

Oral Health Promotion Program among Primary School Children

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Abstract: Oral health is a key indicator of overall health and its links with general health are systemic and reciprocal. Risk factors for oral diseases include unhealthy diet, tobacco use, and poor oral hygiene. At the most basic level, diseases and conditions affecting the mouth disrupt vital functions such as chewing, swallowing, speaking and sleeping. The study aimed at evaluating the effect of oral health promotion program on the primary school children. A Quasi-experimental design included 103 primary school children selected by multistage random sample from a total of 133 primary schools in El-Menofia Governorate (of these, 38 primary schools at Shebin El-Kom City and 95 primary schools from its surrounding villages). Data were collected by using oral health assessment form to determine oral health problems among primary school children and interview questionnaires covering demographic characteristics, oral health knowledge, and reported practices regarding oral health. The study revealed that regarding gingival bleeding, the difference was found to be statistically high significant between pre, post, follow up 6m and 9m ($\chi^2=36.28$, $P<0.001$). Concerning school children's oral health knowledge, the difference observed was statistically high significant between pre, post, follow up 6m and 9m ($\chi^2=99.80$, $P<0.001$). Considering school children's reported practices toward oral health, the difference was found to be statistically not significant between pre, post, follow up 6m and 9m for most aspects (>0.05). The study has proven improvement of gingival health in the targeted schoolchildren. Also, the oral health promotion program was effective in increasing knowledge and generates improvements in some aspects of oral health reported practices among schoolchildren.

Key Words: Oral health, Health promotion, Knowledge, Practices, School children.

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I. Introduction

Oral health is a key indicator of overall health and its links with general health are systemic and reciprocal. Risk factors for oral diseases include unhealthy diet, tobacco use, and poor oral hygiene. At the most basic level, diseases and conditions affecting the mouth disrupt vital functions such as chewing, swallowing, speaking and sleeping World Health Organization (WHO, 2017).

Despite great achievements in oral health of populations globally, problems still remain in many communities all over the world particularly among under-privileged groups in developed and developing countries. Dental caries and periodontal diseases have been considered the most important global oral health burdens. The significant role of socio-behavioural and environmental factors in oral disease and health is evidenced in an extensive number of epidemiological surveys (WHO, 2019).

The first nationwide survey of oral health among Egyptian children conducted by WHO involved different sectors of the society, showed that, nearly 70% of examined children had some untreated caries experience; meanwhile, 80% were suffering from some form of periodontal disease, 40% of participants reported that they experienced dental problems at the time of examination but did not seek a dentist for treatment and 20% had never been to a dentist World Health Organization, Eastern Mediterranean Regional Office (WHO, EMRO, 2015). In contrast to dental caries and periodontal disease, reliable data on the frequency and severity of oro-dental trauma are still lacking in most countries, particularly in developing countries. The prevalence rates of 5-12% are found in children aged 6-12 years in the Middle East (WHO, 2019).

Chandrashekar, et al., (2014) emphasized that oro-dental problems such as dental caries and gingival diseases adversely affect the appearance, nutritional intake, growth and development of children, self-esteem and quality of life. The cost of treating dental caries alone can overwhelm a country's health care expenditure for children and developing countries cannot afford treatment of established dental diseases. The best possible approach for many developing nations is to focus on prevention of these problems.

During the stage of childhood; oral health behaviours consolidate and probably will not change. Stability and early consolidation have particularly been evident for tooth brushing behaviour. During their school years children are receptive to accepting and maintaining positive health behaviours. The earlier the habits are established, the longer their impacts last. To adopt good oral health behaviour early in life is easier than to change detrimental oral health behaviours later in a child's development (Mohamadkhah, et al., 2014).

Oral health promotion is a major public health issue that insure the application of primary prevention methods such as teaching effective oral hygiene practices, promoting use of topical fluorides, promoting healthy diet or nutrition, Improving access to water and sanitation, facilitating early access to preventative dental services to prevent and detect oral diseases in an early stage (Veiga, et al., 2015). The role of oral health programmes for school children has been shown to be successful in countries around the world, with various strategies having been implemented. In Nexø, Denmark, a successful strategy was based on emphasize mechanical plaque control. In Sweden, supervised brushing with fluoride toothpaste was provided. In schools in Brazil, the onus was placed on educational activities. It seems here that well-designed oral health programmes can lead to a decrease in children's oral disease (Amalia, et al., 2011).

The necessity to set up oral health promotion programs in schools is evident, because the lack of organized oral health promotion programs (Niranjan, 2017). So, the researcher undertakes the present interventional study which may be an important step in improving oral health. The data were obtained from interviewing questionnaires, and oral health assessment form. A structured program offering preventive health care, and educational guidance for primary school children was implemented with follow-up period of 6 and 9 months. The study aimed at evaluating the effect of oral health promotion program on the primary school children.

II. Material And Methods

This study was carried out on primary school children in Shebin El-Kom City and its surrounding villages at El-Menofia Governorate, Egypt from October 2016 to April 2018.

Study design: Quasi-experimental design was used in this study to fulfill the study aim.

