Effect of Oral Health Promotional Program on Knowledge, Attitudes and Practices Regarding Dental Caries among Primary School Children In Minia City, Egypt

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Abstract

Background: For optimal health and well-being, oral health is a fundamental element. Dental caries is a prevalent disease both from a community and individual health perspectives. Also, families have to deal with a young child suffering from toothache. The basic mission of oral health educators is to improve information and behaviour in the community. Such understanding requires knowledge that represents the human conviction that has been translated into actions. Positive behavior is the outcome of the sustained action**. The aim of the study** was to evaluate the effect of oral health promotional program on knowledge, attitude and practices regarding dental caries among primary school children in Minia city, Egypt. **Design**: quasi-experimental pre-post-test method was used. **Settings**: The research was applied in Saad Zaghlol and Huda Sharawy Primary Schools affiliated to Minia City of Minia Governorate, Egypt. **Sample**: cluster random sample of 400 participant child who were recruited using multi-stage random sample technique. **Tool**s: I-Socio-Demographic Questionnaire. II-Oral Health Knowledge Questionnaire. III- Dental Behavioral Inventory (HU-DBI) questionnaire at Hiroshima University IV- Questionnaire on Oral Health practice. **Results**: the present study showed that the oral health promotional program(OHPP) become efficient in enhancing awareness, attitude, and skills toward oral health; as the mean scores of knowledge, attitudes and practices were 7.83 ± .488, 6.63± 1.7 and 9.33±1.1 respectively with highly statistical difference before and after oral health promotion program. High statistically significant difference between children about oral health knowledge, attitudes and practices pre and post the assigned program (P= .000**) were noticed. **Conclusion**: There was improvement of level of knowledge, positive attitudes and satisfactory practices among the majority of the participants children after implementation of oral health promotion program. **Recommendations**: Integration of OHPP into the school curriculum for enhancing knowledge, attitude, practices regarding oral health and dental caries prevention. Health care decision makers and authorities should provide continuous support to promote the efficient make use of school teachers for oral health promotion of students.

Keyword: Oral Health Promotion, Knowledge, Attitude, Practices, Dental Caries Primary School.

Introduction

Oral health is an essential component of general health. A healthy mouth enables individual to speak, eat and deal without having disease or confusion. Tooth decay as a prevalent disease of public health and chronic disease is widespread worldwide. The 12th disorder affecting 560 million children was rated as deciduous tooth decay according to a study

done at 2015 by Global Burden of Disease **(Vos et al., 2016).** Biological factors that interfere with the causative agents are triggered by the elevated prevalence of dental caries. Also, it is correlated with demographic ones as education and food habits. Therefore, investigating the risk factors affecting knowledge, attitudes and behaviors aligned to it is a major issue to researchers who are interesting in studying strategies of control and dental caries prevention **(Veerasamy, et al., 2016)**.

Dental caries is considered the most widespread of all health conditions (**Bernabe et al., 2020).** Nearly 60-90% of children suffer from dental caries. Tooth decay is the most prevalent oral chronic condition in the world, affecting 2.4 billion people. On average, 2.11 billion people have decayed, missing, or filled teeth worldwide and unfulfilled need for dental services in 2017 is approximately 3.5 billion cases. **Aldakhili et al., (2018)** added that untreated dental caries affects the quality of social, psychological and economical life of people**.** Caries is dependent on age of teeth eruption and harmful dietary habits **(Albino, and Tiwari, 2016).** Dental caries is a continuous infectious cycle with numerous factors. After consumption of carbohydrates, streptococcus mutans and sobrinus undergo fermentation and produce copious amount of acid and decreases the local pH to a level where the minerals of enamel and dentine dissolve. The frequent consumption of soft carbohydrates and sugary foods with dry mouth and bad oral hygiene increase the propensity for dental caries **(Bilbilova, 2020).**

The same risk factors for non-communicable diseases include oral diseases such as heart disease, cancer, chronic respiratory diseases and diabetes. This can highlight the importance of the mouth-body association for general health. A direct association between incidence of cavities and soft carbohydrates consumption is undisputed **(Ojeda and Llanos, 2017).** Free sugars as sucrose are acidogenic. They are considered the main component in modern diet. Sucrose is a prevalent cariogenic type that is a highly soluble substrate used in intracellular and extracellular polysaccharides **(Bernabé et al., 2016)**. Starch is a carbohydrate found in rice, potatoes, pasta, bread, fruits and vegetables causing little amounts of caries, unlike sugar **(Bilbilova, 2020).**

Severe cavities may negatively affect quality of life causing difficulties in eating and sleeping disturbance. Also, abscesses, pain, edema and systemic infection may occur. Dental caries increase the risk of abnormal growth forms and delay language development. Tooth decay is a main factor of school absenteeism (**Word Health Organization, 2015).** The consequences of poor dental health among children affect the activity of daily living abusing time, decreasing mental concentration and increasing costs of dental management (**Royal College of Surgeons Faculty of Dental Surgery 2015).**

The Health Promoting School (HPS) is a WHO global trial aimed at enhancing public and oral health in school societies. Since the sponsorship of this initiative, healthy school programs have increased in a lot of countries globally, assisting schools in implementing and investigating preventive programs to improve the health of school children **(Jurgensen and Petersen, 2013).**

