diseases. This is especially significant for children because they are one of the most susceptible social groups to hand-transmitted infections due to disregarding proper hand washing. The application of traditional and modern education methods shifts unhealthy behavior among primary students.The average school attendance time for students is 6 hours [12].The method of using equipment and detergents for class cleansing increases the growth and survival of organisms due to increased relative humidity of indoor air [13]. Thus, this study aimed to compare the students' attitude, knowledge, and practice about proper hand washing via a booklet, practical teaching, and integrated booklet and practice methods.

## MATERIALS AND METHODS

In this quasi-experimental study, the statistical community comprised 10 primary schools in Tehran's District 4 in 2019. The region is located in the 51º 15' to

51º 33' Eastern longitude and 35º 32' to 35º 49' Northern altitude. The area, the number of elementary schools, and the population of students in District 4 of the Ministry of Education equaled 9589067 $m^2$, 101 schools, and 63,000 students, respectively. Ten primary schools were located in the center, south, east, west, and north of District 4 of Tehran; 101 major schools were identified,and10 stations (10% of units) were selected due to greater sensitivity as the overall environment and students of primary schools.We divided 96 students of 10 selected primary schoolsinto three groups in December 2019, selected via cluster random sampling.We collected the data by a researcher-made questionnairecompleted in place for 40 minutes during a work shift. The inclusion and exclusion criteria were complete consent and lack of consent to answering the questions, respectively.

The questionnaire consisted of demographic variables (12 questions) and knowledge questions (3 questions and 21 items). Demographic variables such as age, sex, grade, the mother's education, the father's education, parents' marital status, passing a hand washing course, monthly consumption of soap, household monthly income, parents' job, place of residence, and family size were analyzed.We measured the students' knowledge and practice about hand washing in these groups by using pre and post-tests.The students' knowledge about hand washing was scored on a four-point Likert scale and divided into three groups of correct(equal to 4 degree),false(equal to 0 degree), and lack of knowledge(equal to 0 degree).The maximum score awarded to an excellent level of knowledge was 84. The knowledge scores were divided into excellent (63.8-84), good (42.8.2-63), moderate (21.8-42), and weak (0-21) based on the four-point Likert scale. Knowledge questions included ways of infection transmission (7 questions), soap (7 questions), and access to safe water (7 questions). In order to improve the questionnaire, pre-test participants are used in a pilot project with a volume of 10 people. To determine the validity and reliability of the instrument, content validity and test-retest methods wereused, respectively [14].

The students' attitude and practice about hand washing questions was examined on a four-point Likert scale and grouped in to four categories of completely agree(score of 4),agree(3),disagree(2), and completely disagreed(1). The range of students' attitude and practice about hand washing scores was: completely agree (63.8-84),agree(42.8-63),disagree(21.8-42),completely disagree(0-21) [15].The education methods in three groups were using a booklet(32 primary students),practical teaching (32 primary students),and integrated booklet and practice(32 primary students)offered by health educators during three 40-minute session about hand washing. Data analysis was performed using SPSS 22 with ANOVA statistical model. Descriptive analysis was performed for quantitative variables using mean (μ) and standard deviation (SD). The significance level was <0.05. T-test and chi-square test were also run to analyze and compare the variables. The quality map of elementary schools was determined by geographic information system (GIS) mapping (Arc GIS, 10.1) [16].

## RESULTS AND DISCUSSION

Figure 2 and Tables 1-4 show the effect of demographic variables such as age, sex, grade, the mother's education, the father's education, parents' marital status, passing a hand washing course, monthly consumption of soap, household monthly income, parents' job, place of residence, and family size of the students. The area under study is also depicted in Figure 1.

