Effect of an e-Educational Poster on Improving Knowledge, Attitude, and Practice on Proper Use of Hand Hygiene among School Students

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Physio life care

Article

Keywords: Covid 19, Educational poster, Hand hygiene, Prevention, Students

Posted Date: July 7th, 2022

DOI: https://doi.org/10.21203/rs.3.rs-1822452/v1

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Effect of an e-Educational Poster on Improving Knowledge, Attitude, and Practice on Proper Use of Hand Hygiene among School Students

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Abstract

Hand hygiene is important to prevent the spread of the COVID-19 virus by contact. It also interrupts the transmission of other viruses and bacteria causing common colds, flu, and pneumonia, thus useful in reducing the general burden of infectious disease. Literature shows that there is inadequate knowledge, attitude, and practice on the proper use of hand hygiene among school students. Therefore knowledge, attitude, and practice on hand hygiene of school students should be improved. Currently, different approaches are used to improve knowledge, attitude, and practice on the proper use of hand hygiene among school students. But e-educational posters are rare and the effect of e-educational posters to improve the knowledge, attitude, and practice of school students on the proper use of hand hygiene has not been studied. Therefore, the main purpose of this study was to determine the effect of an e-educational poster on improving the knowledge, attitude, and practice of the proper use of hand hygiene among school students. An interventional and prospective study was conducted on advanced-level students in Dehiovita educational zone, Sri Lanka. Pre group consisted of 405 students prior to the e-educational poster intervention. The Post group consisted of 364 subjects after being educated through e-educational poster intervention on the proper use of hand hygiene. Data analysis was conducted by using SPSS Software version 25.
Students of the pre and post-groups were identical in terms of demographic variables; gender (P=0.905), subject stream (P=0.972), and grade (P=0.774). After the educational intervention, a significant improvement was established in the mean score of knowledge ($P < 0.05$), attitude ($P < 0.05$), and practice ($P < 0.05$) of students in the post-group compared with the pre-group. Within each group, there was no difference in knowledge, attitudes and practice attributes due to gender ($p>0.05$) or grade ($p>0.05$). However, there was an influence of the educational stream on attitude ($P<0.05$) and practice ($p<0.05$) in pre-group as well as post-group. The influence of the educational stream on knowledge was significant ($P<0.05$) in the pre-group but not significant ($P=0.051$) in post group.

**Key Words:** Covid 19, E-educational poster, Hand hygiene, Prevention, Students

1. Introduction

Acute respiratory infections including the SARS-CoV-2 virus are the primary causes of morbidity and mortality among children in developing countries. [1,2,3] Coronavirus disease (COVID-19) is an infectious disease caused by the SARS-CoV-2 virus. [2] It was declared a public health emergency of global concern and was characterized as a pandemic by the World Health Organization (WHO). [3] Hand hygiene is important to prevent the spread of the COVID-19 virus by contact. It also interrupts the transmission of other viruses and bacteria causing common colds, flu, and pneumonia, thus useful in reducing the general burden of disease. [4] Inadequate sanitary conditions and poor hygiene practices play major roles in the increased burden of communicable disease within developing countries and Hygiene practices are heavily influenced by students’ knowledge and attitudes towards hygiene. [3,5] During the COVID-19 pandemic, hand hygiene education is still necessary because Study discoveries highlight the requirement for more hand hygiene training in schools; which will direct the advancement of thorough hand hygiene education for school students. [6]

Since the beginning of the pandemic schools are closed for in-person teaching as a strategy to slow the spread of SARS-CoV-2. Reports suggest that the limited in-person teaching during the pandemic may have harmed learning for children [7] and the mental and emotional well-being of both parents and children. [8] Therefore, it is a timely need to open schools for children to continue their in-person learning process. However, considering the current situation the benefits of in-person teaching need to be balanced against the risk of acquiring and spreading SARS-CoV-2 in these settings.

In the early stage of the COVID-19 pandemic, children were not commonly identified as index cases in the household or other clusters [9] largely because schools and extracurricular activities around the world were
closed or no longer held in person. However, outbreaks among adolescents attending camps, sports events, and schools have demonstrated that adolescents can transmit SARS-CoV-2 to others. [10] Furthermore, transmission studies that have examined secondary infection risk from children and adolescents to household contacts who are rapidly, frequently, and systematically tested demonstrate that transmission does occur [11].

