Effectiveness of oral health education on eight to ten year old school children in rural area of Magway Region, Myanmar

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SUBJECT AREAS
  Dentistry

KEYWORDS
  Oral health education, oral health knowledge and behavior
Abstract

Background: Oral diseases are common and widespread around the world. Many oral health problems are preventable and early onset is reversible. Myanmar faces many challenges in rendering oral health services and about 70 percent of total population resides in rural areas. These relate to the availability and accessibility of oral health services. Therefore, oral health education is one key element to prevent oral diseases and to promote oral health.

Methods: A quasi-experimental study was carried out at Basic Education Middle Schools in rural areas of Magway Township to study the effectiveness of oral health education on knowledge and behavior of eight to ten years old school children. A total of 220 school children, 110 from intervention school and 110 from control school, participated in this study from 2015 to 2017. Data for knowledge and behavior were collected before and after intervention in the two groups by using self-administered questionnaire. Tooth brushing method data were collected by direct observation with checklist. Oral health education was provided at eight weekly intervals for one year in the intervention group. After one year and six months, oral health knowledge and behavior were determined in the intervention group only to measure retention. Chi-square test, two samples t test, One way repeated measure ANOVA were used for data analysis. The study was approved by the Ethics Review Committee of University of Public Health in Yangon, Myanmar.

Results: After education, a positive net effect of intervention and significant improvement was found in the intervention group compared to the control group regarding oral health knowledge (p<0.05) except one that is foods that can cause dental caries (p=0.107) and behavior (p<0.001). Retention of mean ± standard deviation on knowledge and behavioral scores were 2.45±1.12, 3.79±1.12, 4.07±0.98 and 1.56±0.90, 3.60±1.21, 3.24±1.31 at baseline, at one year after education and at six months after cessation of education
respectively, and, total knowledge and behavioral scores were significantly improved
(p<0.001) among the school children in the intervention group.

Conclusion: The repeated oral health education was effective to promote and sustain oral
health knowledge and behavior. Word counts: 342

Background

One cannot be healthy without oral health. Oral health and general health should not be
interpreted as independent entities. Oral diseases can affect the ability to work at home,
at school or on the jobs [1]. Children with poor oral health tend to struggle in school, may
lack self-esteem and may have less success later in life. Healthy baby teeth are extremely
important for eating, smiling, talking and keeping the space for adult teeth [2]. Oral
health status has a direct impact on general health and conversely, general health
influences on oral health. Children who suffer from poor oral health are 12 times more
likely to have restricted activity days than those who do not [3]. In the United States,
more than 50 million school hours are lost annually because of oral health problems which
affect children’s performance at school [4]. Dental caries affects 60-90% of school age
children and most of the adults. Periodontal disease is prevalent in 50-90% of adults,
becoming severe in 10-15% of them, while gingival diseases occur in majority of children
and adolescents of Kuwait [5]. Although dental caries is a preventable disease, it is the
most prevalent diseases in children of America [1]. In Myanmar, knowledge, attitude and
practice pertaining to oral health among rural population were low [6] and oral health
status among five year and twelve year old children were not satisfactory [7]. Dental
public health care services are required more than before to reduce high level of dental
caries in twelve to thirteen year age group in Myanmar [8]. Three month oral health
education gave positive effect on total KAP scores and plaque scores of the study group
aged twelve year old school children in Myanmar [9]. Myanmar populations have low
opportunity to take sufficient oral health education because of inadequate dentist population ratio [10].

In order to assess the magnitude of the preventive task it is necessary to know the oral health situation of the school children. Myanmar faces many challenges in rendering health care services including oral health services and about 70 percent of total population resides in rural areas. These relate to the availability and accessibility of oral health services. Therefore, oral health education plays a pivotal role to solve the oral health problems, to prevent common oral diseases and to promote oral health of the rural population. Oral health promotion through schools is recommended by the World Health Organization for improving oral health and for prevention of dental diseases among school children. In Myanmar, oral health education programs are already existed and oral health services are provided to the school children yearly by a dental surgeon as part of functions of school health team but these oral health programs are not strengthened. The number of dentist is inadequate to provide dental services effectively to the school children and oral health education is believed to be an effective method for promoting oral health. The children aged eight to ten years among the school children are suitable for identifying oral health status and for providing primary prevention because of mixed dentition, both primary teeth and permanent teeth. Hence the current study was planned to obtain updated information on the oral health situation of the school children in Myanmar and supported the role of educational program in promoting oral health and preventing the common oral diseases at early stage in the children. Furthermore, this study was an important foundation to stimulate the development of oral health awareness among the community.