Study location: The study was conducted at primary schools in Shebin El-Kom City and its surrounding villages. Shebin El-Kom is the capital of El-Menofia Governorate. The surrounding villages are eight namely: Al-Batanon, Bakhaty, Shobra-Bus, El-May, Shanwan, Estebary, Al-Mesylha, and Mleag. According to schools' geographic location, schools in Shebin El-Kom are divided into two educational sectors; eastern and western sectors. There are 16 primary schools in the east sector. Also, there are 22 primary schools in the west sector. The surrounding villages of Shebin El-Kom City consist of 95 schools.

Study duration: October 2016 to April 2018.

Sample size: 103 primary school children.

Sample size calculation: The sample size was calculated using Epi-Info software statistical package created by World Health Organization and Center for Disease Control and Prevention, with a margin of error 5% at 95% confidence level. Total 103 children subjects (both male and females) of aged $8 \leq 12$ years were in this study.

Subjects & selection method: The total number of children registered in fourth, and fifth grade primary schools in both sectors of Shebin El-Kom City are 8,999 children and 16,255 children at surrounding villages (*Educational Statistic Records, 2015-2016*). Multistage sample type was constructed through taking a series of simple random sample in stages as follow; at the first stage, the researcher took 1 school from each sector and 2 schools from villages. Second stage, the researcher selected one class at every grade from the selected schools by the same method. All children in the chosen class were included except those who refused to participate or those who were absent.

Tools of data collections:

Two tools were used in this study for data collection:

1st tool: Oral Health Assessment Form for School Children (WHO, 2013): It was used to determine oral health problems among primary school children before and after conduction of HP program (pre, post, follow-up period of 6 & 9 months). It consisted of three parts as follows;

- **Part 1: Dental Caries Indices (DMFT, dft):** It was used to assess dental status for decayed and filled teeth in primary teeth and to assess dental status for decayed, missing, and filled teeth in permanent teeth. The examination of dental caries was conducted with visual observation.

- **Part 2: Periodontal Status:** It was used for the assessment of the absence or presence of gingival bleeding, all teeth present in the mouth was examined. A community periodontal probe was used.

- **Part 3: Traumatic dental injuries:** It was used for the assessment of teeth affected by dental trauma.

2nd tool: An Interviewing Questionnaire Format for School Children: A structured interviewing oral health questionnaire was designed by the researcher after reviewing literatures. It was used to evaluate school children's knowledge and practices before and after conduction of HP program (pre, post, follow-up period of 6

& 9 months). It was written in simple Arabic language and included closed-ended questions. It consisted of three parts as follows:

- **Part 1:** Demographic data: Characteristics of school children such as; age, sex, place of residence, number of family member.
- **Part 2:** Concerned with children's knowledge related to oral health such as the relation between cleaning teeth, and oral health, nature of plaque, meaning of dental caries, gingivitis, frequency, timing, and duration of teeth brushing, effect of poor oral health on oral health such as; dental caries and gingivitis, Also question about importance of visiting dentist.
- **Part 3:** Concerned with children's reported practices related to oral health (*WHO, 2013*) such as dental visit, reason for last dental visit, frequency of teeth cleaning, aids used for oral hygiene (toothbrush, dental floss, miswak), use of toothpaste containing fluoride, consumption of foods and drinks (fresh fruit, sweets or candy, lemonade, coca cola, or other soft drinks).

Pilot study:

A pilot study was carried out in order to test applicability of the tools and the clarity of the included questions, as well as to estimate the average time needed to complete the study. Five percent of the pre designated sample size (16 children) fulfilling the criteria were interviewed to test tools applicability. According to its results, modifications were done. Participants included in this study were excluded from the main study sample.

Ethical considerations:

Consent was obtained from each child and his parent who agreed to participate in the study. Before they become a subject of research, they were informed about the nature of the study; the aim of the study, methods used and anticipated benefits and potential hazards. Also they were informed that their participation is voluntary and have the right to withdraw at any time without giving any reason. Socio-cultural and religious aspects were respected throughout the study whether in the contents of the study tools or during data collection. Confidentiality was also assured about their names, address, and information.

Statistical analysis:

Descriptive data were obtained; mean, standard deviation and frequency distributions were calculated. Chi-square, and ANOVA tests were used to find significance of differences and $P < 0.05$ was considered significant. The data were processed and analyzed by means of the Statistical Package for Social Sciences (SPSS version 22.0).

III. Result

Figure no 1 show that, females and males school children were 62.1% and 37.9% respectively. Concerning child age, the largest (98.1%) proportion of children were in the age group $9 \leq 12$ years, while those in the age group $8 < 9$ years were 1.9%. The mean age of the study participants was 10.07 ± 0.81 years.

Figure no 1: Distribution of School Children According to Their Demographic Characteristics (Gender, & Age).