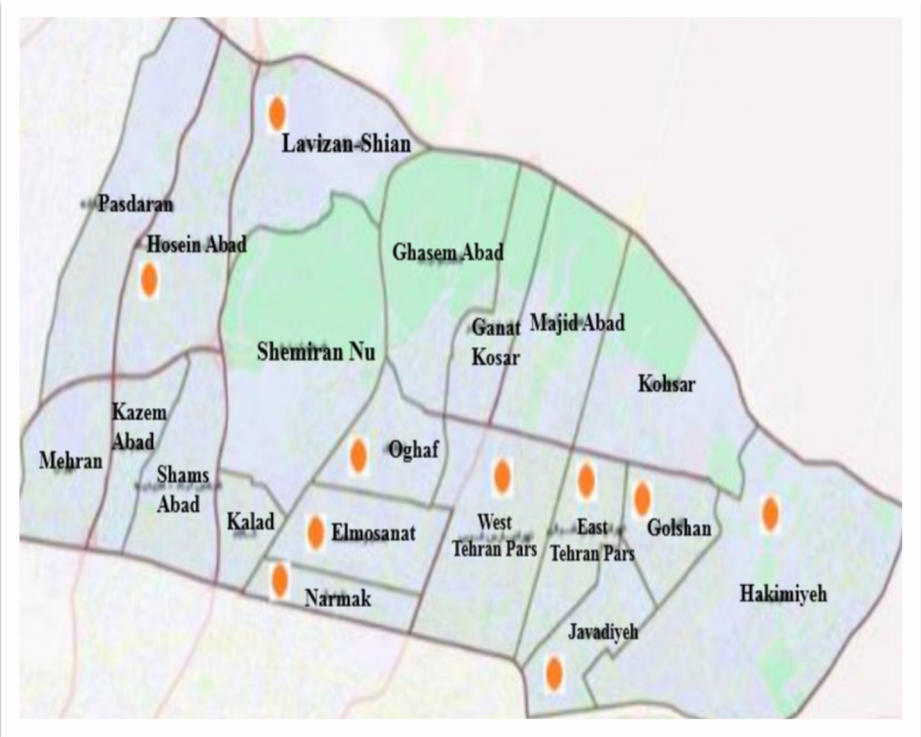
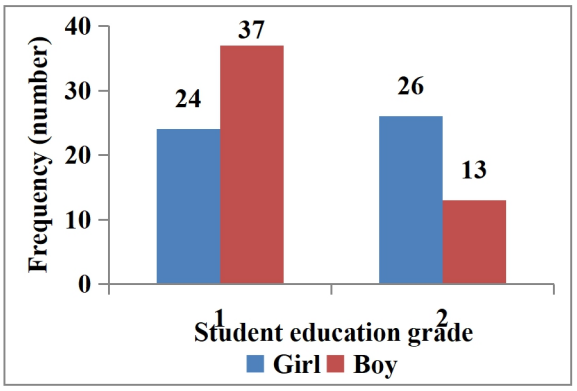
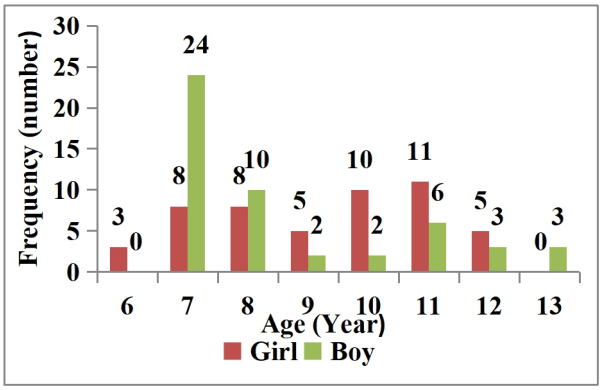
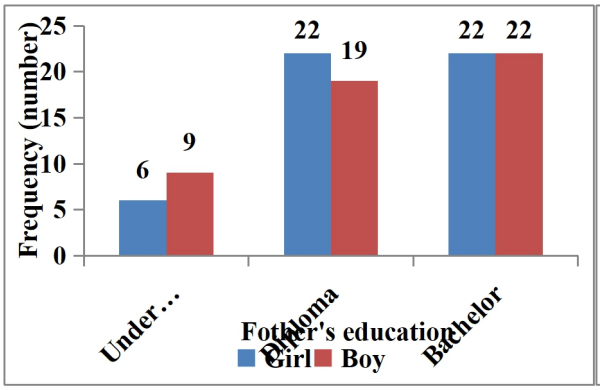
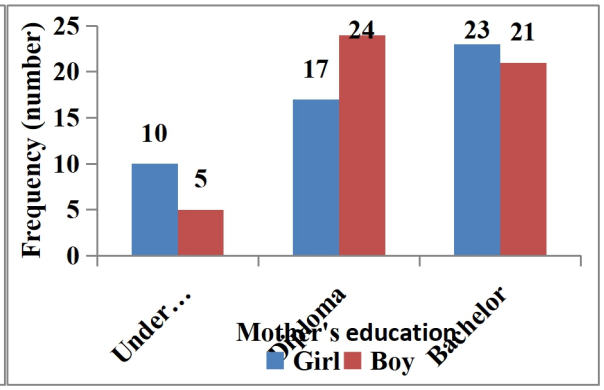


