

# Health Promotion Intervention to Prevent Dental Caries among Primary School Children

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**Abstract:** The school remains a natural channel through which the dental hygiene and prevention of caries of the child can be improved with the children as the natural agent to change. Aim of the study: To determine the effect of health promotion intervention to prevent dental caries among primary school children. Design: A quasi-experimental research design was used for this study. Setting: This study was carried out in two governmental primary schools; Zahraa Helwan and Omar Ibn Al-Khattab at Wady Hof District in Helwan, Cairo Governorate, Egypt. Sample: A multi-stage random sample was used. The total number of children was 480 both boys and girls. Tools: Three tools were used in this study: Tool one: An interview questionnaire which consisted of the following parts: a) Sociodemographic data of studied children. b) Knowledge of studied children about dental hygiene and dental caries. Tool two: Children Attitude Likert Scale Toward Dental Care as reported by children. Tool three: Children Practice Likert Scale Regarding to Dental Care. Results: The current study revealed that, 81.9% of studied children had poor knowledge at pre intervention, which improved to 79.4% and 76.2% in post and follow up intervention respectively. Almost three quarter of studied children (74.4%) had a negative attitude toward dental care in pre intervention, while in post and follow up interventions 84.4% and 81.2% respectively changed to positive attitude. The differences between pre, post and follow up interventions were highly statistically significant ( $P < 0.001$ ). Only one fifth of studied children (20.6 %) had adequate practices at pre intervention, which improved to most and majority of them (91.2% & 88.1%) in post and follow up interventions respectively to be adequate practices. The differences between pre, post and follow up interventions revealed highly statistically significant differences ( $P < 0.001$ ). Conclusion: The application of health promotion intervention increased children's good level of knowledge, positive attitudes and adequate practices related to dental hygiene and prevention of dental caries. Recommendation: The importance of the continuous implementation of school based programs should be highlighted in order to promote dental health, trying to spread the practices of good dental health care to as many children as possible.

**Keywords:** Health promotion intervention, dental hygiene, primary school children.

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## 1. INTRODUCTION

Good dental health is necessary for children to eat, speak and relate to each other without embarrassment. Dental health is recognized as one of the vital need of the children. Dental diseases, which include caries and periodontal diseases, are progressive, infectious diseases with multiple risk factors (1).

Dental care is important to the general health and well-being of all human being as the effect of poor oral hygiene may cause dental caries, periodontitis, bleeding gum and different mucosal lesions. These lesions related oral conditions may cause problems to eat and drink and thereby lead to malnutrition (2).

Dental caries is an infectious microbiological disease of the teeth that results in localized dissolution and destruction of the calcified tissues. It is considered a major public health problem globally due to its high propagation and significant social effect. The World Health Organization reports 60-90% of school children worldwide have experienced caries (3). Caries is affected by the consuming of dietary sugars, salivary flow, exposure to fluoride and preventive behaviors (4).

Although dental caries can have serious health effects throughout life, it may be particularly challenging for school aged children as it can contribute to failure to thrive, may result in oral pain that can interfere with one's ability and desire to eat and can contribute to substantial loss of school days (2). Dental decay is also related to a child's subsequent health and emotional development. Among children aged 4 to 15 years, caries has been significantly associated with adverse effects on smiling, self confidence and emotional wellbeing. In addition loss of sleep, inability to concentrate in school and absences from school are all caused by dental caries related pain (5).

The main objective of dental care is to prevent the buildup of plaques. Poor oral hygiene allows the accumulation of acid producing bacteria on the surface of the teeth. The acid demineralizes the tooth enamel causing tooth decay (cavities). Prevention is always better than cure. Good oral hygiene habits will prevent most of the dental problems and savings the costly dental treatments (6).

Children are suffering from more dental disease which is continuously increasing at a high rate due to deficiency of appropriate care and insufficient knowledge regarding dental hygiene. The school environment is more helpful to learning, hence dental health education and motivation will be more effective (7).

A school is a closed environment that concentrates a considerable number of children of the same age group who regularly attend the school. For this reason, it has been considered ideal for developing health and oral hygiene programs with children in age groups that are favorable for adopting preventive measures (8).

Dental health promotion is any planned effort to build public policies, create supportive environments, strengthen community action, and develop personal skills. Health promotion consists of two main parts: Health education and change in environment or some regional policies (9). Health education is still considered as a basic component of health promotion and is widely recognized as a tool for changing health behaviors (10). Dental health education aims to promote dental health through educational means, principally the provision of information to improve dental health knowledge for adoption of a healthier lifestyle, change attitudes and desirable behaviors (11)

School based oral health education, screenings, assisted referral, and delivery of oral preventive care services provide fair, reliable entry into long term oral health care and help parents by decreasing the need to take time from work and find transportation. Children who receive care in schools also can become an entry point for others in the family to connect with an oral healthcare provider. The combination of prevention education and access to care has the likely to nearly eliminate tooth decay in school age children (12). School health program should have provision for dental examination at least once a year and the success of the school health program depends largely on the community health nurse plans. The health education in the school provides guidance to the teachers and parents in the matters of oral health (6).