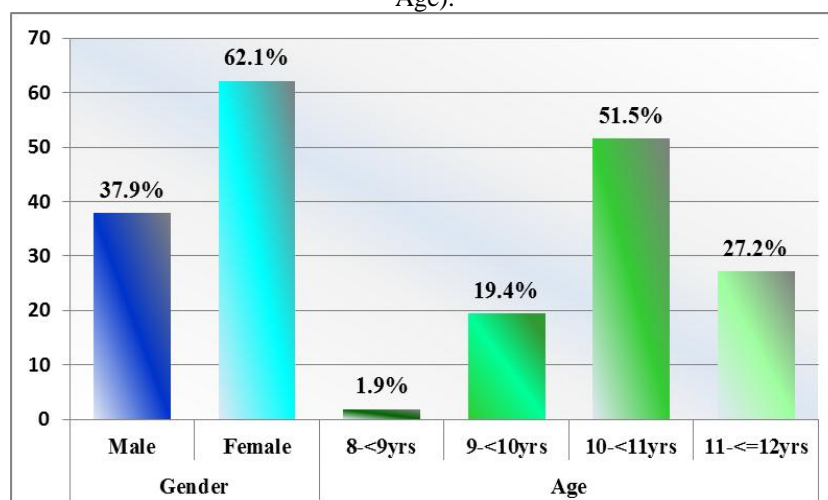


Figure no 2: shows that, as for habitat of residence, the rural ones exceeded those of urban areas (69.9% & 30.1% respectively).

Figure no2:Distribution of School Children According to Their Habitat of Residence.

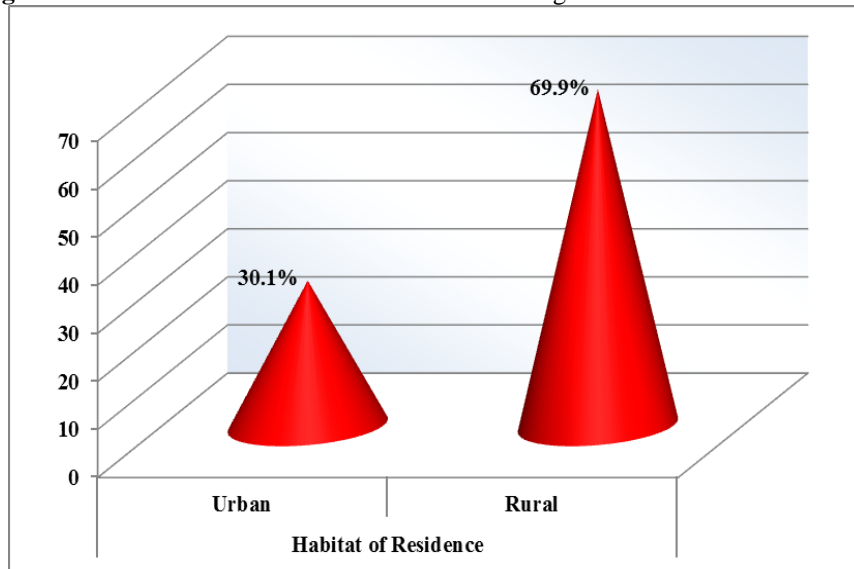


Figure no3:explains that, 42.7% of school children suffered from gingival bleeding in preprogram, compared to 7.8%, 19.4%, and 24.3% respectively in post, follow up 6m., and follow up 9m. The difference was found to be statistically high significant ($\chi^2=36.28$, $P<0.001$). Also this table reveals that, only 6.8% of school children complained from dental trauma in preprogram, compared to 8.7%, 8.7%, and 8.7% respectively in post, follow up 6m. , and follow up 9m. The difference was found to be statistically not significant ($\chi^2=.616$, $P>0.05$).

Figure no3:Distribution of School Children According to Their Oral Health Assessment (Gingival Bleeding& Dental Trauma Status).

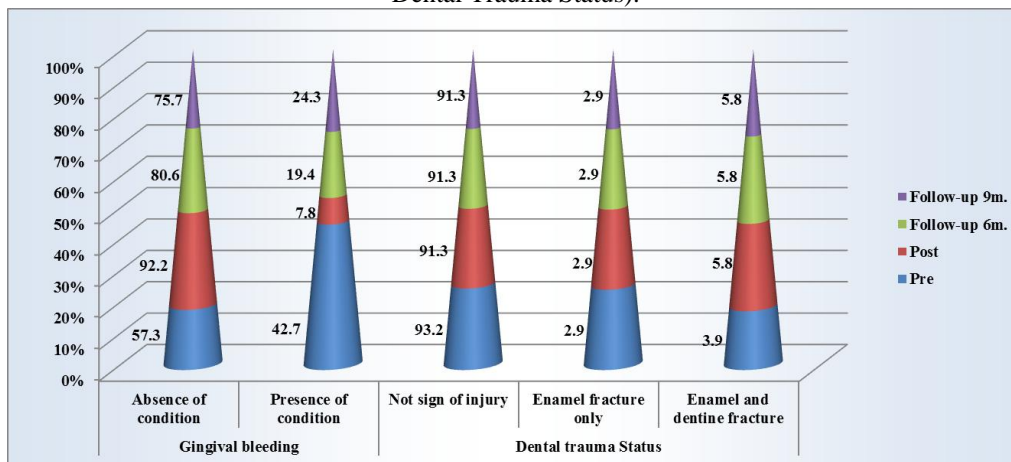


Table no1represents that, DMFT mean of school children were 0.16 in preprogram compared to 0.27, 0.39, and 0.35 respectively in post, follow up 6m., and follow up 9m. The difference was found to be statistically not significant ($F= 1.965$, $P >0.05$).Also this table represents that, dft mean of school children were 1.61 in preprogram compared to 0.84, 0.62, and 0.33 respectively in post, follow up 6m., and follow up 9m. The difference was found to be highly statistically significant ($F= 17.111$, $P<0.001$).