Oral health education should be continued during the academic years as an differential period in children's lives. Personal skills of the children are passed through long acting beliefs and positive or negative attitudes to develop during school years. In addition oral health education

should be an essential component of basic subjects of the curriculum. It should target students, school staffs and parents in health promotion activities at school. Health-promoting school (HPS) programs should be extended to be at homes and developed at early educational stages **(Griebler et al., 2017).**

Nurse has an influential role in providing and disseminating health education. Nurse delivers oral health education and promotion to multiple settings. Yet, schools may be the best place for OHPP because about 1 billion pupils globally spend long time daily at school**.** School based approach may be more efficient in providing oral health services than community based one. So, schools are in great need for health promotion program ensuring dental health **(Otukoya and Doshi, 2018).** In addition, the preventive measures can be by adopting healthy oral behavior such as brushing tooth using fluorinated tooth paste, dental floss. Also, regular dental checkups can prevent periodontal disease **(Bilbilova, 2020).**There are various domains associated with oral healthy behaviours, including dental details, attitude, lifestyle, socioeconomic status, researchers focused on knowledge and attitudes and practice in addition to availability of medical oral services **(Gholami et al., 2014).**

Significance of the study:

Although dental caries prevalence has significantly decreased among Egyptian school children in the last decade, the incidence of cavities is still prevalent among school children in Egypt. This could be attributed to several factors basically lack of dental knowledge and over intake of soft carbohydrate**.** In Egypt, seventy four percent of the children had cavities; also, prevalence of dental caries at preparatory schools among children (12–15 years old) in Shebin El-Kom District, Menoufia Governorate was 62.8 % **(Abdel-Rasoul et al., 2019).**

Because of the continuing perception that oral health is separating from public health, there is a risk of marginalizing dental health promotion. For appropriate oral health, it is necessary to have adequate knowledge and practice regarding oral health. This study was conducted on children because they are more receptive for acquiring information, can continue keeping them along their life cycles and may contribute to enhance awareness of others. Also, the incidence of tooth decayed must be examined to aid in planning and enhancing children oral health awareness through educational programs. Hence the aim of the present research was to assess the effect of oral health promotional program on knowledge, attitude and practices regarding dental caries among primary school children in Minia city, Egypt.

Aim of the study

To evaluate the effect of oral health promotional program on knowledge, attitude and practices regarding dental caries among primary school children in Minia city, Egypt.

Research Hypotheses

1.The children who will expose to the health promotional program will have higher mean score of knowledge after the implementation compared with their pre-program knowledge.

2.The children who will expose to the health promotional program will have higher mean score of practices after the implementation compared with their pre-program practices.

3.The children who will expose to the health promotional program will have higher mean score of attitude after the

implementation compared with their pre-program attitude.

Participants and Methods

Design:

To meet the objective of the research, quasi-experimental design with pre/post-test was used. Such design is important to the nature of the study issue, having one or more group subjects observed on pre and post manipulations **(Creswell, 2012).**

Settings:

The study was conducted in Saad Zaghlol and Huda Sharawy Primary Schools affiliated to Minia City of Minia Governorate, Egypt. The two selected schools had chosen by randomization through multistage random simple as Minia governorate divided into 10 districts then the researchers by simple randomization made a list of them and selected Minia district primary schools, then making another list containing 38 primary governmental schools at the assigned district. The last stage was choosing two schools that were considered historical schools. The demographic, cultural, and geographical features of the selected schools were very similar.

Sample Calculation:

The two selected schools Saad Zaghlol and Huda Sharawy primary schools contained 300 and 186 child respectively from fifth and sixth school levels. The total equal 486 child, a cluster sample of 486 was chosen.

Sample:

The researcher interviewed 486 children as a total. Only 400 participant children were recruited who accepted to take part in this research and met the specified eligibility requirements.

Sample : Multi-stage random sample technique was used by making a list of Minia Governorate districts (10 districts Abokorkas, Banimazar, Samalot, Elminia, Elminia-Elgedidah, Malawy, Eladwa, Matay, Maghagha and Dermawas), then one district selected by simple random sample called Elminia District. Then by simple random sample from the selected district, 2 primary governmental schools were chosen, the first called Saad Zaghlol school, contained 3 classes from fifth academic year and 3 classes from the sixth academic year constituting 300 child as a total. The second called Huda Sharawy primary school contained 3 classes from fifth academic year and 2 classes at sixth academic year constituting 186 child. A cluster random sample (when studying total population) of the students' equal 486 participant child of the last stage of randomization was selected. The researchers interviewed 480 children who agreed and their guardian to participate in the present study.

86 children withdrawn from the study and were not committed to proceeding for various causes like follow up with external dentists due to having oral problems (20), or incompetent with the educational sessions and medical follow up (11) or not fulfilling the selected criteria (9) or absent from school day and during the study (6).In addition to excluding 40 participant children of pilot study.