The introduction of new variants of the virus into the population likely will further affect the evolving epidemiology and interpretation of future studies as will understanding of how transmission varies by the age of the child. COVID-19 vaccination of adults and adolescents may also have an impact on the incidence of COVID-19 in young children who are unvaccinated and therefore at risk. According to the current evidence, the COVID-19 virus is transmitted through respiratory droplets or contact. [12].

It has been identified that multiple prevention strategies that schools can implement in a layered approach to promote safer in-person learning. These include promoting vaccination, consistent and correct use of masks, physical distancing, screening testing in schools to promptly identify cases, improved ventilation, handwashing, and respiratory etiquette, staying home when sick and getting tested, contact tracing in combination with isolation and quarantine, and routine cleaning with disinfection under certain conditions. [13]

Transmission that occurs through the contact can be prevented by applying good respiratory hygiene measures including proper use of hand hygiene. It has been shown that consistent and correct use of hand hygiene reduces the spread of SARS-CoV-2 and during a global pandemic, one of the cheapest, easiest, and most important ways to prevent the spread of a virus is to proper use of hand hygiene. [4,13,14]. Several studies have shown the success of using hand hygiene measures as one of the school’s prevention strategies in limiting transmission in schools [15,16,17]. Also, it has been shown that the inconsistent use of hand hygiene may have contributed to school-based outbreaks. [18] On the other hand, it has been reported that there is an inadequate knowledge attitude and practice of proper use of hand hygiene among school students [19,20,21]. Previous hand hygiene studies have indicated that children with proper hand hygiene practices are less likely to report respiratory symptoms. during the COVID-19 pandemic keeping hands clean is especially important to help prevent the virus from spreading. Therefore, the school students must be equipped with the knowledge and positive attitudes and practice the correct use of hand hygiene to prevent or minimize the risk of spreading the virus. Different approaches are used to improve the awareness of the importance and correct use of hand hygiene [22]. there is a scarcity of e-posters prepared in the Sinhala language on the correct use of hand hygiene. On the other hand, the lack of digital health-related formats in health education and the effect of e-educational posters to improve the knowledge, attitude, and practice of school students on the proper use of hand hygiene have not been studied.
Therefore, the main purpose of this study was to determine the effect of an e-educational poster on improving the knowledge, attitude, and practice of the proper use of hand hygiene among school students.

Therefore, the main objective of this study was to determine the effect of an e-educational poster on improving the knowledge, attitude, and practice of the proper use of hand hygiene among school students. The secondary objectives of this study were; to assess the current knowledge, attitudes, and practice about the proper use of hand hygiene among school students and to assess the effect of an e-educational poster on improving the knowledge, attitude, and practice on the proper use of hand hygiene concerning grade, gender, and subject stream among advanced level students.

2. Materials and methods

Study Setting: Students learning in advanced level classes of government schools in the Dehiovita educational zone in Sri Lanka participated in this study. The information on schools was obtained from the Zonal Directorate of the Dehiovita educational zone, Sri Lanka. There are five educational divisions available and the number of schools is 223 and a total 4001 number of Advance level students.

Participants and sample size: The sample size was calculated as follows using Solvin’s formula [23]. Solvin’s formula is, n= N/ (1+Ne²), where n= sample size, N= total population and e= margin of error. The target population size of the study was 4001 students and sampling error was considered at 5%. Therefore, the sample size was: 364. Considering the response rate of 90% [24], 405 students were selected for the study by convenience sampling method.

Study design: This study was conducted as a pre-test post-test interventional study. A self-administered questionnaire was used to collect the data on the level of knowledge, attitudes, and practice of the students about the proper use of face masks before the intervention. The consecutive sampling method was used for sample collection.