Nurses play a key role in promoting oral health among the children and are considered an important component of a successful oral hygiene program to identify oral care needs, develop individualized care plans, make referrals to dentists and implement facility oral health programs (13). School health nurse can play an important role in health educational program, making the children an important channel for disseminating the health information to the families and the communities. Today's students are tomorrow's leaders (7).

#### **Significance of the study:**

Dental caries is a major health problem affecting an estimated 90% of school children worldwide. In most developing low-income countries, the prevalence rate of dental caries is high. An estimated 5 billion people worldwide suffer from dental caries (14). Egypt, considered being one of the low to middle income countries, suffers from poor dental health in its population, especially in rural areas and Upper Egypt. The latest national oral health survey in Egypt which was carried out in 2015 revealed that 68.57% of 3-12 years old children were affected by dental caries, this percentage increased to

90.02% in 35 - 45 years old adults which is considered as an alarming oral health situation and dental caries in children remains a significant public health problem (15).

There is a need to develop a mechanism to provide coverage of the population with essential oral health care and to promote the availability of oral health services that should be directed towards diseases' prevention and health promotion. The development and implementation of preventive programs is necessary to introduce healthy lifestyle and self-care practices, especially for the children (16).

The school health nurse plays a vital role in providing effective oral care and promoting oral hygiene by appropriate assessment of oral health, providing guidance for effective oral care, supporting oral hygiene, preventing discomfort and detecting dental diseases early (17). Therefore, this study was conducted to improve knowledge, attitude and practices of primary school children and prevent of dental caries.

#### **Aim of the study:**

This study was carried out to determine the effect of health promotion intervention to prevent dental caries among primary school children.

#### **Research hypotheses:**

H<sub>1</sub>: Health promotion intervention will improve studied children's knowledge, attitudes and practices about dental care and prevention of dental caries.

H<sub>2</sub>: There will be a significant association between knowledge, attitudes and practices of studied children regarding dental care and prevention of dental caries.

H<sub>3</sub>: There will be a significant association between studied children's knowledge, attitude and practice scores regarding dental care and prevention of dental caries with their sociodemographic characteristics.

## **2. SUBJECTS AND METHODS**

#### **Research design:**

A quasi-experimental research design was utilized in this study with pre, immediately post and follow up test after 2 months.

#### **Setting:**

The study was carried out in Zahraa Helwan Primary School and Omar Ibn Al-Khattab Primary School affiliated to Wady Hof District in Helwan, Cairo Governorate.

#### **Sampling:**

**Sample technique:** A multi-stage random sample was used for selection of primary school children according to the following stages:

**First stage:** The total number of governmental primary schools at Wady Hof District is four schools, two schools were chosen randomly for the conduction of the study. Zahraa Helwan and Omar Ibn Al-Khattab Primary School.

**Second stage:** Two classes from fifth grade and two from sixth grade were selected randomly from each school. Total classes included in the study were 8 classes.

**Third stage:** All school children in the selected classrooms were included in the study.

**Sample size:** A pilot study had been performed to obtain data in order to calculate the sample size and the obtained SD from the pilot study was 8.6 and change of the knowledge score of 2.7. Considering level of significance of 5%, and power of study of 80%, the sample size was calculated using the following formula:

$$n = [(Z_{w/2} + Z_{\beta})^2 \times \{2(SD)^2\}] / (\text{mean difference between the two groups})^2$$

Where

SD = standard deviation

$Z_{\alpha/2}$ : This depends on level of significance, for 5% this is 1.96.

$Z_{\beta}$ : This depends on power, for 80% this is 0.84.

Therefore,

$$n = [(1.96 + 0.84)^2 \times \{2(14.94)^2\}] / (2.7)^2$$

Based on the above formula, the sample size required is 480.

The description sample size in the intervention was: A sample size of 480 students is sufficient to detect a clinically important difference of knowledge score after health promotion intervention using a two-tailed t-test of difference between means with 80% power and a 5% level of significance.

### Tools for data collection:

#### Tool one: An Interview questionnaire.

It was designed by the researchers after reviewing related literature to collect the required data. It was written in simple Arabic language and it consisted of two parts.

**Part 1: Sociodemographic data of studied children which include:** age, gender, educational grade, parent's level of education and occupation.

**Part 2: Knowledge of children about dental care and dental caries:** It was developed by researchers based on **Al-Bashtawy (18) and Al-Omiri et al. (12)**. It consisted of 20 questions to assess the studied children's oral health knowledge, it included items on the effects of brushing teeth and what does fluoride do, the best way to get fluoride, the concept of gum bleeding and how to protect against it, the meaning of dental plaque and decay and its effects, the effect of sweets and soft drinks on dentition and the effects of caries on appearance.