Cluster random sample of 400 children were committed to the interventions after excluding 10 of pilot study. The percent of recruitment in the study was 400/486= 82.3 %

Participants were chosen according to the following **inclusion criteria**:

Children in grades 5-6, had good general health status as observed and confirmed in their school medical record.

The exclusion criteria were:

1.Children who are under dental interventions either preventive or curative at or prior to the study.

2.Children who are having chronic illness as registered in their school medical record.

Instruments for Data Collection:-

A- **Socio-Demographic Questionnaire:** it included 5 questions for assessing personal data e.g. age, gender and place of residence of school children in the form of multiple choice questions.

B- **Oral Health Knowledge Questionnaire:** it was adopted from **Haque et al., (2016).** It was used to assess children knowledge concerning oral health and dental caries. It included 10 statements such as dental disease can impact health, regular tooth brush can protect from tooth decay, fizzy soft drinks affect the teeth, use of fluorides prevent tooth decay etc. All items have three responses format (yes, no or do not know). It was used pre and post interventions for the same participant children.

The Scoring System

- The scoring system of oral health knowledge questionnaire done by pointing each correct answer by 1 score, while incorrect or 'don't know' answers was given zero. The total scores of 10 statements were equal 10. Children who scored 0–4 points were classified as poor knowledge, those with 5–7 points classified as average knowledge, and those with 8–10 points classified as good knowledge.

C- Dental Behavioral Inventory of Hiroshima University (HU-DBI) questionnaire: It was adopted from **Kawamura (1998)**. It was used to test children's oral health attitudes and actions during tooth brushing. The original HU-DBI questionnaire was written in Japanese. Researchers obtained English version of the questionnaire from previous study **(Haque et al., 2016)** then submitted it to three dental academics from Faculty of dentistry, Minia University. The questionnaire was translated into Arabic by professional linguistic. It involves 20 statements basically assigned to tooth-brushing action. There are two answer formats amongst all elements (agree/disagree). It included 20 items such as whether worrying much about visiting the dentist or not, the gums tendency to bleed when brushing the teeth and whether or not worry in gab out the color of my teeth. It was used pre and post interventions for the same participant children.

The Scoring System

- The scoring system of **Dental Behavioral Inventory of Hiroshima University (HU-DBI) questionnaire** done by pointing each positive attitude(correct response) to be was given 1 point, while negative attitude (incorrect or 'don't know' answers) was given zero. The total scores of 20 statements were equal 20. Children who scored 0–<10 points were classified as negative attitude, and those with 10–20 points classified as having positive attitude.

C- **Oral Health Practice Questionnaire:** it was adapted from **Haque et al., (2016)**. It was used to assess oral health-related patterns of practice. It was consisted of nine items such as dental cleanings frequency a day, time being spent on brushing in minutes, washing aids used, tooth cleaning products, etc. The researchers omitted the questions about products used for brushing tooth, frequency of replacing tooth brush and

form of toothpaste utilized with timing of cleaning the teeth, the total period needed for cleaning teeth and follow up of parents during cleaning teeth. This was done as the researchers unified the material used to clean teeth to be toothpaste and suitable brush. Also researchers prioritize the technique of brushing itself and the needed time. The researchers unified the used tooth paste due to young age period as described by the participant academic dentist. So the questionnaire after modification still included 9 items and its answers differed according to the meaning of each item. It was used pre and post interventions for the same participant children.

The Scoring System

- The scoring system of Oral Health Practice Questionnaire done by pointing each correct done was given 1 point, while incorrect or wrong done was given zero. The total scores of 9 statements were equal 9. Children who scored 0–<5 points were classified as unsatisfactory practice, those with 5–9 points classified as having satisfactory practice.

Validity:

The questionnaires were revised for content validity by a five of professionals in the area of Community Health Nursing, Pediatric Health Nursing and Oral and Dental Medicine.

Reliability: It is the administration of the same instruments to same participants in identical conditions on one or more occasions. Cronbach'sα for Oral health knowledge inquiry was 0.75 for the knowledge instrument. The reliability of the test and re-testing of **HU-DBI** inquiry was 0.89. A reliability of all tools reveals a good reliability. Cronbach'sα of Oral Health Practice Questionnaire was 0.79 for the practice instrument.

Pilot Study:

For the purpose of checking clarification, completeness, pilot research was done, validity, and applicability of the study tools. It was carried out on ten percent of the participants (40) children to determine the time involvement (20: 30 minutes) and excluded from the total sample. Also it was done to show the effectiveness of using the study instruments and the feasibility of the study process. Needed modifications were done after completion. Testing the item was performed to see if they were relevant and if they elicited the type of information, which is thought according to the responses and children comments. The researchers modified some of the items in the form of Arabic translation to be more suitable for children perception. The researchers omitted unnecessary details for advancing or reducing the instrument lengthy test.

Data Collection methods:

- Study period: data was gathered over 9 months (academic year); it was implemented from October 2018 to May 2019.

-Approval: formal authorization was obtained from the concerned authority to conduct this research; an official letter was issued by the Dean of the Faculty of Nursing to the Directory of Education of the City of Minia.