Data collection and instruments: The questionnaires were distributed among the students and stopped the receiving of answers once 405 students completed the pretest questionnaire. Thereafter the e-educational poster (annex 2) was distributed among the same group of students. After two weeks of the distribution of the e-educational poster, the post-test questionnaire was distributed. Only students who answered the pre-test and studied the e-educational poster were allowed to answer the post-test questionnaire. Receiving of answers for the post-test questionnaire was stopped once 364 students completed the pretest questionnaire. Pre and post-tests were conducted through google forms-based questioners. The questionnaires and e-educational posters were distributed using, WhatsApp.
**The questionnaire:** The questionnaire was developed according to the current evidence and information from WHO regarding the knowledge and facts about the proper hand hygiene measures related to Covid 19. The questionnaire was reviewed by the subject expert for accuracy, validity, and appropriateness and tested for reliability. To assess the face validity, it was given to 10 students (homogenous and non-participated), and the explanations, questions, and shortages inside the questionnaire were evaluated. The reliability of the questionnaire was assessed on 40 students through internal consistency and Cronbach's alfa for attitude (0.775) and practices (0.843) was obtained.

The questionnaire consisted of the following parts: one question about demographic characteristics of the students, 7 questions on knowledge of proper hand hygiene measures, 6 questions regarding proper hand hygiene measures usage attitudes, and 6 questions that evaluated the practices of proper hand hygiene measures usage. The scoring method of the questionnaire in the knowledge part was 1 score for each correct answer and 0 for each wrong answer. In the attitude section, the Likert scale (Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree) and practices section Likert scale (Always, Often, Sometimes, Seldom, Never) were used to evaluate the responses and positive aspect questions ranked from 1 to 5 and negative aspect questions ranked from 5 to 1. Total scores of each section were calculated following individual question scoring.

Assessment of the validity of the above-mentioned questionnaire was conducted through the face and content validity; thus, the questionnaire was provided given reliable articles and sources, and assessment of content validity was given 4 experienced professionals in the health sector and was reviewed by the researchers and a number of the views and comments applied in the questionnaire.

To assess the face validity, it was given to 10 students (homogenous and non-participated), and the explanations, questions, and shortages inside the questionnaire were evaluated. The reliability of the questionnaire was assessed on 40 students through internal consistency and Cronbach's alfa for attitude 0.83 and practices 0.91 was obtained.

**Intervention:** The e-educational poster was developed according to the current evidence and information from WHO regarding the knowledge and facts about the proper hand hygiene measures and use of face masks related to Covid 19. The poster was reviewed by the subject expert for accuracy and appropriateness.

**Ethical Considerations:** Ethical approval was obtained from the ethics review committee of the Charted Society of Physiotherapy, Sri Lanka. Consent of the parents or guardians was obtained before participating in the study by filling out the pre-test questionnaires.
**Data Analyses:** In this study, the data were analyzed by using SPSS Software. The normality of the data was checked using the Shapiro Wilk test. Since the data were not normally distributed, an independent t-test with bootstrapping approach was used to compare the means of the KAP attributes between the pre and post-groups and also to assess their mean changes. Co-relational analysis was done to identify the relationship between the attributes in pre and post-groups. Chi-square was used to evaluate and compare differences in demographic variables between the pre and post-groups. \( \alpha = 0.05 \) was considered the significant level for all the tests.

### 3. Results (Results and discussion can be written in one section or separately.)

To describe demographic attributes in pre-and post-groups for variables of knowledge, attitude, and practices, descriptive tests of frequency and percentage of frequency, mean, and standard deviation were utilized. The Independent sample t-test with bootstrapping approach was used to perform the mean comparison between pre and post-groups. Co-relational analysis was done to identify the relationship between the attributes. Independent sample t-test and ANOVA with bootstrapping approach were performed within the pre and post-groups separately to study the relationship of attributes regarding demographic specifications. The confidence interval was 95% and the significance level of the P-value was considered smaller than 0.05.