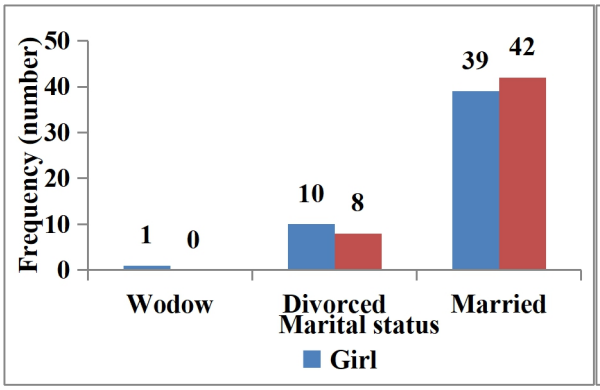

Figure 1. Map of sampling stations

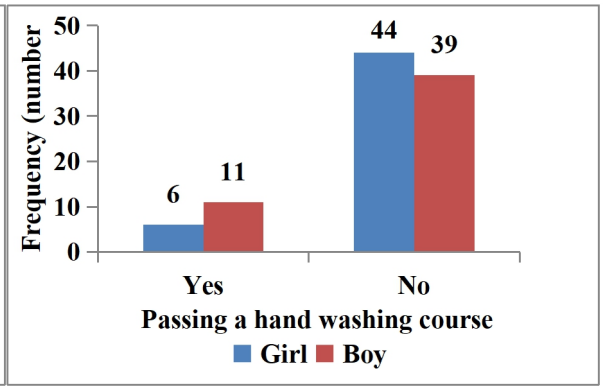

Frequency (number)
40
30
20
10
0
24
37
26
13
1
2
Student education grade
Girl
Boy

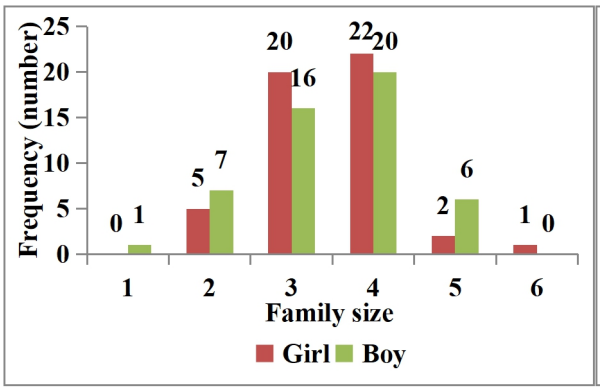

Frequency (number)
30
25
20
15
10
5
0
3
0
8
24
8
10
5
2
10
2
11
6
5
3
0
3
6
7
8
9
10
11
12
13
Age (Year)
Girl
Boy


Frequency (number)
25
20
15
10
5
0
6
9
22
19
22
22
Under…
Diploma
Bachelor
Father's education
Girl
Boy


Frequency (number)
25
20
15
10
5
0
10
5
17
24
23
21
Under…
Diploma
Bachelor
Mother's education
Girl
Boy


Frequency (number)
50
40
30
20
10
0
1
0
10
8
39
42
Wodow
Divorced
Married
Marital status
Girl


Frequency (number
50
40
30
20
10
0
6
11
44
39
Yes
No
Passing a hand washing course
Girl
Boy