Table no1: Distribution of School Children According to Their Oral Health Assessment Regarding to Dental Caries.

Dental Caries	Pre	Post	Follow-up 6m.	Follow-up 9m.	ANOVA	
					F	P-value
(DMFT) Mean±SD	0.16±0.54	0.27±0.67	0.39±0.93	0.35±0.79	1.965	>0.05
(dft) Mean±SD	1.61±1.86	0.84±1.31	0.62±1.22	0.33±0.71	17.111	<0.001

Figure no 4 reveals that, as regards school children's good knowledge level scores were detected in 6.8% in preprogram increased to 66.0%, 51.5%, and 60.2% in post, follow up 6m., and follow up 9m respectively.The difference observed was statistically high significant ($\chi^2= 99.80$, $P<0.001$).

Figure no 4: Distribution of School Children Regarding Their Total Level of Knowledge about Oral Health.

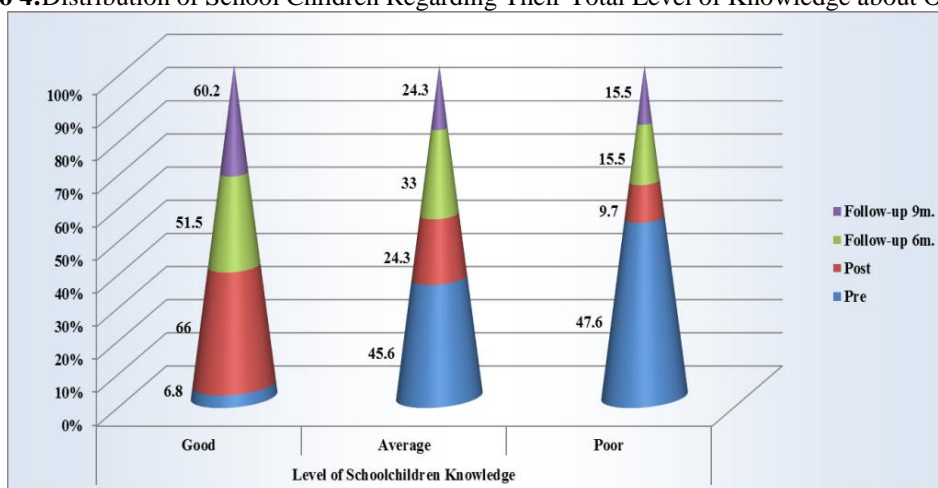


Table no 2 explains that, regarding school children's times they visit dentist, there was highly statistically significant difference ($\chi^2=52.51$, $P<0.001$). Also, this table shows that, concerning reason for visiting dentist, there was no statistically significant difference ($\chi^2=11.40$, $P>0.05$).

Table no 2: School Children's Reported Practices toward Oral Health about Dental Visit.

Items	School Children's Reported Practices								χ^2	P-value
	Pre		Post		Follow-up 6m.		Follow-up 9m.			
	No.	%	No.	%	No.	%	No.	%		
How often do you visit dentist in the 12 past months										
- Once	17	16.5	18	17.5	12	11.7	7	6.8	52.51	<0.001
- Twice	9	8.7	37	35.9	13	12.6	17	16.5		
- Three times	7	6.8	4	3.9	11	10.7	8	7.8		
- Four times	3	2.9	7	6.8	9	8.7	7	6.8		
- More than four times	25	24.3	10	9.7	15	14.6	18	17.5		
- I had no visit to dentist during the past 12 months	5	4.9	6	5.8	4	3.9	7	6.8		
- I have never received dental care/visited a dentist	4	3.9	4	3.9	6	5.8	8	7.8		
- Don't know/don't remember	33	32.0	17	16.5	33	32.0	31	30.0		
What was the reason for your last visit to the dentist										
- Pain or trouble with teeth, gums or mouth	37	60.7	34	44.1	36	57.2	33	56.8	11.40	>0.05
- Treatment/follow-up treatment	9	14.8	15	19.5	5	7.9	7	12.1		
- Routine check-up of teeth	6	9.7	10	13.0	7	11.1	11	19.0		
- Don't know/don't remember	9	14.8	8	23.4	15	23.8	7	12.1		

Table no 3 explains that, in relation to frequency of teeth brushing, 38.8% of school children brush their teeth two or more times a day in preprogram compared to 48.5%, 44.7%, and 57.3% respectively in post, follow up 6m., and follow up 9m. There was no statistically significant difference ($\chi^2=19.38$, $P>0.05$). As for tools used for teeth cleaning, regarding tooth brush the majority (91.3%) of school children reported used it in preprogram compared to 94.2%, 96.1%, and 92.2% respectively in post, follow up 6m., and follow up 9m. There was no statistically significant difference ($\chi^2=2.34$, $P>0.05$). Considering dental floss, in preprogram 12.6% of them reported used it while in post, follow up 6m., and follow up 9m improved to 32%, 28.2%, and 27.7% respectively. There was statistically significant difference ($\chi^2=12.04$, $P<0.05$). Regarding miswak, in preprogram 29.1% of them reported used it compared to 33%, 31.1%, and 23.3% respectively in post, follow up 6m., and follow up 9m. There was no statistically significant difference ($\chi^2=2.63$, $P>0.05$). Considering cleaning teeth by using toothpaste, 88.3% of school children reported used it in preprogram compared to 94.2%, 92.2%, and 90.3% respectively in post, follow up 6m., and follow up 9m. There was no statistically significant difference ($\chi^2=2.43$, $P>0.05$).