Frequency and percentage distributions of demographic characteristics of pre and post-groups are presented separately. Students of the pre and post-groups were identical in terms of gender (\( P = 0.905 \)), grade (\( P=0.774 \)), and Stream (\( P=0.972 \)). Hence in terms of demographic variables, there was no significant difference between the Pre and post-groups. (Table 1)

| Demographic Characteristic | PRE(N=405) | POST(N=364) | Pearson Chi-Square value | Significance (P value) |
|----------------------------|------------|-------------|--------------------------|------------------------|
| Gender                     |            |             |                          |                        |
| F                          | 213        | 52.6        | 193                      | 53.0                   | 0.014                   | 0.905                   |
| M                          | 192        | 47.4        | 171                      | 47.0                   |                         |                        |
| Grade                      |            |             |                          |                        |
| 12                         | 215        | 53.1        | 197                      | 54.1                   | 0.082                   | 0.774                   |
| 13                         | 190        | 46.9        | 167                      | 45.9                   |                         |                        |
| Stream                     |            |             |                          |                        |
| Art                        | 139        | 34.3        | 131                      | 36.0                   |                         |                        |
| Bio Science                | 52         | 12.8        | 43                       | 11.8                   |                         |                        |
| Commerce                   | 115        | 28.4        | 103                      | 28.3                   | 0.517                   | 0.972                   |
| Maths                      | 55         | 13.6        | 51                       | 14.0                   |                         |                        |
| Technology                 | 44         | 10.9        | 36                       | 9.9                    |                         |                        |

* significance at p value 0.05
The distribution of pre and post-data suggested that the data does not follow a normal distribution (Shapiro-Wilk test p-value <0.001 for all the KAP attributes of both pre and post-groups). Post group distribution plots show all the three attributes highly left-skewed suggesting that most of the subjects score near maximum scores after approaching the educational poster. The co-relational analysis indicates that there is a positive moderate to a high correlation between knowledge, attitudes, and practices in both pre and post-groups (Figure 1).

After the educational intervention, a significant increase was established in the mean score of knowledge ($P < 0.001$), attitude ($P < 0.001$), and practice ($P < 0.001$) of students in the post-group compared with the pre-intervention time (pre-group). (Table 2). Hence, we can state that there is a significant improvement in knowledge attitude, and practices of hand hygiene among students due to educational poster (Table 2 and Figure2).

Demographic characteristic influence on KAP attributes was analyzed separately in pre and post-groups. Gender and grade influence were analyzed using a t-test and the results depicted that there is no difference in KAP attributes in both groups due to gender or grade ($p>0.05$). However, there is an influence of the educational stream on knowledge ($p=<0.001$), attitude ($<0.001$), and practice ($p=0.005$) in the pre-group. There is also an influence of stream on post-group attitude ($p=0.004$) and practice ($p=<0.001$). No significant influence of stream on post-group knowledge ($p=0.051$) (Table 3).

In the pre-group, all three attributes' mean values are significantly different ($P<0.05$) regarding the students' educational stream. Post-group attitudes and practices vary according to the educational stream ($p<0.05$).
Figure 1: Distribution (A) and Correlation (B) of attributes (Pre and Post groups)

Table 2: Knowledge, attitude, and practices mean score comparisons between pre and post groups

| Attributes  | Group | N   | Mean   | SD   | SE Mean | Mean Difference | t       | P value |
|-------------|-------|-----|--------|------|---------|----------------|---------|---------|
| Knowledge   | PRE   | 405 | 2.48   | 1.42 | .071    | -3.272         | -40.301 | <0.001* |
|             | POST  | 364 | 5.76   | .76  | .040    |                |         |         |
| Attitude    | PRE   | 405 | 21.14  | 3.54 | .176    | -7.461         | -33.254 | <0.001* |
|             | POST  | 364 | 28.60  | 2.64 | .139    |                |         |         |
| Practices   | PRE   | 405 | 14.47  | 4.00 | .199    | -9.023         | -39.886 | <0.001* |
|             | POST  | 364 | 23.50  | 2.06 | .108    |                |         |         |

*: Statistically significant at p ≤ 0.05

Figure 2: Box-plots of knowledge, attitude, and practices
The identified significant difference of mean values of knowledge attitude and practices due to educational stream in pre-group evaluated using Bonferroni's method to determine which means are significantly different. All the pairs were compared. In the pre-group knowledge and attitude components, Students in Bioscience, Math, and Technology streams carry significantly higher mean values compared to the art and commerce stream students. In the pre-group practice component, there is only a significant difference between art and bioscience stream students (Table 4,6 and Figure 3). In the post group, there is no significant difference in knowledge due to stream. Post group attitude component maths and technology streams scores significantly higher than commerce stream. In the practice component, there is a significant difference between Art and BioScience, Art and Maths, and commerce and maths. (Table 5,6 and Figure 4)