Methods
Study design, area, population and period

A quasi-experimental nonequivalent control group study design was carried out in randomly selected two Basic Education Middle Schools at rural area of Magway Township from 2015 to 2017 to determine the effectiveness of oral health education on oral health knowledge and behavior of eight to ten year old school children. A total of 220 school children, 110 from intervention school and 110 from control school, participated in this study. Eight to ten year old healthy children who are attending the selected middle schools were included and those who are unwilling to participate in the study and not present on the day of data collection were excluded.

Sample size and sampling procedure

The sample size was calculated by $n = (z_{\alpha} + z_{1-\beta})^2 (p_c q_c + p_e q_e) / d^2 + 2/d + 2$ (Fleiss, 1981) and a drop-out rate of 20% for each group was considered. The total sample size was 220. Prior to conduct the study, permission was taken from Township Educational Officer and Township Medical Officer. Out of a total of 47 BEMSs in Magway Township, there were only four in urban. To obtain the required sample, in the first stage, two BEMSs from rural area, and in the second stage, 110 students from each school, were randomly selected.

Data collection method

The research question was developed and reviewed by the experienced dental specialist. The question consists of demographic characteristics, knowledge and behavior on oral health. Oral health education (OHE) was given to the intervention group only at eight weekly intervals for one year. An oral health education session for a period of about 45 minutes was prepared on key oral health messages such as structure and functions of teeth, types of dentitions, causes and prevention of common oral diseases, importance of
brushing teeth twice daily, proper tooth brushing technique, importance of regular dental visit. Chalk and blackboard, dent form model, charts, toothbrush and toothpaste were used as oral health education aids. Proper tooth brushing technique (modified bass technique) was demonstrated on a dent form model. After completion of the whole study, an oral health education session was also conducted for the children in the control group. A pilot survey was done on the 30 students to ensure the clarity of interpretation. A visit was paid to each school before data collection to discuss the research procedure with the school headmaster and written informed consent was obtained from the caregivers. At the beginning of the study, the baseline data were collected in both groups by using a self-administered questionnaire except one behavioral question that is ‘method of tooth brushing’. It was collected by direct observation with the checklist. The questionnaires, originally constructed in English and translated into Myanmar, were given and filled up by the children under the supervision of the research team members with the help of class teachers to ensure that all questions were answered. Interpersonal communications were not allowed during answering. After one year period from collection of the baseline data, post intervention data were collected in the two groups using the same questionnaire as at baseline. After one year and six months, retention of proper knowledge and behavior were determined in the intervention group only. Toothbrush and toothpaste were provided to all participant children in both groups before and after intervention.

Data management and analysis

The data were checked for completeness and consistency daily and analyzed by using SPSS version 16.0. Descriptive statistics was computed for all variables. Differences between intervention and control groups responded to the knowledge and behavior questions by correct answers before and after intervention were calculated. The net effect of the intervention programme was estimated by subtracting the percentage change pre-
to post-intervention in control students from that for the intervention students. One way repeated measure ANOVA with Bonferroni correction (Post Hoc test) was used to determine the retention of proper knowledge and behavior on oral health at three different points in time, at baseline, at one year after OHE, at six months after cessation of OHE, in students who received OHE at eight weekly intervals for one year. The level of statistical significance for all tests was set at 0.05.