Table no3: School Children's Reported Practices toward Oral Health about Oral Hygiene Practice.

Items	School Children's Reported Practices								χ^2	P-value
	Pre		Post		Follow-up 6m.		Follow-up 9m.			
	No.	%	No.	%	No.	%	No.	%		
How often do you clean your teeth										
- Never	8	7.8	11	10.7	11	10.7	10	9.7	19.38	>0.05
- Several times a month (2-3 times)	14	13.6	14	13.6	8	7.8	10	9.7		
- Once a week	7	6.8	7	6.8	9	8.7	10	9.7		
- Several times a week (2-6 times)	18	17.5	15	14.6	18	17.3	9	8.7		
- Once a day	16	15.5	6	5.8	11	10.7	5	4.9		
- Two or more times a day	40	38.8	50	48.5	46	44.8	59	57.3		
Do you use any of the following for clean your teeth										
Toothbrush:										
- Yes	94	91.3	97	94.2	99	96.1	95	92.2	2.34	>0.05
- No	9	8.7	6	5.8	4	3.9	8	7.8		
Dental floss:										
- Yes	13	12.6	33	32.0	29	28.2	28	27.7	12.04	<0.05
- No	90	87.4	70	68.0	74	71.8	75	72.3		
Miswak:										
- Yes	30	29.1	34	33.0	32	31.1	24	23.3	2.63	>0.05
- No	73	70.9	69	67.0	71	68.9	79	76.7		
Use toothpaste to clean your teeth:										
- Yes	91	88.3	97	94.2	95	92.2	93	90.3	2.43	>0.05
- No	12	11.7	6	5.8	8	7.8	10	9.7		

Table no 4 demonstrates that, regarding eating or drinking foods, 27.2% of school children reported eating fresh fruit several times a day in preprogram compared to 29.1%, 30.1%, and 31.1% respectively in post, follow up 6m., and follow up 9m. There was no statistically significant difference ($\chi^2=17.23$, $P>0.05$). As for drinking Lemonade, coca cola or other soft drinks, there was no statistically significant difference ($\chi^2=21.45$, $P>0.05$). As regards to taking sweets and candy, there was statistically significant difference ($\chi^2=25.27$, $P<0.05$).

Table no 4: School Children's Reported Practices toward Oral Health about Nutrition.

Items	School Children's Reported Practices								χ^2	P-value
	Pre		Post		Follow-up 6m.		Follow-up 9m.			
	No.	%	No.	%	No.	%	No.	%		
How often do you eat or drink any of the following foods										
Fresh fruit:										
- Never	3	2.9	5	4.9	8	7.8	9	8.7	17.23	>0.05
- Several times a month	6	5.8	4	3.9	1	1.0	6	5.8		
- Once a week	14	13.6	9	8.7	6	5.8	6	5.8		
- Several times a week	14	13.6	9	8.7	16	15.5	14	13.6		
- Every day	38	36.9	46	44.7	41	39.8	36	35.0		
- Several times a day	28	27.2	30	29.1	31	30.1	32	31.1		
Lemonade, coca cola or other soft drinks:										
- Never	12	11.7	25	24.3	21	20.4	22	21.4	21.45	>0.05
- Several times a month	16	15.5	14	13.6	15	14.6	8	7.7		
- Once a week	12	11.7	21	20.4	22	21.4	25	24.3		
- Several times a week	17	16.4	14	13.6	16	15.5	19	18.4		
- Every day	28	27.2	19	18.4	18	17.5	14	13.6		
- Several times a day	18	17.5	10	9.7	11	10.6	15	14.6		
Sweets & candy:										
- Never	19	18.4	23	22.3	22	21.4	16	15.5	25.27	<0.05
- Several times a month	9	8.7	9	8.7	8	7.8	8	7.8		
- Once a week	15	14.6	21	20.4	26	25.2	19	18.4		
- Several times a week	8	7.8	15	14.6	17	16.5	21	20.4		
- Every day	36	35.0	25	24.3	14	13.6	19	18.4		
- Several times a day	16	15.5	10	9.7	16	15.5	20	19.5		

IV. Discussion

The American Academy of Pediatric Dentistry (AAPD, 2014) recognizes that children oral health is one of the foundations on which preventive education and dental care must be built to enhance the opportunity for a lifetime free from preventable oral disease.