Frequency (number)
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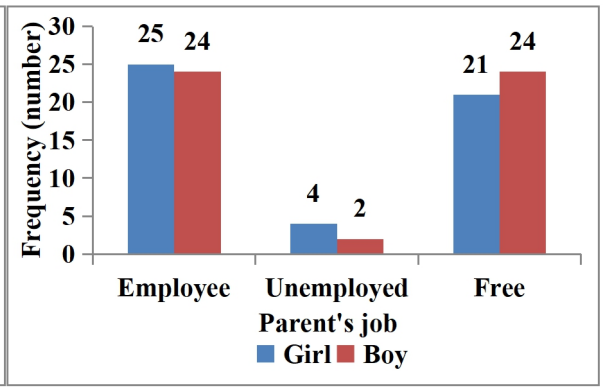
20
15
10
5
0
0
1
5
7
20
16
22
20
2
6
1
0
1
2
3
4
5
6
Family size
Girl
Boy


Frequency (number)
30
25
20
15
10
5
0
25
24
4
2
21
24
Employee
Unemployed
Free
Parent's job
Girl
Boy

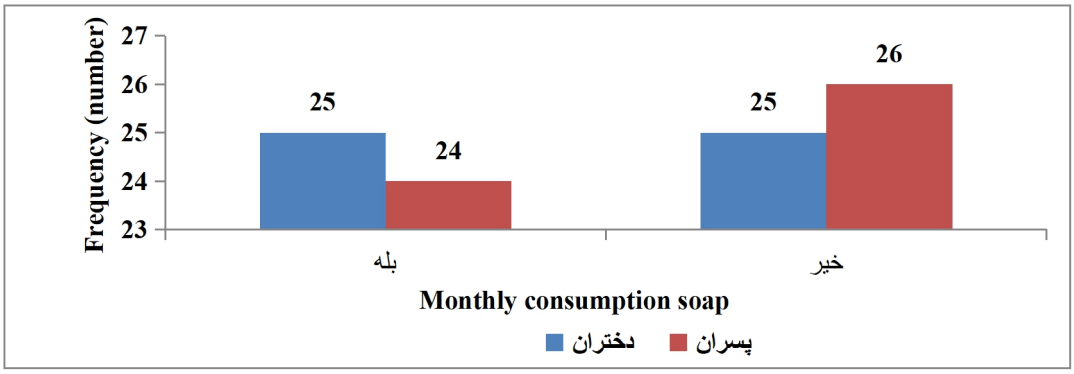



Figure 2. Demographical information of the selected elementary schools and the students

The results of the research in the demographic survey of five girls' schools indicated that the mean age was 9.28±1.81 years (6-12); 24 students were in the first grade, and 26 in the second grade; the frequency of 4-people households was 22; and 25 people used more than 1 soap per month. Moreover, 23 mothers had a bachelor's degree; 22 fathers had a bachelor's degree; 39 parents were married; 6 of them had passed the course of hand washing; and 25 were employed. The results of the research in the demographic survey of five boys' schools showed that the mean age was 8.54 ± 2.02 (7-13) years; there were 37 studnets in the first and 13 in the second grade; the frequency of 4-people householdwas 20 people; and 24 people used more than 1 soap per month. Furthermore, 24 mothers were high school graduates, 22 fathers had a bachelor's degree, 39 were married, 11 had passed the course of hand washing, and 24 were employed.The consumption of soap was more in girls than boys (6%) and more in the second grade than the first grade (8%).

This finding is consistent with the research carried out by Guzek et al.(2020) where girls reported a higher frequency of daily hand washing ($p < 0.0001$) and washing their hands constantly during emergencies more often than boys (68.2% vs. 54.1%; $p < 0.0001$)[17]. This finding is also consistent with the research carried out by Ubheeram and Biranija-Hurdoya 2017. They showed that age was noticeably associated with hand washing behaviors [18]. Pre-tests showed that an increase in the level of parenting education enhances the hand washing behaviors. This finding is in line with the research by Wong and Lee (2019) who showed that education level was noticeably related to hand washing behaviors [19].Therefore, there is a strong positive correlation between the hand washing behaviors and maternal and parental education variables.

According to the results of the study, booklet, practical teaching, and integrated booklet and practice improved hand washing behaviors. Therefore, the necessity of education by integrated booklet-practice as the most effective intervention is determined. This research finding is in line with the study by Kim et al.(2012). They noticed that education might noticeably enhance the youth's hand washing behaviors [20]. The integrated booklet-practice program ldecreases the outbreaks of respiratory and gastrointestinal infections among children. This research finding is consistent with the the study by Alzyoot et al.(2020) who emphasised on education and provision of information on hand washing [21].