- Research ethics: After describing the essence & aims of the research to obtain their approval, each child caretaker was asked to sign the consent form in advance. As each questionnaire was coded and the name of the respondents was anonymous on the study tools, confidentiality of any information collected was assured. Each child and guardian was informed about the right to refuse to participate or withdraw from the study. The Head Masters of schools were

contacted by the researchers through formal letter explaining the necessity of good dental health and hygiene emphasizing the importance of OHPP. Permit to enable researchers to perform OHPP was received.

The Oral Health Promotional Program (OHPP):

It was designed to evaluate its effectiveness on knowledge, attitude and practices regarding dental caries among primary school children in Minia city, Egypt.

It was consisted of two main phases:

A- Preparatory phase:

It was based on the base line assessment data obtained from the interviewing questionnaires, literature review, through learning, the methods of caries prevention and training for proper tooth brushing. A panel of experts in the field pediatric oral health medicine and Community Health nursing and pediatric nursing discussed all items and elements of the colored booklet. It was written in Arabic language, printed out according to the sample size and given after implementing the program. It contained total of 7 consecutive visits including initial of pre-intervention visit, subsequent visits (5) and last of post intervention visit for medical and educational nursing interventions. Each session took 2 hours

B- Implementation phase:

The OHPP was implemented for 9 months along academic year (2018-2019) in the two mentioned schools.

The first part of the intervention program was the nursing interventions

Initial visit:

- The researchers introduced their selves, explained the nature & objective of the study, before obtaining the pretest data to obtain their cooperation.
- Filling out the questionnaires were done by the children with the researcher help.
- The researchers introduced OHPP at school classroom where the children were regularly taught in it.
- Monitoring the oral health through using the structured interviewing questionnaires, including knowledge; attitude and practice were assessed and observed by the researchers.
- Each child's interview continued for 30-45 minutes through direct observation accompanied with self-reporting for fulfilling their items or with help for some other who needed them.

The subsequent visits:

- Before starting any sessions, it began with a summary of previous session's content then the learning outcomes of the next session.
- Each session was performed by the researcher using Arabic language simplified to be appropriate for children. Each session lasted for 35-45 minutes.
- The utilized learning strategy was based mainly on demonstration and re-demonstration for practical part in combination with discussion and lecture for theoretical part.
- The first five sessions contained theoretical part about knowledge concerning structure and functions of teeth; number and classification of teeth present in each dentition, their significance; food habits and their impact on dental health. also, the necessity of balanced diet; meaning of dental caries, causes, risk factors clinical picture, medical management; methods of preventing dental caries were explained. In

addition to explanation of effect of dental health on public health and the necessity of teeth brushing twice per day and rinsing the mouth were clarified.

- The later sixth session concerning the practical part about oral hygiene practices using simulated large deciduous teeth model and performance in front of researchers for oral health hygiene methods.

The Final evaluation, visit (post interventions- test):

- The researcher re-administered the study questionnaires to assess the effect of school-based OHPP on knowledge, attitude and practices regarding dental caries.
- The effect of OHPP on children was reached by comparing students' scores before and after the implementation.

The second was medical interventions (performed by the participant dentist): It included the clinical oral checkup before and after interventions. The dentist assessed pain and caries before and after interventions.

- **Initial visit:** was done to assess pain, dental caries and check general oral status. Practical domain: Oral Clinical examination was carried out to assess the child's caries experience following the **WHO, 2013** criteria for diagnosis and indices. It was conducted in the school while the child was sitting on an ordinary chair in day light.

- Health education was performed in a prepared class using posters and life sized arches model, all children received health education on how to control plaque for improvement of practices regarding dental health and hygiene which included:

A-Brushing tooth:

- -Children and their parents were advised to look after their teeth and then researchers demonstrated tooth brushing technique using life size model as following:

Modified Bass method:

- Technique through the following steps:

- The head has been positioned parallel to the occlusal plane of the soft brush.

- The bristle was located at the edge of the gingiva at an angle of 45 to the long axis of the teeth.

- Using quick backward motion to apply smooth vibratory pressure to dislodge the tips of bristles. This movement moves the end of the bristles into both the gingiva sulcus region and the interproximal embrasures.

- Children were asked to perform multiple strokes in the same place and to switch regularly to the clean surface of the tooth, focusing on apical 1/3 of clinical crowns, gingival sulci, and proximal surfaces as they can meet bristles. Total brushing of around 3 teeth at a time around the arch.

- For 'lingual surfaces,' the same approach was used

- The children were told to replicate the same for the mandibular (lower) arch after completing the maxillary (upper) arch.

- **Brushing frequency suggestions:**

- Health education focused on plaque reduction to clarify tooth brushing techniques and 10 strokes for each section and a total brush period of 2-3 minutes with soft or medium tooth brush techniques **(Wilder and Bray, 2016)**

B-Floss Procedure (Method of the Spool):

- Approximately 18 inches of dental floss was wrapped around the middle fingers, leaving between each hand approximately 1/2 to 1-1/2 inches of dental floss stretched tightly. To guide the floss between teeth, the index finger and thumb were used **(Wilder and Bray, 2016)**. The dental floss between the teeth was used gently, ensuring that the floss slipped against the sides of each tooth. Along the gum line, the floss was bent, creating a 'c' shape around each tooth. To avoid food rubble and plaque, the floss was worked carefully under the gums.
- Examination was carried out using disposable mouth mirrors and sharp explorers. The students who need dental treatment were referred to private clinic of academic dentist for health education
- **Subsequent visits:** It included 5 sessions for those children with detected un-treated dental caries, then providing medical treatment and health education. Providing the necessary medical modalities of filling or extraction was performed.
- **Final visit:** it included final follow up to the oral health status of all participant students for pain presence and dental caries for those who had them after 1year of monthly follow up.