Results

Table 1 shows the demographic characteristics of the school children in the two groups at baseline and one year after oral health education. Age distribution from eight to ten year before and after intervention were 19.1%, 58.2%, 22.7% in the intervention group and 14.5%, 20.9%, 64.5% in the control group, respectively. According to the gender, boy and girl distribution before and after intervention were 43.6%, 56.4% in the intervention group and 51.8%, 48.2% in the control group, respectively. Table 2 shows correct knowledge and proper behavior on oral health among the school children between the two groups. In the intervention group, the correct proportion was higher in after intervention than in before regarding all knowledge questions and, in the control group, the correct response rate before and after intervention were nearly the same except main cause of tooth decay and gum diseases. In comparing the two groups before intervention, about 16% of intervention students and 12% of control students gave the true answer with regard to main cause of tooth decay. The majority of school children in both groups gave the true answer with regard to behavior about devices using in tooth brushing before as well as after intervention. Before intervention, about 7% of school children in intervention group and nearly 5% of school children in control group used dental floss to remove food debris stuck between the teeth. Regarding pattern of tooth brushing, nearly 5% in intervention group and only 3% in control group brushed their teeth according to the recommended
method. Before intervention, no significant differences were found between the two groups in four out of five knowledge questions and in three out of five behavior questions (p>0.05). These were knowledge about the main cause of gum diseases and behavior about frequency and occasion of tooth brushing (p<0.05). After intervention, significant differences were found between the two groups in four out of five knowledge questions and in all behavior questions (p<0.05). The only one knowledge question shows no significant differences between the two groups was ‘foods that can cause dental caries’ (p>0.05). Table 3 shows percentage changes in response to knowledge and behavior on oral health before and after intervention between the two groups and a positive effect of oral health education for a period of 45 minutes at eight weekly intervals for one year was noted. Table 4 shows mean knowledge and behavior scores on oral health in the intervention group only. There were 2.45±1.12, 3.79±1.12, 4.07±0.98 and 1.56±0.90, 3.60±1.21, 3.24±1.31 at baseline, at one year after OHE and at six months after cessation of OHE, respectively. Statistically significant effect of eight weekly interval for one year OHE was found on total knowledge and behavior scores in the intervention group (p<0.001). Table 5 shows highly significant differences between two different points in time (baseline vs one year after OHE and baseline vs six months after cessation of OHE) regarding total knowledge and behavior scores (p<0.001), and, no significant difference between one year after OHE and six months after cessation of OHE (p=0.159) in knowledge and (p=0.060) in behavior. It was shown that the school children in the intervention group had the ability to maintain the correct knowledge and behavior related to oral health even though the OHE session was stopped for six months.

Discussion

At the beginning of the study, minimum age of the school children in both groups was eight year and maximum age was ten year. The duration of the study lasted for one and
half year. There was no attrition in both groups after intervention. The correct response rates were more or less the same between the two groups before intervention in almost all of knowledge questions except one that is question concerning with main cause of gum diseases, in which correct answer rate of control students was significantly greater than that of intervention students. It may be possible that even in the absence of health education, some children might have tried to search and get correct answers and gain knowledge through various sources like social media, TV, toothpaste advertisements, etc. After one-year-intervention, significant differences were observed between the two groups in almost all of knowledge questions except one that is question concerning with foods that can cause dental caries. This may be attributed to the school co-curriculum wherein some general information about unhealthy effect of sweetened foods and drinks on teeth is taught to the school children in the primary classes. No significant differences were found between the two groups before OHE in three out of five behavioral questions and with regard to frequency and occasion of tooth brushing, significantly more of the students in the intervention group brushed their teeth twice per day and also cleaned their teeth in the morning before breakfast and at night before going to bed compared with their control counterparts. This might be due to unequally in accessibility and availability of dental health services among the students. However, the proportion of correct behavior was significantly higher in all behavioral items for the intervention group following OHE. This may be because of methods applied and materials used in the OHE session. When the present study assessed the percentage changes in response to knowledge and behavior on oral health before and after intervention between the two groups, a positive net effect of intervention was observed. The improvement in overall knowledge and behavior was found in the intervention group as compared to the control group after OHE which may be ascribed to the mode of OHE. It was delivered to the
students by means of an interactive talk around key oral health messages and the students who can give the correct answer were rewarded to participate actively and to get more interest in the OHE session. Well prepared and repeated OHE which would probably improve knowledge and enhance behavior. The OHE emphasized the importance of frequency, occasion and method of tooth brushing, use of tooth brush and tooth paste, and use of dental floss. A large teeth model was used to demonstrate the recommended method of tooth brushing to visualize all the students and after demonstration, some students were picked up in front of the class to show the method of tooth brushing step by step to know whether the students understand well. The finding of the present study was in accordance with an intervention study conducted in Ireland wherein an oral health intervention for six weeks was done amongst primary school children aged seven to twelve year and positive changes were observed in oral health knowledge and behaviors [11]. Other studies done in Chandigarh, Northern India [12], in Tanzania [13] and Greece [14] reported that school based OHE program was highly significant improved knowledge and behavior. In a study done in Kyauktan and Tharkayta Townships of Yangon Region in Myanmar, significant improvement of knowledge, attitude and practice scores on oral hygiene was found between the baseline and three months after intervention among 12 year old school children [9]. In India, a systematic review was conducted in a total number of 40 articles to assess the effectiveness of oral health education programs on knowledge, attitude, practice and oral health status. In their review, they reported that oral health education was effective in improving knowledge on oral health in all studies, however, with regard to practice outcome, thirteen studies were found to be effective and two studies were not effective [15]. These disparities might be due to differences in target age group, methods and duration of oral health education program and background characteristics of the study subjects. The present study showed that the eight weekly oral
health educations for one year had a statistically significant effect on total knowledge and behavior scores of the oral health among the school children in the intervention group even though stopping of the education program for six months after one-year OHE and it was found that the students in the intervention group had sustainability on positive knowledge and behavior. In similar to the present study, a study done in India documented that reinforcement through repeated OHE sessions in the intervention schools resulted in significant improvement in oral health knowledge and practices even after cessation of the program [16]. Another study done in the northwest of England reported that schools with more frequent exposures to the program had better scores than schools with fewer exposures [17]. A study in Karachi of Pakistan showed that one-time teacher led OHE was ineffective compared to repeated and reinforcement OHE in improving the oral health knowledge, behavior and oral hygiene status [18]. OHE is a feasible way to reach out all sections of the children whether rich or poor, near or far, developed or underdeveloped. Impartation of OHE improves oral health knowledge and behavior of the students which will be passed on to their family members and neighbor community and has had effect on the whole community of the country. The results of this study can be generalized to the school children in Myanmar because schools and students are randomly selected in collecting the data for measuring the outcome variables. However, the study procedure had some limitations. Teachers and caregivers were not included in the OHE sessions, it might have affected the effectiveness of OHE since they have daily contact with the students and may be essential for the achievement of long-term benefits.