#### Scoring system for knowledge:

Knowledge obtained from the studied children was checked with a model key answer. The open question scored as the following: Complete correct answer takes "two", while the incomplete answer takes "one" and a wrong answer or don't know takes "zero". For each closed question a score of "one" was given for every correct answer and score of "zero" was given for every wrong answer. The total score was converted into percentage and interpreted as follows: < 50% is considered poor, 50 - < 75% is considered fair and  $\geq 75\%$  is considered good.

**Tool two: Children Attitude Likert Scale Toward Dental Care as Reported by Children.** It was developed by **Stenberg et al. (2000) (19)**, it consisted of five statements to assess the studied children's attitude towards dental care, for example it is necessary to brush the teeth after breakfast in the morning and last thing at night, visit dentist no less important than other doctors' visits, caring for teeth is important as caring for other parts of the body. The Likert Scale was rated from 1- 4, with (1) strongly disagree, (2) disagree, (3) agree and (4) strongly agree.

#### Scoring system:

The total attitude score was ranged from 5-20. The negative attitude (<60%) with score ranged from 5-<12 and the positive attitude ( $\geq 60$ ) with score ranged from 12- $\leq 20$ .

**Tool three: Children Practice Likert Scale Regarding to Dental Care.** Developed by **Al-Omiri et al. (12)**, it consisted of 6 questions related to children practices about dental health for example, how often do you brush your teeth? Do you rinse your mouth with water after each meal? Do you use tooth brush and fluoride tooth paste for tooth brushing? Do you brush your teeth using up, down and sideways technique? etc. The Likert scale was rated from 1-4 with (1) never practiced, (2) sometimes a week practiced, (3) twice a day practiced, and (4) once a day practiced.

#### Scoring system:

The total practice score ranged from 6-24. The inadequate practice (<60%) with score ranged from 6-14 and the adequate practice ( $\geq 60$ ) with score ranged from 15- $\leq 24$ .

**Data collection procedures:**

- **Study Period:** Data were collected during a period of 6 months started from 15 October 2016 to 15 April 2017.
- **Approval:** A formal approval was taken from the Ministry of Education to carry out of the study, official letters were addressed to the directors of the schools. Each director was informed about the study title, aim, time and date of data collection.

**Ethical considerations:** Oral consent was obtained from the studied children and their parents to participate in the study. Participants were assured that all collected data taken from them would be treated confidentially and used for the research purpose and their benefit only. Participants' anonymity, confidentiality, privacy, safety and protection were secured.

**Tool development:**

- **Validity:** Tools were reviewed and tested for validity by 5 experts in Pediatric Nursing and Community Health Nursing. Modifications were done accordingly to ascertain relevance and completeness.
- **Reliability:** Reliability was applied by the researchers for testing the internal consistency of the tools, by administration of the same tools to the same subjects under similar condition twice with an interval of 2 weeks. Answers from reported testing were compared (test-re-test reliability). The reliability of the study tools was tested using Cronbach Alpha. It amounted to be 0.92 indicating good reliability of the tools.
- **Pilot study:** A pilot study was carried out on 10% of the study sample from different schools to evaluate tools for clarity, applicability, and to estimate the time required for filling in the tools before starting the actual data collection. Data obtained from the pilot study were analyzed and the necessary modifications and rearrangement on the study tools were done. Children who participated in the pilot study were excluded from the main study sample.
- **The convenient time** was arranged with responsible for getting answers for the questions, which was not interfering to their education. The researchers introduced themselves and explained the aim of the study to studied children before their enrollment in the study. The data collection was then done using the previous tools as a pretest, the questionnaire was introduced to the studied children individually or in a group and the answers were marked by the researchers, about 20-30 minutes was needed to complete the questionnaire. The researchers were available in the study settings three times/week, the interventions starts from 9.00 a.m. to 12.00 mid-day.
- **The study was conducted through four phases:** preparatory, planning, implementation, and evaluation.

**1) Preparatory phase:** The preliminary stage was done by utilizing the assessment tools after being revised and tested for general information about dental health. Time expended for answering the study sheet ranged from 20-30 minutes.

**2) Planning phase:** Based on the outcome acquired from the preparatory phase, the educational sessions were designed after reviewing of related literature. Detected needs, requirements and deficiencies were converted into aim and objectives of the educational sessions.

**3) Implementation phase:** The intervention was implemented in the form of four sessions; 2 sessions for theory and 2 sessions for practice. The length of every session was distinctive according to studied children response and time accessible. At the beginning of each session, the researchers started by a summary about what was given through the previous session and objectives of the new one, taking into consideration using simple and clear Arabic language to suite the educational level of the studied children.