Prevention of disease, and suffering should be a primary goal of any society that hopes to provide a decent quality of life for its individuals. Prevention on the community based level is the most cost effective approach and has the greatest impact on a community as school. An effective community prevention program is a planned procedure that prevents the onset of a disease among a group of individuals. Many different approaches to preventing dental diseases exist and the most cost-effective method is health education (WHO, 2017).

Methodological issues:

In this study, sampling procedures were optimized to ensure that the results of this study could be generalized to all 8≤12 years old schoolchildren in Shebin El-Kom City and its surrounding villages, thus minimizing selection bias. Study participants were enrolled based on multi-stage random sampling technique, reducing time and costs. The sample was sufficiently large enough, including 4 schools and drawn from diverse area to make the study sample reasonable representative of all 8≤12 years old school children's in Shebin El-Kom City and its surrounding villages. During this age, children are receptive to accepting and maintaining positive health behaviours. Also, by this age, children are able to understand and complete the questionnaire.

The researcher used close-ended questions format in a structured paper and self-administrated survey questionnaires. Prior to the questionnaires administration, the questions were pretested among a group of children (16 children) to assess reliability and validity. Two quite different reasons for using close-ended as opposed to open-ended questions have been distinguished in the literatures. First, close-ended questions are more easily analyzed. Second, close-ended questions take less time for the researcher to evaluate it. On the other hand, open-ended questions allow respondents to use their own words, which is difficult to compare the meaning of the response.

Oral health assessment form developed by WHO was chosen for this study as it has been used to determine oral health status in many studies. This relatively simple assessment is easy to use since the criteria are objective and the examinations can be carried out quickly with minimum training.

Inflammation of the gingival is a response to the bacterial plaque build at and below the gingival margin. Individuals with good oral hygiene behavior and regular flossing followed by brushing can disrupt the accumulation of dental plaque and eventually prevent gingivitis.

Core finding of the present study explained that, there were high statistically significant differences between pre, post, follow up 6m., and follow up 9m related to gingival bleeding (*Figure 3*) which agrees with study conducted in Nalgonda district, India by **Chandrashekaret al. (2014)** who assured that, the preintervention and post intervention comparison within each group revealed a substantial reduction in mean gingival index at post-intervention compared to baseline. As well, this coincided with study carried out among 13 to 15 years old school children in Bangalore City by **D'Cruz & Aradhya (2013)** reported that, nine months post intervention, there were significant reductions in mean gingival index scores in the experimental groups. Similar opinion has been reported by **Shenoy & Sequeira (2013)** in India mentioned that, gingival score reductions were highly significant in intervention schools. The probable explanation of the present results in the view of researcher is that education and adoption of appropriate tooth-brushing technique after oral health promotion program.

The present study represented that, there were no statistically significant differences between pre, post, follow up 6m., and follow up 9m regarding dental caries (DMFT) (*Table 1*). This finding corroborated by study conducted in Nalgonda District, Andhra Pradesh, India by **Chandrashekar et al. (2014)** reported that, there was lack of significant difference in dental caries between different groups. This finding is on contrary with previous study carried out by **Lai et al. (2016)** where it was found that, the intervention group had lower DMFT score than the nonintervention group. Also, study done among children in Southern Thailand **Petersen et al. (2015)** represented that, there was reductions in caries in intervention group. As well, study conducted among 12 and 15 years old school children **Bhardwaj et al. (2013)** showed that reduction in the mean caries status of the study subjects was insignificant. Additionally, study carried out in urban areas of Chandigarh and Panchkula, India by **Chachra et al. (2011)** who revealed a highly significant DMFT percentage reduction in intervention group compared to control. This may attribute to the short duration of the study which would not have been sufficient to bring a noticeable change in dental caries. However, the benefits accrued in terms of improved oral hygiene may show their benefit in caries prevention in the long run which could not be elicited in the present study.

The study findings revealed that, there were high statistically significant differences between pre, post, pre and follow up 6m., pre and follow up 9m related to dental caries (dft) (*Table 1*). For our information, there was no study explained this aspect. It is suggested that because primary school children are in a period of mixed dentition and will gradually exfoliated their deciduous teeth and develop permanent teeth over time, this leads to a reduction in the dental caries status of school children.

The study findings showed that, there was highly significant difference between pre, post and follow up 6m., and follow up 9m of school children total knowledge level scores related to oral health (**Figure 4**). This finding matches with study done in Saveh city, Iran by **Naseri-Salahshour, et al., (2019)** who represented that, there was statistically significant difference observed between the intervention and control groups, immediately and one month after the intervention related to knowledge. Also, this result is in accordance with study done among school children aged 10-11 years by **Lai et al. (2016)** showed that, the intervention group had significantly better dental knowledge. Also this result supported by **Angelopoulou et al. (2015)** assured that, oral health education programs improved the oral health knowledge of children. As well this finding is in congruent with study done among Children aged 9-12 years by **Blake et al. (2015)** asserted that, children's dental knowledge significantly improved following the intervention, with improvement evident at immediate follow-up and maintained 6 weeks later.

In contrast, **Niranjan & Knight (2017)** reported that there was no significant difference between the two groups at the end of the study regarding knowledge. These results are very logic because they were giving the program and there is an increase in their knowledge, which reflect the need of those children for effective teaching program about oral health.