The pre-tests showed that hand washing reduced microbial load on the hands resulting from removal of germs from hands. This result is consistent with the research by Ataee et al. (2017). They reported that the bacteria removed from females' washed hands in wet and dry condition was significantly lower than from males' hands(3 CFU vs. 8 CFU; confidence interval 95%, $P \leq 0.001$) [22].Wet hand washing is more effective than dry hand washingandremoves germs from hands due to producing more foam. This finding is consistent with the research conducted by Freeman et al.(2014) concluding that hand washing with running water reduces microbial contamination significantly [23].

The pre-tests showed that hand washing with ABHR formulation with at least 60% ethanol was the most cost-effective mode against infections cross-transmission. This result is in line with the research conducted by Lee et al.(2020). They recommended the use of anABHR formulation with at least 60% ethanol for washing hand in the absence of soapand water [24].

It is concluded thatintegrated booklet-practice method about hand washing is superior to booklet teaching alone due to enhancing motor skills and performance. Mohammadi et al. demonestrated that practical training and the preparation of educational posters and videos could increase knowledge, attitude, and hand washing performance [25].Thus, the application of warm water and soap improves general illness status in students. This finding is in consistent with the study by Cho et al. (2020) who recommended that classrooms be equiped with warm water, soap, towels, and hand sanitizer [26].

The mean of students' age in the booklet method was 8.91±1.93 years. The mean knowledge scores of the students before and after the booklet method was32.32±6.98 (moderate level), and 62.60±4.66 (good level), respectively. The most important source of information for students in the booklet method was the media (84%, 27). The mean practice scores of students before and after the booklet method was 33.30±4.32 (disagree) and 62.90±5.29 (agree), respectively. The mean of students' age in the practical teaching method was8.94±2.1 years. The mean knowledge scores of students before and after the practical method were32.38±7.05 (moderate level)and 62.95±4.75 (good level), respectively. The most important source of information for students in the practical teaching method was the media (87%, 28). The mean practice scores of students before and after the practical method were 33.50±4.40 (disagree) and 63.05±4.57 (agree), respectively. The mean of students' age in the integrated booklet-practice method was 8.99±2.15 years. The mean knowledge scores of students before and after integrated booklet-practice method were 32.35±7.01 (moderate level) and 84.±4.71(excellent level), respectively. The most important source of information for the students in the integrated booklet-practice

method was the media(90%, 29). The mean practice scores of students before and after integrated booklet-practice method were 33.42±4.33(disagree) and 84±4.57(completely agree), respectively.

Girls and boys were trained with practices (how to wash their hands properly, how to do approperiate action, and how to rub their hands as the most important section of hand washing) for 120 minutes (3 sessions of 40 minutes) per week, and received a special hand washing booklet. In this way, the students gained 100% awareness and performance. Wearn etal. (2015) demonstrated that the development of good hand washing behaviors needed a multi-stage program, including education, support, feedback, and survey [27].

There was a significant correlation between performance scores and marital status, family size, monthly consumption of soap, and and knowledge level(P <0.05) (Table 4). Mortazavi and Andam (2014) demonstrated that their researcher-made questionnaire was a reasonable scale for evaluating women's motivations for participation in recreational water sports [28].

The reasons mentioned by the boys for not washing their hands were: it was not necessity to perform, they did not like to do it, they had no time to perform it, or they forget to perform it (p <0.001). The reasons for girls were side effects such as skin problems (p <0.02).According to Tuzun et al. (2015), hand washing was performed after returning to home, after using transportation services, and after money exchange [29]. Albashtawy (2017) decleared that the reasons that students did not wash their hands were that there was no need (70.8%) and that the hand-washing facilities were not clean (62.3%) [30].