Theoretical sessions cover the part, which included: Definition of dental caries, risk factors and causes of dental caries, dietary advices about reducing frequent intake of sugar containing food and drink and they can substitute them by having fresh fruits. The benefits of brushing the teeth carefully at least twice a day with fluoridated toothpaste and flossing. The importance of regular visiting of dentists for early identification of teeth problems and their proper treatment.

Two practical sessions cover practices regarding proper ways of using tooth brushes to clean the teeth, denture care and how to clean the tongue, oral cleansing methods. The studied children were interviewed in a private room. Different teaching methods were used including small group discussions, lectures, brainstorming, handouts, role playing and demonstration. The teaching aids used were brochures, colored posters and laptop screen show. At the end of each session, studied children were informed about the content of the next session and its time.

The intervention was guided by illustrated leaflet offered to the studied children as reference; it was developed by the researchers based on the related literature review (1, 5, 12 & 15) containing necessary information and hints about dental care, caries and how to prevent of caries.

**4) Evaluation phase:** Evaluation of the educational sessions was done immediately after intervention by comparing the changes in studied children's levels of knowledge, attitudes and practices through applying the same tools of pretest as posttest and then a follow up was performed after two months.

#### Statistical Analysis:

All statistical analyses were performed using the Statistical Package for Social Sciences (SPSS), version 20.0 (SPSS, Chicago, IL). Continuous data were expressed in mean  $\pm$  standard deviation (SD), while categorical data were expressed in number and percentage. Prior to calculation, continuous data were examined for the normality of distribution. The comparison of the continuous data of the scores at pre-intervention, post intervention and follow up were tested using the repeated measure ANOVA test. The comparison of the continuous data that did not assume the normal distribution was tested using the Mann-Whitney U test or the Kruskal-Wallis test for comparison between two groups or among more than two groups respectively. Comparison of the categorical data was performed using the differences chi-square test. Correlation between variables as performed using the correlation co-efficient test. Statistical significance was set at  $P < 0.05$ , and highly statistical significance was set at  $P < 0.001$ .

### 3. RESULTS

**Table (1)** shows that 45% of studied children were boys, while 55% were girls. Regarding age, 50.6% had 11-<12 years, while 49.4% had 12- $\leq$ 13 years. Concerning level of mother education, 34.4% of them had secondary education, while 43.7% of fathers had university education. As regards mother employment status, 76.9% were housewives, while 71.9% of fathers were employees.

**Table (2)** presents that there were highly statistically significant increases in mean scores of knowledge, attitudes and practices at pre, post and follow up implementation of health promotion intervention ( $P < 0.001$ ).

**Figure (1)** clarifies that, the majority of studied children (81.9%) had poor knowledge at pre intervention, which improved to more than three quarter (79.4% & 76.2%), had good knowledge in the post and follow up health promotion intervention respectively. The difference among pre, post and follow up intervention was a highly statistically significant difference ( $X^2 = 889.444$  at  $P < 0.001$ ).

**Figure (2)** illustrates that, slightly less than three quarter (74.4%) of studied children had a negative attitude toward dental care in pre intervention, while at post and follow up intervention 84.4% and 81.2% respectively changed to positive attitude. The difference among pre, post and follow up intervention was a highly statistically significant difference ( $X^2 = 453.874$  at  $P < 0.001$ ).

**Figure (3)** demonstrates that, slightly less than four fifth of studied children (79.4%) had inadequate practices at pre intervention, which improved to 91.2% and 88.1% respectively in post and follow up health promotion intervention having adequate practices. The difference between pre, post and follow up interventions was highly statistically significant difference ( $X^2 = 687.881$  at  $P < 0.001$ ).

**Table (3)** shows that there were highly statistically significant associations between knowledge and attitudes scores, between knowledge and practices scores and between attitudes and practices scores at pre and post intervention, and pre and follow up intervention.

**Table (4)** demonstrates the associations between knowledge, attitude and practice scores of studied children with their sociodemographic characteristics. The study shows that there were insignificant associations between the knowledge, attitude and practice scores of studied children with their age and educational grade. On the other hand; the knowledge, attitude and practice scores were higher in the girls in comparison to the boys with highly statistically significant differences. In addition there were highly statistically significant associations with mother and father educational levels and employment status.



Table 1. Sociodemographic Characteristics of the Studied Children (n=480)

Items	No	%
<b>Age ( in years)</b>		
11 <-12	243	50.6
12- ≤ 13	237	49.4
<b>Gender</b>		
Girls	264	55
Boys	216	45
<b>Educational Grade</b>		
5 <sup>th</sup>	240	50
6 <sup>th</sup>	240	50
<b>Mother education</b>		
Illiterate	69	14.4
Basic	114	23.7
Secondary	165	34.4
University education	132	27.5
<b>Father education</b>		
Illiterate	27	5.6
Basic	117	24.4
Secondary	126	26.3
University education	210	43.7
<b>Mother Employment status</b>		
Employed	111	23.1
Unemployed (housewives)	369	76.9
<b>Father Employment status</b>		
Employed	345	71.9
Unemployed or professionals	135	28.1

Table 2. Comparison Between the Total Scores of Knowledge, Attitude and Practices of the Studied Children at Pre, Immediately Post and Follow up Implementation of Health Promotion Intervention (n=480).