Statistical Analysis: The content of each questionnaire was analyzed, classified and then coded by the researchers. Using SPSS software version 21, the data was tabulated and analyzed. Excel used for figures. Descriptive statistics were used to present information in the form of frequencies, percentages for qualitative variables, and quantitative variables were described utilizing means and standard deviations. Paired T-test was utilized for two groups to measure the performance of a sample of children before and after completing the program, and analyze the differences. To evaluate the inter-relationships among quantitative variables, Pearson correlation analysis was used. At P. value <0.05, statistical significance was considered.

Results

Table (1) shows that 56 % of school children are more than 12 years and 54 % are females. Males constituted about 46% of the total. Regarding education of the parents, 28% of fathers and 40% of mothers were illiterate.

Tables (2) shows improvement of knowledge before and after implementing the program ; as 10 %, 33 %, 43 % and 15 % of children reported that regular tooth brush protect from tooth decay, use of fluorides prevent tooth decay, tooth decay caused by bacteria from unclean tooth with presence of food inside tooth accompanied with sugary food and fruits & vegetables have effects on teeth & gums respectively While after program it turned to 90%, 67%, 57 % and 85 % respectively with significant difference, p value is less than 0.05

Table (3) shows a high percentage of positive attitudes such as noticing some white sticky deposits on the teeth, preferring use a child-sized toothbrush, thinking teeth are getting worse despite daily brushing, educated professionally how to brush, impossibility to prevent gum disease with tooth brushing alone and putting off going to the dentist until having toothache (47 %, 25 %, 22 %, 50 %, 73 % and 90%) before implementing the program respectively turned to 78 %, 90 %, 11 %, 87 %, 79 % and 16 % after implementing the program respectively. A noticed improvement of items of attitude after the interventions is present. Also, minimum statements are showing disagreement representing positive attitude such as tendency of gum to bleed

when brushing the teeth before (54 %) and after (11%) OHPP.

Table (4) shows the reported practices of children regarding oral health, as 60 %, 25 % and 30 % of children clean their teeth, twice per day by using tooth brush respectively before implementing the OHPP, raised to 87 %, 68 % and 78 % respectively after implementation. There are significant differences for each: $P<0.05$. Also, 45 %, 27%, and 7 % clean their tooth before going to sleep, regularly rinsing mouth after eating and eating candy/ chocolate/ sweets less than 1 time respectively before implementing the OHPP raised to 55 %, 96 % and 52 % respectively after implementation. There are significant differences for each: $P<0.05$

Table (5) shows that 56% of children have poor knowledge, 19% have good knowledge, 25% have average knowledge before implementation of the program, while there are improvements of knowledge after implementation of the program where 75% have good knowledge, 15% have average and 10% have poor knowledge. Regarding practices 80% of children have unsatisfactory practices and 20% have satisfactory practices before health intervention while after program implementation it was noted that 58% have satisfactory practices and 48% have unsatisfactory practices. In addition to attitudes before program implementation it is notes that 63% have negative attitudes and 37% have positive attitudes which turned to 76% have positive 24 % have negative. Also the mean scores of knowledge, practices and attitudes are 7.83 ± .488, 6.63± 1.7 and 9.33±1.1 respectively.

Table (6) shows the mean score of knowledge turned from 2.88 ±2.33 before program implementation to 7.38±0.488 after program implementation with highly statistical significant P value 0.000. As regard attitudes the mean score of attitudes turned from 4.82 ±1.3 before program implementation to 9.33±1.1 after program implementation with highly statistical significant P value 0.000. Regarding to practices the mean score of practices turned from 2.82 ±1.9 before program implementation to 6.63±1.7 after program implementation with highly statistical significant P value 0.000

Table (7) reveals a positive correlation between participant children' knowledge, attitudes and practices before and after implementing the program.

Table (1): Frequency and Percentage Distribution of Demographic characteristics of participant children: n = 400

Demographic characteristics	No	%
Age in years:		
< 12	176	44.0
≥12	224	56.0
Gender		
Male	184	46.0
Female	216	54.0
Academic year:		
5th year	172	43.0
6th year	228	57.0
Father's education:		
Illiterate	112	28.0
Read & write	144	36.1
Primary / Preparatory	76	19.0
Secondary / University	48	17.0
Mother's education:		
Illiterate	160	40.0
Read & write	112	28.0
Primary /preparatory	72	18.0
Secondary /university	56	14.0

Table (2) Comparison of oral health knowledge of children before and after program implementation: n = 400.