Conclusions

The repeated oral health education comprising of lecturing with interactive talk, demonstration and supervised tooth brushing method at eight weekly intervals for one year was found to be effective to promote and sustain correct knowledge and behavior
among the school children.

Abbreviations

SPSS: Statistical Package for Social Science
OHE: Oral health education
vs: Versus

Declarations

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Availability of data and materials

Data are available upon request by co-authors and reviewers.

Authors’ contribution

KKS, HTS and SHA developed the concept and design of the study. KKS and AKS involved in data collection and observation. KKS and HTS involved in analysis of data and interpretation of the result. All authors read and approved the final manuscript.

Competing interests

The authors declare that there is no competing interest among them.
Ethical approval and consent to participate

Ethical clearance was obtained from Ethical Review Committee of University of Public Health, Yangon, Myanmar. Written informed consent was obtained from the caregivers and verbal consent was obtained from the school principal and class teachers. Written informed assent was obtained from all participant school children.

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Tables

Table 1 Demographic characteristics of the school children in intervention group (n=110) and control group (n=110)
| Variables | Categories   | Intervention group | Control group |
|-----------|--------------|--------------------|---------------|
|           | n (%)        | n (%)              |
| Age (year) |              |                    |
| 8         | 21(19.1)     | 16(14.6)           |
| 9         | 64(58.2)     | 23(20.9)           |
| 10        | 25(22.7)     | 71(64.5)           |
| Gender    |              |                    |
| Boy       | 48(43.6)     | 57(51.8)           |
| Girl      | 62(56.4)     |                    |