Items	Pre Mean±SD	Post Mean±SD	Follow up Mean±SD	ANOVA test	
				F	P
<b>Knowledge scores</b>	3.4 ±1.7	8.8 ±2.4	8.5 ±2.7	832.020	<0.001 **
<b>Attitude scores</b>	11.6 ±2.6	17.2 ±3.5	16.5 ±3.8	400.789	<0.001 **
<b>Practice scores</b>	11.2 ±3.0	20.9 ±3.9	20.4 ±4.4	985.889	<0.001 **

\*\* : Highly significant at P ≤ 0.001

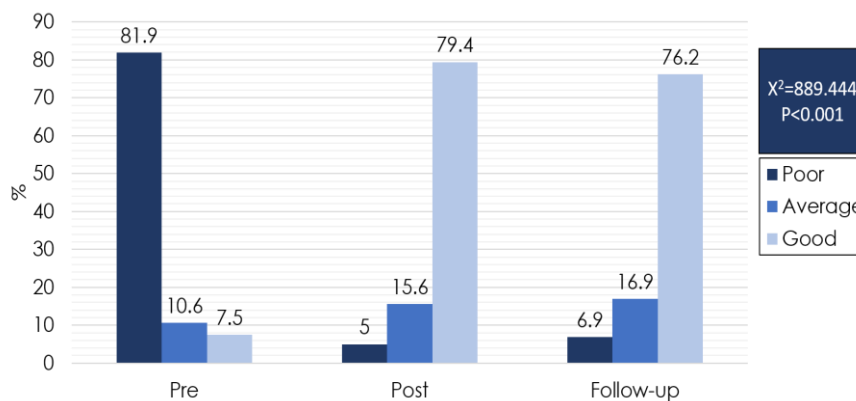


Figure 1. Comparison Between the Knowledge Scores at Pre, Post and Follow up of Health Promotion Intervention

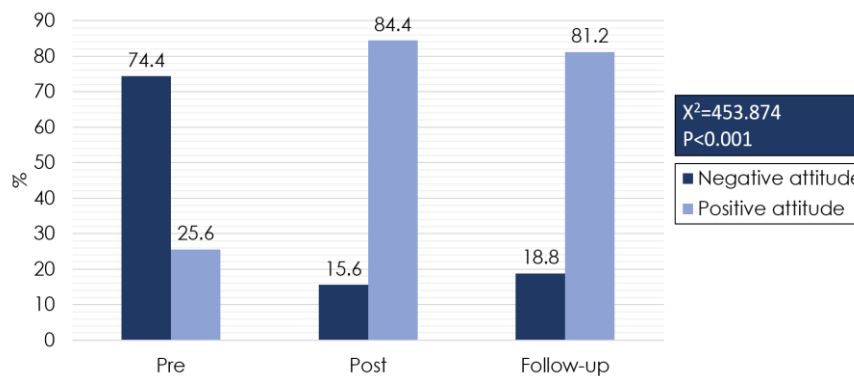


Figure 2. Comparison Between the Attitudes Scores at Pre, Post and Follow up of Health Promotion Intervention.

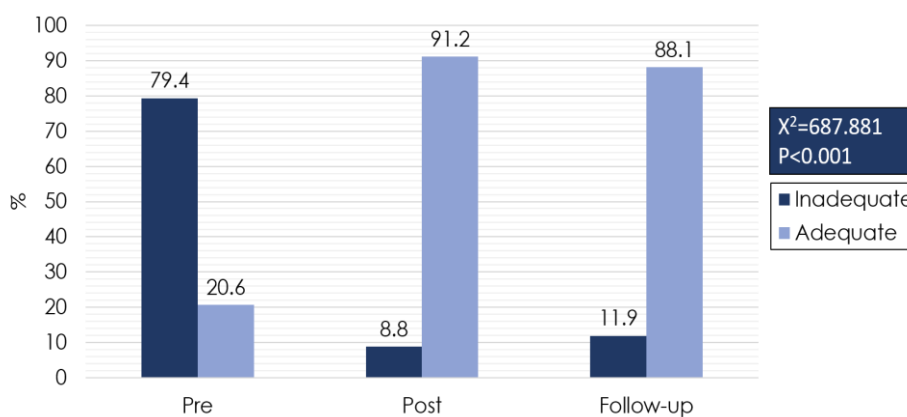


Figure 3. Comparison Between the Practices Scores at Pre, Post and Follow up Health Promotion Intervention.

Table 3. Associations Between Scores of Knowledge, Attitudes and the Practices at the Pre, Post and Follow up Health Promotion Intervention.