Oral health knowledge	Before the program n=400		After the program n=400		T test and P value
	No.	%	N.	%	
- Periodontal disease can affect health	60	15.0	340	85.0	(4.5) 0.05**
- Regular tooth brush can prevent tooth decay	40	10.0	360	90.0	(9.2) 0.01**
- Fizzy soft drinks affect the teeth	128	32.0	272	68.0	(-6.3)0.001**
- Use of fluorides prevent tooth decay.	132	33.0	268	67.0	(-7.2)0.001**
- Gingivitis is a disease that makes your gums bleed	160	40.0	240	60.0	(-4.9)0.000**
- Sugar causes tooth decay	112	28.0	288	72.0	(-10.5)0.003**
- Tooth decay caused by bacteria from unclean tooth, presence of food inside tooth and sugary food	172	43.0	228	57.0	(-4.0)0.001**
- Consequences of tooth decay include tooth ache, erosion and difficult to eat	140	35.0	260	65.0	(-7.2)0.001**
- Fruits& vegetables have effects on teeth& gums	60	15.0	340	85.0	(-15.1)0.001*

Statistical significance, P. <0.05.

Table (3): Comparison of attitude/behavior scale (HU-DBI) of children before and after program implementation: n = 400

Attitude/behavior scale (HU-DBI)	Before the program				After the program			
	Positive		Negative		Positive		Negative	
	No	%	N.	%	N	%	N.	%
1-I don't worry much about visiting the dentist	100	25.0	300	75.0	248	62.0	152	38.0
2- When I brush my teeth, my gums start to bleed.	184	46.0	216	54.0	356	89.0	44	11.0
3-I'm scared of the color of my teeth	260	65.0	140	35.0	344	86.0	56	14.0
4-I found some sticky white deposits on my teeth	188	47.0	212	53.0	312	78.0	88	22.0
5-I likes to use a child toothbrush	100	25.0	300	75.0	360	90.0	40	10.0
6-I guess I can't help but have false teeth when I'm old.	244	61.0	156	39.0	128	32.0	272	68.0
7-I am angry about the color of my gums.	152	38.0	248	62.0	284	71.0	116	29.0
8-I think, despite my regular cleaning, my teeth are getting worse.	88	22.0	312	78.0	44	11.0	356	89.0
9-I carefully brush each of my teeth.	340	85.0	60	15.0	352	88.0	48	12.0
10-I was properly taught how to brush	200	50.0	If 200	50.0	348	87.0	52	13.0
11-I think without using toothpaste, I can brush my teeth well.	100	25.0	300	75.0	40	10.0	360	10.0
12-After brushing, I always check my teeth in a mirror,	164	41.0	236	59.0	260	65.0	140	35.0
13-I'm concerned about bad breath.	276	69.0	124	31.0	336	84.0	64	16.0
14-With tooth brushing alone, it is difficult to avoid gum disease	292	73.0	108	27.0	316	79.0	84	21.0
15-I held off going to the dentist until I had a toothache.	360	90.0	40	10.0	64	16.0	336	84.0
16-I used a colorant to see how to clean my teeth,	200	50.0	200	50.0	252	63.0	148	37.0
17-I use a toothbrush that has appropriate age-appropriate bristles.	68	17.0	332	83.0	284	71.0	116	29.0
18-Unless with quick strokes, I don't believe I've brushed well.	236	59.0	164	41.0	296	74.0	104	16.0
19-I feel like I take too much time to brush my teeth sometimes.	100	25.0	300	75.0	60	15.0	340	85.0
20-I had my dentist tell me that I was really good at brushing.	188	47.0	212	53.0	332	83.0	68	17.0

Table (4) Comparison of oral health practices of children before and after program implementation.

Practices about oral health	Before the program		After the program		T test and P value
	No.	%	N.	%	
Clean your teeth every **day**					(-5-7)0.001**
-Yes	160	60.0	348	87.0	
-No		40.0	52	13.0	
How many times					(6.3)0.000**
- once per day	120	30.0	48	12.0	
- Twice per day	100	25.0	272	68.0	
- More than twice per day	180	45.0	80	20.0	
Cleansing aid used					(6.3)0.000**
- Toothbrush	120	30.0	312	78.0	
- Flossing	180	45.0	40	10.0	
- Others	100	25.0	48	12.0	
					(10.3)0,003*
When do you clean your teeth:					
-Before going to sleep	180	45.0	220	55.0	
-After eating	12	3.0	80	20.0	
-At the morning	52	13.0	60	15.0	
-At any time	156	39	40	10.0	
Time needed for cleaning teeth:					(9.3)0.02*
-One minute	100	25.0	152	38.0	
-Two minutes	132	33.0	212	53.0	
-Don't know	168	42.0	36	9.0	
Parents follow the child during cleaning teeth:		15.0			(9.2)0.05*
-Parents follow the child	60	50.0	180	45.0	
-Not watch the child but give advice	200	5.0	88	22.0	
-Mother only follow the child	20	30.0	64	16.0	
-No interest from parents	120		68	17.0	
Rinsing mouth after eating					(14.2)0.003**
- Regularly	108	27.0	384	96.0	
- Irregularly	92	23.0	16	4.0	
- Not at all	200	50.0	0	00.0	
Clean tongue after meal or during brushing					(0.172)08
- Yes	84	21.0	360	90.0	
- No	316	79.0	40	10.0	
Frequency of eating candy/chocolate/sweets, per day					(16.2)0.04*
- Less than 1 time	28	7.0	208	52.0	
- 1time	80	20.0	64	16.0	
- 2-3 times	100	25.0	56	14.0	
- 4-6 times	100	25.0	20	5.0	
- More than 6 times	92	23.0	72	18.0	

Statistical significance P. <0.05.