Concerning school children's reported practices regarding times they visit dentist, the present study revealed that, there were highly statistically significant differences between pre, post and follow up 6m., and follow up 9m (**Table 2**) which agrees with study in Yichang City, China by **Tai et al. (2009)** stated that, the 3-year children in the intervention schools adopted regular oral health behavioral practices such as visiting the dentist within the past calendar year. This finding is on the contrary with study conducted among children aged 12 in Yogyakarta Province, Indonesia by **Amalia et al. (2011)** mentioned that, 90.2% never or rarely visited a dentist. Tooth brushing daily reduces plaque accumulation and gingivitis and should be performed for children twice or more daily as highlighted by **American Academy of Pediatric Dentistry (AAPD, 2014)**. This importance was confirmed by Hadith, **Abu-Hurairah (R)** who narrates that the Prophet (Salla-AllahuAlaihi Wa-Sallam) said: "Was it not for my fear of imposing a difficulty on my people I would have ordered that the miswak be used for every prayer".

Regarding to the study result, there were no statistically significant differences in pre, post, follow up 6m., and follow up 9m related to frequency of teeth brushing (**Table 3**). This finding is supported by study conducted among grade 5 learners by **Niranjan & Knight (2017)** reported that there was no significant difference between the groups regarding frequency of brushing practice at the end of the study. Similar opinion has been reported by **Blake et al. (2015)** asserted that, no significant differences were detected in tooth brushing after the intervention compared with baseline. The researcher attributed this to that self-reported oral health practices may not necessarily reflect actual practices. On the other hand, a study done in Kutch district, Gujarat, India by **Sanadhyal et al. (2014)** reported a different view as there was drastic improvement in the practices related to oral health after the program. 82% children started rinsing after meals and there was significant improvement in the practice related to times of cleaning teeth.

As for tools used for teeth cleaning, regarding tooth brush, miswak, and toothpaste, there were no statistically significant differences between pre, post, follow up 6m., and follow up 9m. This finding is in line with study conducted among 15 years old children selected from rural schools by **Chandrashekar et al., (2014)** reported that, post intervention, only 18-27% of the children reported using brush and paste for cleaning their teeth. This result is on the contrary with study conducted in Kutch district, Gujarat, India by **Sanadhyal et al. (2014)** who showed that, there were self-reported increases in use of oral hygiene aids and maintenance of oral hygiene as compared with the baseline.

Evidence has showed that brushing alone is not sufficient in cleaning proximal surfaces of teeth, and, therefore, the use of dental floss have been recommended to further help in preventing both dental caries and periodontal disease. Considering use of dental floss as reported by children, there were statistically significant differences between pre, post, follow up 6m., and follow up 9m. This finding matches with study conducted in Kutch district, Gujarat, India by **Sanadhyal et al. (2014)** who reported that, significantly more children reported using dental floss 6 weeks after the intervention compared with baseline.

The present study illustrated that, there were no statistically significant differences between pre, post, follow up 6m., and follow up 9m related to reported practices as regard to oral health about nutrition (**Table 4**). In the same line, study done by **Blake et al. (2015)** pointed out that, no significant differences were detected in dietary behaviors. This finding differs from study carried out in Saveh city, Iran by **Naseri-Salahshour, et al., (2019)** who reported a different view as the educational intervention had a positive effect on promoting attitude and leading to behavior related to dietary regime. Also study done among 10 years old children assessed at baseline and 6 and 18 months afterwards by **Angelopoulou et al. (2015)** who mentioned that, oral health education program improved the oral health behavioral practices of children.

As regards to taking sweets and candy in the present study, there were statistically significant differences between pre, post, follow up 6m., and follow up 9m. This result confirmed by study carried out in

urban areas of Chandigarh and Panchkula, Indiaby **Chachra et al. (2011)** who identified that, improve in practice regarding limit number of sugar exposures to three times a day, twice at meal, and once in between meals.

Study limitations: The self-reported responses might not represent school children's true knowledge and practices. They may report what they think should be the correct knowledge or practice rather than the truth. Also, there was high loss to follow-up among school children.

V. Conclusion

The study has proven improvement of gingival health in the targeted school children. Also, the oral health promotion program was effective in increasing knowledge and generates improvements in some aspects of oral health reported practices among school children.