Table 1. The students' knowledge and practice scores

| Parameters | Elementary-school boys | | | | Elementary-schoolgirls | | | |
|---|---|---|---|---|---|---|---|---|
| | Min. | Max. | μ | SD | Min. | Max. | μ | SD |
| Age | 7 | 13 | 8.54 | 2.002 | 6 | 12 | 9.28 | 1.81 |
| Family size | 1 | 5 | 3.46 | 0.95 | 2 | 6 | 3.48 | 0.81 |
| Monthly income | 1 | 11.7 | 3.69 | 2.001 | 1 | 14.5 | 4.15 | 2.63 |
| Ways ofinfection transmission | 0 | 7 | 1.92 | 2.50 | 0 | 7 | 3.4 | 2.74 |
| Soap | 0 | 7 | 1.94 | 2.57 | 0 | 7 | 3.24 | 2.96 |
| Access to safe water | 0 | 7 | 1.4 | 2.34 | 0 | 7 | 1.64 | 2.37 |
| Total knowledge score | 0 | 21 | 5.06 | 6.91 | 0 | 21 | 8.18 | 6.98 |
| Infection prevention | 3 | 7 | 5.42 | 1.99 | 3 | 7 | 5.5 | 1.97 |
| High-grade cleaning solutions | 3 | 7 | 5.18 | 2.01 | 3 | 7 | 5.26 | 2.01 |
| Hand washing activity | 3 | 7 | 4.3 | 1.88 | 3 | 7 | 5.9 | 2.01 |
| Total practice score | 9 | 21 | 15.68 | 4.57 | 9 | 21 | 15.74 | 4.32 |

Table 2. The frequency of students' knowledge and practice scores (intergratedbooklet-practice)

| Parameters | | Elementary-school boys | | | | Elementary-school girls | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Excellent (15.9-21) | Good (10.7-15.7) | Moderate (5.4-10.5) | Weak (0-5.2) | Excellent (15.9-21) | Good (10.7-15.7) | Moderate (5.4-10.5) | Weak (0-5.2) |
| Knowledge | Pre-Test | 3 (9%) | 2 (6%) | 8 (25%) | 19 (60%) | 4 (12%) | 8 (25%) | 6 (19%) | 14 (44%) |
| | Post-Test | 33 (100%) | 0 (0%) | 0 (0%) | 0 (0%) | 33 (100%) | 0 (0%) | 0 (0%) | 0 (0%) |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Practice | Pre-Test | 12 (38%) | 10 (31%) | 10 (31%) | 0 (0%) | 16 (50%) | 8 (25%) | 8 (25%) | 0 (0%) |
| | Post-Test | 33 (100%) | 0 (0%) | 0 (0%) | 0 (0%) | 33 (100%) | 0 (0%) | 0 (0%) | 0 (0%) |

Table 3. Mean and standard deviation of students'knowledge and practice scores (intergratde booklet-practice methods)

| Parameters | | Elementary-school boys | | | Elementary-school girls | | |
|---|---|---|---|---|---|---|---|
| | | μ±SD | Min. | Max. | μ±SD | Min. | Max. |
| Knowledge | Pre-Test | 5.06±6.91 | 0 | 21 | 8.18±6.98 | 0 | 21 |
| | Post-Test | 21 | 21 | 21 | 21 | 21 | 21 |
| | Paired-Test | T=21.57 | Df=45 | P=0.001 | T=9.16 | Df=31 | P=0.001 |
| Practice | Pre-Test | 15.68±4.5 | 9 | 21 | 15.74±4.39 | 9 | 21 |
| | Post-Test | 21 | 21 | 21 | 21 | 21 | 21 |
| | Paired-Test | T=25.89 | Df=43 | P=0.001 | T=7.59 | Df=28 | P=0.001 |

Table 4. Correleation between parameters (intergratedbooklet-practice)