**Table 4: Pairwise comparison of educational streams (Pre-intervention group)**

|          | Knowledge [Mean Difference] | P value | Attitude [Mean Difference] | P value | Practices [Mean Difference] | P value |
|----------|-----------------------------|---------|-----------------------------|---------|-----------------------------|---------|
| Art      | Bio Science                 | 1.291*  | .000                        | 3.739*  | 2.112*                      | 0.011   |
| Art      | Commerce                    | 0.103   | 1.000                       | 0.609   | 1.000                       | 0.278   |
| Art      | Maths                       | 1.237*  | .000                        | 3.938*  | 1.372                       | 0.296   |
| Art      | Technology                  | 0.782*  | .007                        | 3.033*  | 1.345                       | 0.495   |
| Bio Science | Commerce                  | 1.188*  | .000                        | 3.131*  | 1.834                       | 0.057   |
| Bio Science | Maths                      | 0.054   | 1.000                       | 0.198   | 0.740                       | 1.000   |
| Bio Science | Technology                | 0.509   | .615                        | 0.706   | 0.767                       | 1.000   |
| Commerce | Maths                       | 1.134*  | .000                        | 3.329*  | 1.094                       | 0.916   |
| Commerce | Technology                  | 0.679*  | .040                        | 2.424*  | 1.067                       | 1.000   |
| Maths    | Technology                  | 0.455   | .905                        | 0.905   | 0.027                       | 1.000   |

* The mean difference is significant at the 0.05 level.
Table 5: Pairwise comparison of educational streams (POST group)

|            | Attitude |          | Practices |          |
|------------|----------|----------|-----------|----------|
|            | Mean     | Difference| P value   | Mean     | Difference| P value   |
| Art        | 0.613    | 1.000    | 1.079*    | 0.024    |
| Bio Science|          |          |           |          |
| Art        | 0.666    | 0.530    | 0.048     | 1.000    |
| Commerce   | 0.072    | 1.031    | 0.050     |          |
| Art        | 0.666    | 1.000    | 1.070*    | 0.014    |
| Maths      |          |          |           |          |
| Art        | 0.784    | 1.000    | 1.004     | 0.084    |
| Technology |          |          |           |          |
| Bio Science| 1.279    | 0.072    | 1.031*    | 0.050    |
| Commerce   | 0.053    | 1.000    | 0.010     | 1.000    |
| Bio Science| 0.171    | 1.000    | 0.075     | 1.000    |
| Technology |          |          |           |          |
| Commerce   | 1.332*   | 0.030    | 1.021*    | 0.032    |
| Maths      | 1.450*   | 0.043    | 0.956     | 0.146    |
| Technology | 0.118    | 1.000    | 0.065     | 1.000    |

*. The mean difference is significant at the 0.05 level.
Figure 4: Post group box plots of educational stream

Table 6: Mean value of streams

| Stream     | Knowledge | Attitude | Practices |
|------------|-----------|----------|-----------|
|            | PRE       | Post     | Pre       | Post     | Pre       | Post     |
| Art        | 2.04      | 5.68     | 19.63     | 28.55    | 13.79     | 23.11    |
| Bio Science| 3.33      | 5.86     | 23.37     | 29.16    | 15.90     | 24.19    |
| Commerce   | 2.14      | 5.65     | 20.23     | 27.88    | 14.07     | 23.16    |
| Maths      | 3.27      | 5.94     | 23.56     | 29.22    | 15.16     | 24.18    |
| Technology | 2.82      | 5.94     | 22.66     | 29.33    | 15.14     | 24.11    |