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References

- [1]. **Amalia, R., Schaub, R. M. H., Widyanti, N., Stewart, R., & Groothoff, J.W.** The role of school-based dental programme on dental caries experience in Yogyakarta Province, Indonesia International Journal of Paediatric Dentistry BSPD, IAPD and Blackwell Publishing Ltd 2011; 203-210.
- [2]. **American Academy of Pediatric Dentistry (AAPD).** Guideline on infant oral health care. *Pediatr Dent* 2014; 141-5.
- [3]. **Angelopoulou, M. V., Kavvadia, K., Taoufik, K., Oulis, C. J.** Comparative clinical study testing the effectiveness of school based oral health education using experiential learning or traditional lecturing in 10 year-old children *BMC Oral Health* 2015; 15(51).
- [4]. **Bhardwaj, V. K., Sharma, K. R., Luthra, R. P., Jhingta, P., Sharma, D., & Justa, A.** Impact of school-based oral health education program on oral health of 12 and 15 years old school children. *J Edu Health Promot* 2013; 2: 33.
- [5]. **Blake, H., Dawett, B., Leighton, P., Rose-Brady L., & Deery, C.** School-based educational intervention to improve children's oral health-related knowledge. *Health Promot Pract* 2015; 16(4):571-82.
- [6]. **Chachra, S., Dhawan, P., Kaur, T., & Sharma, A. K.** The most effective and essential way of improving the oral health status education 2011; (29) 3: 216-221 Available at: https://www.researchgate.net/publication/51707961The_most_effective_and_essential_way_of_improving_the_oral_health_status_education
- [7]. **Chandrashekar, B. R., Suma, S., Sukhabogi, J. R., Manjunath, B. C., & Kallury, A.** Oral health promotion among rural school children through teachers: an interventional study. *Indian J Public Health* 2014; 58: 235-40 Available from: <http://www.ijph.in/text.asp?2014/58/4/235/146278>
- [8]. **D'Cruz, A. M., & Aradhya, S.** Impact of oral health education on oral hygiene knowledge, practices, plaque control and gingival health of 13 to 15 years old school children in Bangalore city. *Int J Dent Hyg.* 2013; 11(2):126-33.
- [9]. **Educational Administration (2015):** Educational statistic records, Talat-Harb St. Shebin El-Kom, El-Menofia Governorate, Egypt.
- [10]. **Hadith, Saheeh Muslim,** Part 1, No. 91, P.93
- [11]. **Lai, H., Fann, J. C., Yen, A. M., Chen, L. S., Lai, M. H., Chiu, S. Y.** Long-term effectiveness of school-based children oral hygiene program on oral health after 10 year follow-up. *Community Dent Oral Epidemiol.* 2016 Jun; 44(3):209-15.
- [12]. **Mohamadkhah, F., Shokravi, F. A., Karimy, M., & Faghizadeh, S.** Effects of lecturing on self-care oral health behaviors of elementary students *Med J Islam Repub Iran.* 2014; 28: 86.
- [13]. **Naseri-Salahshour, V., Abredari, H., Sajadi, M., Sabzaligol, M., & Karimy, M.** The Effect of Oral Health Promotion Program on Early Dental Decay in Students: a Cluster Randomized Controlled Trial. *J Caring Sci.* 2019 Jun; 8(2): 105-110.
- [14]. **Niranjan, N. & Knight, S.** An education intervention to improve oral health knowledge and behaviour in learners: A cluster randomized controlled trial. *saDJ* 2017; 72 (4): 167-172.
- [15]. **Niranjan, V., Kathuria, V., Venkatraman, J., & Salve, A. (2017):** Oral Health Promotion: Evidences and Strategies Available from: <https://www.intechopen.com/books/insights-into-various-aspects-of-oral-health/oral-health-promotion-evidences-and-strategies>
- [16]. **Petersen, P. E., Hunsrisakhun, J., Thearmontree, A., Pithpornchaiyakul, S., Hintao, J., Jürgensen, N., & Ellwood R. P.** School-based intervention for improving the oral health of children in southern Thailand. *Community Dent Health.* 2015; 32(1): 44-50.
- [17]. **Sanadhya, Y. K., Thakkar, J. P., Divakar, D. D., Pareek, S., Rathore, K., Yousuf, A., Ganta, S., Sobti, G., Maniar, R., Asawa, K., Tak, M., & Kamate, S.** Effectiveness of oral health education on knowledge, attitude, practices and oral hygiene status among 12-15 years old schoolchildren of fishermen of Kutch district, Gujarat, India. *Int Marit Health.* 2014; 65(3): 99-105.
- [18]. **Shenoy, R., & Sequeira, P.** Effectiveness of a school dental education program in improving oral health knowledge and oral hygiene practices and status of 12 to 13 years old school children. *Indian J Dent Res* 2013; 21:253-259.
- [19]. **Tai, B. J., Jiang, H., Du M. Q., & Peng, B.** Assessing the effectiveness of a school-based oral health promotion programme in Yichang City, China *Community Dent Oral Epidemiol.* 2009 Oct; 37(5):391-8.
- [20]. **Veiga, N. J., Pereira, C. M., Ferreira, P. C., & Correia, I. J.** Prevalence of dental caries and fissure sealants in a Portuguese sample of adolescents *PLoS One.* 2015; 24(10): 3.
- [21]. **World Health Organization (WHO) (2013):** Oral health surveys; basic methods, 5th ed., pp. 1-123. Available at: http://www.who.int/oral_health/publications/9789241548649/en/
- [22]. **World Health Organization (WHO) (2017):** what is the burden of oral disease? Available at: http://www.who.int/oral_health/disease_burden/global/en/
- [23]. **World Health Organization (WHO) (2019):** What is the burden of oral disease? Available at: https://www.who.int/oral_health/disease_burden/global/en/
- [24]. **World Health Organization, Eastern Mediterranean Regional Office (WHO EMRO) (2015)** Egypt. Egypt releases results of epidemiological study on oral health status.