### Table 2 Correct knowledge and proper behavior on oral health between the two groups

| Variables | Categories | Intervention | Control | p-value |
|-----------|------------|--------------|---------|---------|
|           | n (%)      | n (%)        |         |         |
| Knowledge questions |            |              |         |         |
| The main cause of tooth decay | At baseline | 17(15.5) | 13(11.8) | 0.432   |
|                           | After one year | 79(71.8) | 20(18.2) | <0.001  |
| The main cause of gum diseases | At baseline | 29(26.4) | 64(58.2) | <0.001  |
|                           | After one year | 60(54.5) | 41(37.3) | 0.010   |
| Prevention of dental caries and periodontal diseases | At baseline | 78(70.9) | 85(77.3) | 0.281   |
|                           | After one year | 100(90.9) | 88(80.0) | 0.022   |
| Foods that can cause dental caries | At baseline | 71(64.5) | 72(65.5) | 0.888   |
|                           | After one year | 82(74.5) | 71(64.5) | 0.107   |
| Development of oral cancer | At baseline | 74(67.3) | 84(76.4) | 0.134   |
|                           | After one year | 96(87.3) | 82(74.5) | 0.016   |
| Behavior questions |            |              |         |         |
| Frequency of tooth brushing | At baseline | 39(35.5) | 25(22.7) | 0.038   |
|                           | After one year | 74(67.3) | 7(6.4) | <0.001  |
| Occasion of tooth brushing | At baseline | 21(19.1) | 8(7.3) | 0.010   |
|                           | After one year | 70(63.6) | 4(3.6) | <0.001  |
| Devices using in tooth brushing | At baseline | 99(90.0) | 92(83.6) | 0.163   |
|                           | After one year | 106(96.4) | 84(76.4) | <0.001  |
| Device used to remove food debris stuck between the teeth | At baseline | 8(7.3) | 5(4.5) | 0.391   |
|                           | After one year | 51(46.4) | 4(3.6) | <0.001  |
| Pattern of tooth brushing (by direct observation) | At baseline | 5(4.5) | 3(2.7) | 0.721   |
|                           | After one year | 95(86.4) | 6(5.5) | <0.001  |

### Table 3 Percentage change in responses to knowledge and behavior on oral health among
the school children in both groups before and after intervention

| Knowledge and behavior questions on oral health | % difference between before and after intervention | Net effect of intervention (% change) |
|------------------------------------------------|-------------------------------------------------|-------------------------------------|
| Intervention                                    | Control                                         |
| Knowledge questions                             |                                                 |                                     |
| The main cause of tooth decay                   | +56.37                                          | +50.01                              |
| The main cause of gum diseases                  | +28.19                                          | +49.1                               |
| Prevention of dental caries and periodontal diseases | +20                                             | +17.27                              |
| Foods that can cause dental caries              | +10                                             | +10.9                               |
| Development of oral cancer                      | +20                                             | +21.81                              |
| Behavior questions                              |                                                 |                                     |
| Frequency of tooth brushing                     | +31.82                                          | +42.73                              |
| Occasion of tooth brushing                      | +44.55                                          | +48.18                              |
| Devices using in tooth brushing                 | +6.36                                           | +13.64                              |
| Device used to remove food debris stuck between the teeth | +39.09                                          | +40.00                              |
| Pattern of tooth brushing (by direct observation) | +81.81                                          | +79.09                              |

Table 4 Oral health scores at three different points in time in the intervention group (n=110)

| Variables          | Categories                  | Mean ± SD | p-value |
|--------------------|-----------------------------|-----------|---------|
| Knowledge scores   | At baseline                 | 2.45±1.12 | <0.001  |
|                    | At one year                 | 3.79±1.12 |         |
|                    | At one and half year        | 4.07±0.98 |         |
| Behavior scores    | At baseline                 | 1.56±0.90 | <0.001  |
|                    | At one year                 | 3.60±1.21 |         |
|                    | At one and half year        | 3.24±1.31 |         |

SD: standard deviation

Table 5 Retention of oral health knowledge and behavior in the intervention group (n=110)

| Variables          | Categories                  | Mean diff | 95% CI for diff | p-value |
|--------------------|-----------------------------|-----------|-----------------|---------|
| Knowledge scores   | Baseline vs one year        | -1.345    | -1.69 to -1.00  | <0.001  |
|                    | One year vs one and half year | -0.282   | -0.63 to 0.07   | 0.159   |
|                    | Baseline vs one and half year | -1.627  | -1.98 to -1.28  | <0.001  |
| Behavior scores    | Baseline vs one year        | -2.04     | -2.41 to -1.67  | <0.001  |
|                    | One year vs one and half year | 0.36     | -0.01 to 0.74   | 0.060   |
|                    | Baseline vs one and half year | -1.67    | -2.05 to -1.30  | <0.001  |

Diff: difference, CI: Confidence Interval, vs: versus