Items	r	p
<b>Pre-post intervention change</b>		
Association between scores of knowledge and attitudes.	0.440	<0.001 **
Association between scores of knowledge and practices.	0.885	<0.001 **
Association between scores of attitudes and practices.	0.206	<0.001 **
<b>Pre-follow up intervention change</b>		
Association between scores of knowledge and attitudes.	0.217	<0.001 **
Association between scores of knowledge and practices.	0.290	<0.001 **
Association between scores of attitudes and practices.	0.287	<0.001 **

\*\* : Highly significant at  $P \leq 0.001$

Table 4. Association Between Knowledge, Attitudes and Practices of Studied Children with their Sociodemographic Characteristics After Implementation of Health Promotion Intervention.

Score levels Variables	Knowledge Difference	Attitudes' Difference	Practices' Difference
<b>Age in years</b>			
11- <12	4.8 ±2.7	9.4 ±0.8	9.8 ±4.8
12- ≤13	5.4 ±2.1	9.3 ±0.7	9.6 ±2.8
<b>P (Mann-Whitney U test)</b>	<b>0.167</b>	<b>0.647</b>	<b>0.216</b>
<b>Gender</b>			
Girls	5.8 ±2.0	9.9 ±0.8	10.3 ±3.0
Boys	4.3 ±2.6	7.7 ±0.2	7.9 ±4.5
<b>P (Mann-Whitney U test)</b>	<b>&lt;0.001**</b>	<b>&lt;0.001**</b>	<b>&lt;0.001**</b>
<b>Educational Grade</b>			



5 <sup>th</sup>	4.8 ±2.7	9.4 ±0.8	8.8 ±4.8
6 <sup>th</sup>	5.4 ±2.1	9.3 ±0.7	9.7 ±2.8
<b>P (Mann-Whitney U test)</b>	<b>0.132</b>	<b>0.585</b>	<b>0.178</b>
<b>Mother education</b>			
Illiterate	4.2 ±2.9	9.4 ±0.7	8.4 ±3.8
Basic	4.8 ±2.6	9.9 ±0.9	7.7 ±4.6
Secondary	5.4 ±2.4	9.4 ±0.6	9.8 ±3.4
University	5.4 ±1.9	9.0 ±0.1	10.4 ±3.6
<b>P (Kruskal–Wallis test)</b>	<b>0.007</b>	<b>&lt;0.001**</b>	<b>0.008</b>
<b>Father education</b>			
Illiterate	4.7 ±2.9	9.4 ±0.7	8.0 ±3.5
Basic	4.1 ±2.7	9.7 ±0.8	7.1 ±4.5
Secondary	5.1 ±2.3	9.5 ±0.8	9.9 ±3.3
University	5.8 ±2.0	9.0 ±0.1	10.4 ±3.6
<b>P (Kruskal–Wallis test)</b>	<b>&lt;0.001**</b>	<b>&lt;0.001**</b>	<b>&lt;0.001**</b>
<b>Mother Employment status</b>			
Employed	5.1 ±2.4	9.2 ±0.5	10.1 ±4.0
Unemployed (housewives)	3.0 ±2.4	7.5 ±0.8	8.1 ±3.9
<b>P (Mann-Whitney U test)</b>	<b>&lt;0.001**</b>	<b>&lt;0.001**</b>	<b>&lt;0.001**</b>
<b>Father Employment status</b>			
Employed	5.5 ±2.2	9.3 ±0.6	9.9 ±3.7
Unemployed or professionals	3.9 ±2.7	8.7 ±0.9	7.7 ±4.2
<b>P (Mann-Whitney U test)</b>	<b>&lt;0.001**</b>	<b>&lt;0.001**</b>	<b>&lt;0.001**</b>

\*\* : Highly significant at  $P \leq 0.001$

#### 4. DISCUSSION

Dental health is recognized as one of the vital needs of the children and dental caries is the leading dental problem of children, 90% of children have some tooth decay by 12 years of age. 95% of all cavities are caused specifically by eating sugar habits like candies, ice-cream, canned juice, which usually develop during early childhood as a result of changing life style. Hence, the importance of preventing dental caries at the school age level is very essential (7). Therefore, this study was carried out to determine the effect of health promotion intervention to prevent dental caries for primary school children.

##### Sociodemographic characteristics of studied children:

The present study results revealed that slightly more than half of the studied children were in the age group of 11- < 12 years (table 1). This result agrees with Umarani (6), who in study entitled "Knowledge of children regarding oral hygiene: A school based descriptive study" conducted in Mangalore, India, reported that more than half of the children were in the age group of eleven years, and added that dental caries are a leading dental problem of children. Majority of children have some tooth decay by 12 years of age. This may be due to that at this age group, children like to eat sweet and ignore to clean the teeth after eating which leads to increase dental caries.