Table (5) Comparison of total oral health knowledge, practices, and attitudes of children before and after program implementation: n =400.

Items	Before the program		After the program		T test and P value
	N.	%	N.	%	
Knowledge about oral health					**(-17.7) .000****
- Good	76	19.0	300	75.0	
- Average	100	25.0	60	15.0	
- Poor	224	56.0	40	10.0	
- Mean	2.88± 2.3		7.83± .488		
Practices about oral hygiene					**(-16.26) .000****
Satisfactory	80	20.0	232	58.0	
Un Satisfactory	320	80.0	168	42.0	
Mean	2.8± 21.9		6.63± 1.7		
Attitudes toward oral health					**(-23.20) .000****
- Positive	148	37.0	304	76.0	
- Negative	252	63.0	96	24.0	
Mean	4.82 ±1.3		9.33±1.1		

Statistical significance P. <0.05.

Table (6) Comparison between mean scores of knowledge, attitudes and practices among children before and after implementing the program n=400

Items	Before the program Mean± SD	After the program Mean± SD	T-value	P value
Total mean scores of knowledge	2.88 ±2.33	7.38±0.488	-17.7	.000**
Total mean scores of practices	2.82 ±1.9	6.63±1.7	-16.26	.000**
Total mean scores of attitudes	4.82 ±1.3	9.33±1.1	-23.20	.000**

Statistical significance P. <0.05.

Table (7) Correlation between overall scores of children' knowledge, attitudes and practices after program implementation (n=400)

Variables	Knowledge	Practices	Attitudes
Knowledge			
- r.Value	1	.764**	.581**
- P.Value	-	.000	.000
Practices			
- r.Value	.764**	1	.646**
- P.Value	.000	-	.000
Practices			
- r.Value	.581**	.646**	1
- P.Value	.000	.000	-

Statistical significance P. <0.05.

Discussion

The elevated prevalence of cavities is affected by biological factors that interact with the causative agents, demographic and food habits **(Otukoya and Doshi, 2018).** Therefore, investigating knowledge, attitude and practice as risk factors has become an essential issue for researchers seeking strategies for management and prevention **(Abbass, 2019).**

Demographic characteristics of school children

Current research results indicated that more than half of children were more than 12 years and slightly more than half were females. Males constituted about two fifth of them. Regarding education of the parents, less than third of fathers and two fifths of mothers were illiterate. Researchers suggested that oral health awareness level of the children is associated with educational level of both parent. The current study results are similar to **Haque et al., (2016**) stated that more than three-fifths of the subjects were female (63.2 %) and the rest were male. About 34.0 % of subjects were 10–12 years of old. Regarding father's education, approximately 14.0 % were illiterate, 37.2 % did not complete basic education, 24.5% basic education, and the rest 24.7% had secondary or university education. Regarding mothers' education, 22.1% of them had secondary and university education. This is contrary to **Alsumait et al., (2019)** who found that 49.3% were male. About 50 % participants had secondary or university education and aged 39 years or less. **Also the findings are different from Mahmoud, (2013**) who reported that the age of the subjects was between 17 years and 20 years with a mean value of 18.96 ± 0.80. All of the participants were females; 57.7% of them were in grade 4 and from rural area. About 50 % of children' mothers and fathers had secondary education (48.8% & 53.3%) respectively.

The reported knowledge

The Current research has shown that more than half (56%) of children have poor knowledge, few students (19%) had good knowledge, and one quarter (25%) had average knowledge before implementation of the program, while there were improvements of knowledge after implementation of the program where three quarters (75%) had good knowledge, and few students had average and poor knowledge (15%, 10%) respectively. This was in the same line with **Al Saffan et al., (2017)**who found the overall knowledge of subjects classified with the high score elevated from 7.5% on pretest to 33.1% on posttest showing a remarkable positive increase of 25.6% was observed due to the received dental health education session. So, a drop of the number of subjects who classified with low score from 40.8% on pretest to 18.5% on posttest revealing a statistically significant difference regarding the knowledge assessment test after implementing dental health educational session: ($P < 0.001$).

In current study average mean score of knowledge turned from 2.88 ±2.33 before program implementation to 7.38±0.488 after program implementation with statistical significant P value 0.000. The current study findings is supported by **Alotaibi et al., (2017)**, who noted that statistically significant difference regarding dental health knowledge level were noted after implementing dental health education program ($P<0.0001$) the mean scores turned from 4.79 ± 2.09 before program implementation to 8.91 ± 1.7 after program implementation

The current findings of the study were in accordance with **Haque et al., (2016),** who stated that significant differences were noted along fast majority of the knowledge items on pre and posttest of implementing dental health education program except knowledge regarding dental caries as being not contagious illness and gingivitis seems to be a disorder of a gums that causes bleeding. Generally, a significant differences were detected ($p < 0.001$) concerning total knowledge level on posttest than pretest. The researchers attributed the significant improvement to the health education using simulated teeth model accompanied with dental checkup and education.