4. Discussion

To the best of our knowledge, this is the first study conducted to determine the effect of an e-educational poster on knowledge, attitude, and practice on the proper use of hand hygiene among school students. The students or children are the most important segment of the population and intend to receive attention from family, school, society, and government. Students are the foundation of society because healthy students grow to develop into healthy and strong adults who can actively participate in the developmental activities of a nation [25]. Overall, 60% of children in developing countries had changed to good hygienic practices and self-care measures by correct health education [26]. Therefore, hygiene practices are heavily influenced by students’ knowledge and attitudes towards hygiene [18]. According to the results After the educational intervention, a significant increase was established in the mean score of knowledge (P < 0.001), attitude (P < 0.001), and practice (P < 0.001) of students in the post group compared with the pre-intervention time (pre-group). (Table 2). Several
other studies have shown that health education intervention had an impact on the knowledge base, attitude, and practice of study subjects in the intervention group compared to the control group [28]. The results of another study have indicated that the health knowledge of the student significantly improved after education. The attitude of the students towards personal hygiene also improved significantly after proper health education. The practice of personal hygiene improved significantly as well. [29]. The reason for the effectiveness of the e-educational poster may be the media of distribution i.e., electronic media. A study has shown that secondary school students are conducting on the internet, social media, and online information is becoming one of the principals and rapid ways to obtain information, compared with other resources [30]. The co-relational analysis indicates that there is a positive moderate to a high correlation between knowledge, attitudes, and practices in both pre and post-groups (Figure 1).

Several studies have reported that there is an inadequate knowledge attitude and practice of proper use of hand hygiene among school students [19,20,21]. According to the result of our study, there were an inadequate knowledge attitude and practice of proper use of hand hygiene among school students before the intervention concerning subject stream among advanced level students too. (Figure 3). The study depicted that there is no difference in attributes in both groups due to gender or grade (p>0.05). However, there is an influence of the educational stream on knowledge (p=<0.001), attitude (<0.001), and practice (p= 0.005) in pre-group knowledge, attitudes, and practices up. There is also an influence of stream on post-group attitude (p=0.004) and practice (p=<0.001). No significant influence of stream on post-group knowledge (p=0.051) (Table 3). The study systematically identified and summarized the characteristics of the effect of an e-educational poster on hand hygiene intervention in improving knowledge, attitudes, and practices among students and indicates that there is a positive moderate to a high correlation between knowledge, attitudes, and practices and there is an influence of educational stream on knowledge attitude) and practice. An e-educational poster intervention on hand hygiene has a positive effect on improving knowledge, attitude, and practice on the proper use of hand hygiene among students.

**Limitations:** This study was limited to Advance level students and those who had e-learning facilities. Thus, results may not be generalized to all school children. Additionally, there were no plans to test the retention of the effects of the intervention. This limitation resulted in the unavailability of an assessment of the influence of the intervention approach on retention.
5. Conclusion

Based on the results of this study, it can be concluded that the e-educational poster on knowledge, attitude, and practice on the proper use of hand hygiene is an effective educational measure to improve the knowledge, attitude, and practice on the proper use of hand hygiene among school students and there is an inadequate knowledge attitude and practice of proper use of hand hygiene among school students. Additionally, it can be concluded that the e-educational poster on knowledge, attitude, and practice on the proper use of hand hygiene is an effective educational measure to improve the knowledge, attitude, and practice on the proper use of hand hygiene among school students regardless of the gender difference but have to consider about subject stream.

Recommendations and suggestions for Future Research: Future studies regarding knowledge, attitudes, and practices should specifically assess the attitudes that students have toward hand hygiene among different age groups of students. Enhanced comprehensive knowledge about these issues should be used to improve low-cost, but highly effective programs that will meaningfully attenuate the burden of transmissible disease among school children. (27). In addition, investigating the retention of the effects of e-educational posters on the improvement of knowledge, attitudes, and practice on the proper use of hand hygiene is suggested.

6. Ethical approval

Ethical approval was obtained from the ethics review committee of the Charted Society of Physiotherapy, Sri Lanka. Consent of the parents or guardians was obtained before participating in the study by filling out the pre-test questionnaires.

7. Acknowledgements

We acknowledge the National Science Foundation of Sri Lanka for providing direction for the study. I acknowledge the students who participated in the study.

8. Conflicts of interest

All the authors declared no conflicts of interest

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