Regarding to gender, the present study result (table 1) indicated that more than half of studied children were girls. This result is inconsistent with Khamaiseh and Al-Bashtawy (20), who studied "Oral health knowledge, attitudes, and practices among secondary school students in the Al-Karak Governorate". They reported that more than half of school students were boys and more than two fifth were girls. This result is consistent with Kaur (7), who studied "School children knowledge regarding dental hygiene in governmental schools of Jalandhar district, Punjab", and reported that more than half of the sample was girls and less than half was boys. This increase in proportion of girls might be due to that girls are generally more concerned about their dental care than boys.

The result of the present study revealed that, slightly more than one third of mothers had secondary education, while more than two fifths of fathers had university education. This result is consistent with Haque et al. (21), who studied "Effect of a school-based oral health education in preventing untreated dental caries and increasing knowledge, attitudes and practices among adolescent students in Bangladesh". They found that more than half of fathers had university education while about one third of mothers had secondary education. This result is incongruent with that of a study carried out by Al-

**Bashtawy (18)**, who studied "Oral health patterns among school children in Mafraq Governorate, Jordan", and found that more than half of parent had university education. This may be due to increase awareness about the importance of education, belief and custom of community.

Considering employment status, the result of the present study revealed that, more than three quarter of mothers were housewives, while more than two third of fathers were employees. This result is to some extent consistent with that of **Pereira et al. (22)**, who studied "Oral health behaviors in a sample of Portuguese adolescents". They reported that more than two third of fathers of children were employees and more than half of mothers were unemployed. As well, this result is congruent with that of a study carried out by **Haque et al. (21)**, who stated that more than three quarter of fathers were employed, while more than half of mothers were housewives. This may be due to lack of opportunities of employment and culture of community.

#### **Knowledge, practices and attitudes of studied children about dental caries and care:**

Evidence has showed that an increase in knowledge about oral disease and strong knowledge of oral health demonstrates better oral care practices that aim to promote healthy habits as identified by **Al-Darwish (23)**.

Regarding to knowledge of the studied children about dental caries and care, the present study result revealed that the majority of studied children had poor level of knowledge, while there were improvements among the studied children after health promotion intervention, the difference among pre, post and follow up was a highly statistically significant (**figure 1**). This result is congruent with that of a study carried out by **Al-Bashtawy (18)**, who reported that the lack of knowledge among secondary school students could reflect the lack of health education programs in the school curriculum. In addition, **Kaur (7)**, who stated that, the result of the post-test score revealed that the structured teaching program had its impact on improving the level of knowledge regarding dental hygiene among middle school children. This may be related to the effect of health promotion intervention on the studied children's knowledge. In addition to that children at this age are receptive to guidance and familiar with learning environment and culture.

Attitudes toward dental care are influenced by beliefs and values, personal needs and behavior as clarified by **Satyawan et al. (24)**. The present study result showed that slightly less than three quarter of the studied children had a negative attitude regarding to dental care in pre intervention. However, at post and follow up health promotion intervention, more than four fifth of them changed to positive attitude and there was a highly statistically significant difference between pre, post and follow up health promotion intervention (**figure 2, table 2**). This result agrees with **Devdas et al. (25)**, who studied "Oral health attitudes, knowledge and practices among school children in Chennai, India". They showed that children's attitudes toward the oral hygiene should be guided properly by the parents and the guardians as well as the school dental health programs. As well, to have an impact on attitudes and practices, children may take more time, but in the long term it will have positive effects. This may be attributed to the effect of health promotion intervention in enhancement of the studied children's knowledge regarding dental hygiene, which affected the studied children attitudes.

Lack of dental hygiene practices leads to development of dental caries. These practices, such as brushing, flossing, and periodic dental visit should be developed early in the childhood to prevent dental caries as mentioned by **Haque et al. (21)**. The present study showed that there were statistically significant improvements in the mean scores of studied children regarding to the dental care practices in post and follow up application of the health promotion intervention (**table 2**). This result is consistent with that of **Vishwanathaiah (26)**, who studied "Knowledge, attitudes and oral health practices of school children in Davangere", and reported that dental care knowledge, attitudes and practices among the school students are still below the satisfactory level, and also stated that it is important to add oral health education in the curriculum at school level. This will help not only in creating awareness but also in development of correct oral health practices, thereby, to control problems. This may be attributed to an increase in knowledge among the studied children after training which led to improve their practices. In addition to that, primary school students are more likely to accept advice and guidance than older students and they are motivated to learn easily. As well, children during early stages of development and initial stage of learning process will take up all the new things in the way of fast track.

Hence, the research hypothesis ( $H_1$ ) which stated that, health promotion intervention will improve studied children's knowledge, attitudes and practices about dental care and prevention of dental caries was justified.

In a similar study, **Nutbeam (27)**, clarified that education should be conducted in a way that children acquire knowledge, a positive attitude toward dental care and the necessary skills to carry out the elements of the health promotion about dental care.