| Knowledge | Parameters | Elementary-school boys | | | Elementary-school girls | | |
|---|---|---|---|---|---|---|---|
| | | $\mathbf{P}_{value}$ | F | $R^2$ | $\mathbf{P}_{value}$ | F | $R^2$ |
| Pre-Test | Age | 0.778 (NS) | 0.034 | 0.002 | 0.494 (NS) | 0.388 | 0.007 |
| | Education | 0.736 (NS) | 0.053 | 0.002 | 0.322 (NS) | 0.757 | 0.014 |
| | Mother's Education | 0.596 (NS) | 0.257 | 0.005 | 0.110 (NS) | 1.155 | 0.121 |
| | Father's Education | 0.248 (NS) | 0.999 | 0.118 | 0.753 (NS) | 0.135 | 0.002 |
| | Marital status | 0.048 (S) | 3.506 | 0.069 | 0.035 (S) | 4.769 | 0.91 |
| | Household size | 0.049 (S) | 3.218 | 0.063 | 0.044 (S) | 2.920 | 0.057 |
| | Monthly income | 0.147 (NS) | 1.377 | 0.281 | 0.209 (NS) | 1.058 | 0.023 |
| | Job | 0.451 (NS) | 0.209 | 0.006 | 0.069 (NS) | 1.252 | 0.027 |
| | Use soap | 0.002 (S) | 0.992 | 0.160 | 0.001 (S) | 15.282 | 0.243 |
| | Source of Data | 0.451(NS) | 0.361 | 0.008 | 0.816 (NS) | 0.012 | 0.002 |
| | Level of knowledge | 0.039 (S) | 3.5462 | 0.068 | 0.003 (S) | 9.30 | 0.163 |
| | Incidence of respiratory and gastrointestinal infections | 0.002 (S) | 0.992 | 0.160 | 0.001(S) | 15.282 | 0.243 |
| Post-Test | Age | 0.778 (NS) | 0.034 | 0.002 | 0.494 (NS) | 0.388 | 0.007 |
| | Education | 0.736 (NS) | 0.053 | 0.002 | 0.322 (NS) | 0.757 | 0.014 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Mother's Education | 0.596 (NS) | 0.257 | 0.005 | 0.110 (NS) | 1.155 | 0.121 |
| | Father's Education | 0.248 (NS) | 0.999 | 0.118 | 0.753 (NS) | 0.135 | 0.002 |
| | Marital status | 0.048 (S) | 3.506 | 0.069 | 0.035 (S) | 4.769 | 0.91 |
| | Household size | 0.049 (S) | 3.218 | 0.063 | 0.044 (S) | 2.920 | 0.057 |
| | Monthly income | 0.147 (NS) | 1.377 | 0.281 | 0.209 (NS) | 1.058 | 0.023 |
| | Job | 0.451 (NS) | 0.209 | 0.006 | 0.069 (NS) | 1.252 | 0.027 |
| | Use of soap | 0.001 (S) | 14.790 | 0.258 | 0.001 (S) | 15.380 | 0.341 |
| | Source of Data | 0.451(NS) | 0.361 | 0.008 | 0.816 (NS) | 0.012 | 0.002 |
| | Level of knowledge | 0.001 (S) | 17.407 | 0.358 | 0.001 (S) | 18.193 | 0.455 |
| | Incidence of respiratory and gastrointestinal infections | 0.001 (S) | 14.790 | 0.258 | 0.001 (S) | 15.380 | 0.341 |

## CONCLUSION

These results confirm past findings indicating that the use of soap, as a helpful behavior, assess to safe water, and helps children with and without respiratory and gastrointestinal infections. Therefore, for future studies, it is suggested that the effect of other personal protection devcies such as wearing masksin different age and occupational groups be investigated. Accoridng to this study, the continuation of soap consumption, as a complementary method, along with therapeutic approaches such as drug therapy, are recommended for the improvement of the status of children with respiratory and gastrointestinal infections. Planning and provsion of in-service teacher training and parent education about the seven steps of hand washing decreases the prevalence rate of respiratory and gastrointestinal infections in students.

Some limitations of this research were the lack of proper control of the subjects' hand washing activity outside the study time, the sample sizeProper hand washing education planning in the primary schools increases hand washing knowledge and practice. The integrated booklet-practice methods considerably promote the public health and primary students' knowledge and practice about hand washing. As the students' performance and the cost-effectiveness of the integrate booklet-practice method were more than the other methods, we suggest that the teachers apply thisintegrated method.

## ACKNOWLEDGEMENT

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**List of Symbols**

| **Nomenclature** | |
|---|---|
| ABHR | Alcohol hand rub |
| BCW | Behavior change wheel |
| GIS | Geographic information system |
| Max | Maximum |
| μ | Mean |
| Min | Minimum |
| SD | Standard deviation |
| WHO | World Health Organization |

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**Appendices**

To think of innovative solutions to solve a problem such as incidence of respiratory and gastrointestinal infections in primary students and how to prevent them needs to be familared to with a problem in depth: to understand how it occurs, what the background biochemistry and physiology is (as far as known), how it is seen in the general population, in different communities, how it is seen in health care – as well as a thorough understanding of epidemiologic principles of bias and confounding.