The results of the current study indicated that there was a statistically significant positive association between knowledge, attitude and practice scores through the pre intervention to the post and follow up periods (**table 3**). This result is in accordance with that of the study conducted by **Shenoy and Sequeira (28)**, who studied "Effectiveness of a school dental education program in improving oral health knowledge and oral hygiene practices and status of 12 to 13 year old school children", conducted in Indian. They reported that dental health behaviors and attitudes of children were changed after conducting the dental health education programs and found positive association between knowledge, attitude and practice. As well the result of this study is in agreement with that of a similar study conducted in Chicago, USA by **Biesbrock et al. (29)**, who studied "Short-term impact of a national dental education program on children's oral health knowledge". They found a significant association between knowledge, attitude and practice scores among school students after intervention. In addition, **Al-Darwish (23)**, who studied "Oral health knowledge, behavior and practices among school children in Qatar", said that an increase in knowledge about oral disease and strong knowledge of oral health demonstrates better oral care practices. Moreover, school children with inadequate oral health knowledge are twice as likely to have caries as school children with adequate knowledge. Therefore, an effective preventive program is desirable for children. This may be due to that improvement of knowledge among children leads to improve their positive attitude and good practices, in addition to increase motivation to carry out procedures of dental care correctly.

The above mentioned results proved the research hypothesis ( $H_2$ ), which revealed that there will be significant association between knowledge, attitudes and practices of studied children regarding dental care and prevention of dental caries.

Associations between studied children knowledge, attitude and practice scores with their selected socio-demographic characteristics after implementation of health promotion intervention, the present study (**table 4**) showed that, there were no statistically significant associations between the knowledge, attitude and practice scores of studied children with their age and educational grade. On the other hand, the change of the knowledge, attitude and practice scores were higher in the girls in comparison to the boys with highly statistically significant differences. This result was in contrast to that of **Lian et al. (30)**, who studied "Oral health knowledge, attitudes and practices among secondary school students in Kuching, Sarawak". They found that no statistically significant differences between girls and boys regarding their knowledge, attitudes and practices about dental health. However the finding of the present study was in congruence with that of **Khami et al. (31)**, who studied "Health behavior and its determinants amongst Iranian dental students". They found that girls had better oral health knowledge, attitude and behavior scores than boys and added that females usually care more about their body. Also this result was consistent with that of a study of **Kurushima et al. (32)**, entitled "Influence of genetic and environmental factors on oral diseases and function in China and Japan". They reported that a significant association was observed between girls and boys and found girls had good knowledge, attitude and practice scores than boys. This may be due to that girls are more interested in their general appearance than boys.

The current study result revealed that parents' level of education had influences on the dental health knowledge, attitude and practice scores of studied children, and was in line with that of study done by **Adeyemi et al. (33)**, who studied "The knowledge and experience of personal and professional oral care among secondary school students in Ibadan". They showed that oral hygiene habits, dental health knowledge and attitudes among school children were affected by the level of education of their parents. In addition, **Castilho et al. (34)** in their study entitled "Influence of family environment on children's oral health: A systematic review". Carried out in Iran, they confirmed the influence of parents' level of education on the dental health knowledge, attitudes and practices of their children. This may be due to that education about dental health is acquired first from the parents, where they stimulate the health of the mouth and teeth.

The present study revealed that the change of the knowledge, attitude and practice scores of studied children were significantly higher with their mother's and father's employment status with a Mean  $\pm$  SD higher in employed mothers and fathers. The same finding was reported by **Pereira et al. (22)**, who reported that employed parents were a powerful factor that influences dental knowledge and attitude occurrence among children.

Hence, the research hypothesis ( $H_3$ ) which stated that there will be a significant association between studied children's knowledge, attitude and practice scores regarding dental care and prevention of dental caries with their sociodemographic characteristics was not justified for age and educational grade, while with the rest of variables, it was approved.

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The study suggested that dental care knowledge, attitudes, and practices (KAP) among studied children about the dental care and prevention of caries was poor and needed to be improved. This study demonstrated that there was a significant improvement in KAP among studied children after health promotion intervention.

### 5. CONCLUSION

The study findings implied that the majority of the primary school children had poor level of knowledge, inadequate practices regarding dental care and had a negative attitude toward dental care before intervention. The health promotion intervention helped in improving the studied children's knowledge, attitudes and practices toward dental care and prevention of caries. As well, there were positive associations between their total knowledge, attitudes and practices.

### 6. RECOMMENDATIONS

- Posters can be displayed at school on the importance of the correct technique of brushing and flossing teeth to increase the knowledge and practices of the school children about dental care.
- Regular dental check-up should be conducted for school children.
- The importance of the continuous implementation of school based programs to be highlighted in order to promote dental health, trying to spread the practices on good dental health care to as many children as possible.
- Further research needed for teachers who are the sources of knowledge for children, so that they can impart correct knowledge, attitudes and practices about dental care and prevention of dental caries to children.

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