Attitude/behavior scale (HU-DBI)

The present study showed an improvement in total school children attitudes scores before and after implementing the program. Also the mean scores of attitude were turned from 4.82 ±1.3 to 9.33±1.1 after intervention with statistical significant difference between two group p value 0.000. This was in line with **Shirzad et al, (2016)** who found that the teaching sessions had meaningful impact on the mean score of participants in the study group's dental health actions compared to the control group from 20.06 ± 0.35 to 15.59 ± 0.27 P0.001. These similarities may suggest that the study was conducted in the same target and same setting as the schools force children ability as a proper place for living, learning and working to aid children to have appropriate self-care and to be active and responsible citizens in the future in the community. This is supporting the second research hypothesis and may be attributed to the combined manipulation of both nursing oral health education and medical checkup and manipulation.

Regarding oral health practices

The current study results showed the practices of children regarding oral health, as more than half, one quarter, and less than one third (60 %, 25 % and 30 %) respectively of children clean their teeth, twice per day and by using tooth brush before implementing the program, raised to majority, about two thirds and more than three quarters respectively after implementing the program. There are significant differences for each: $P<0.005$. Also, less than half, little number of children (45 %, 18 % and 7%)clean their tooth before going to sleep, regularly rinsing mouth after consuming candy/ chocolate/ sweeteners less once respectively before implementing the program raised to more than half, fast majority and half respectively after implementing the program. There are significant differences for each: $P<0.05$. This is supporting the third research hypothesis and may be attributed to the combined medical and nursing interventions using demonstration and re-demonstration aided with simulated teeth model and open discussion documented with graphic explanation. The current study was similar to **Haque et al., (2016)** Who indicated that after the health education program, subjects' practices reported more appropriate oral hygiene (3 times or more per day) relative to pre-test ($p<0.001$).

Significant difference was noted concerning the time needed to brush teeth about 2 min or more, utilize paste, usage of fluoridated toothpaste, cleaning mouth or rinsing tongue after meal, on posttest compared to pretest results. Regarding food habits and behaviors important improvement was noted for feeding rate of soft carbohydrates or sweeteners to be less than 1 time on posttest findings ($p< 0.05$). Positive improvement has been reported ($p< 0.001$) with reference to grand total

scores of good practices on posttest compared to pretest findings (more than half versus less than fifth). Furthermore in present study the mean score of practices turned from 2.82 ±1.9 before program implementation to 6.63±1.7 after OHPP implementation with a highly statistically significant difference, P<0.000. This was accordance with **El-Nasr (2017),** which studied the program of oral health intervention among primary school children in El-Qalyubia Governorate between before and after the program of oral health intervention (P<0.000)

Researchers suggest that rational of improvement may be due to using a simulated model to tooth for aiding the children recognize the correct technique of brushing teeth with fluoridated tooth paste. Brushing practices 1 time per day in the school during the implementation of OHPP was a crucial factor that attributed to the improvement of correct brushing technique. The study revealed an improvement regarding skills of cleaning mouth regularly during brushing or after food intake. Researchers expect the improvement may be due to the application of combination of strategies as the modifications of practices were performed by providing proper information, motivation and application of the interventions to the participants and treatment of disease by dentist in case of dental caries or pain. Regarding correlation among knowledge, attitudes and practices after program implementation there were a positive correlation between participant students' knowledge, attitudes and practices before and after implementing the program. This could be explained by the influence of oral health promotion program indicated a significant positive effect as improved knowledge and practices this reflect on dental health practices such as brushing, using fluoride toothpaste and proper dietary habits.

Conclusions

Depending on the findings of this research, it could be stated that the level of understanding has improved, positive attitudes and satisfactory practices among the majority of the participants students after implementation of oral health promotion program.

Recommendations:

- Results indicated that integration of OHPP into school curriculum may enhance information, attitude, oral health practices and dental caries prevention.
- Health care decision makers and authorities should provide continuous support to promote the efficient make use of school teachers for oral health promotion of students.
- Training school nurses and other primary care workers who have regular contact with young children on the identification of high caries risk among preschool and school children.

Conflict of interest

There were no conflicts of interest.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article

References:

Abbass, M.M., Mahmoud, S.A., El Moshy, S., Rady, D., AbuBakr, N., Radwan, I. A. and Al Jawaldeh, A. (2019). The prevalence of dental caries among Egyptian children and adolescences and its association with age, socioeconomic status, dietary habits and other risk factors. A cross-sectional

study. *F1000Research, 8(8):1-19. doi: 10.12688/f1000research.17047.1. Published online 2019 Jan 3.@ https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6396843.1/*

Abdel-Rasoul, G.M., Mahrous, O.A., El-Shazly, H.M., Gabr, H.M., and Alghalban, Y.A. (2019). Epidemiology of dental caries among preparatory school children (12–15 years old) in Shebin El-Kom District, Menoufia Governorate. *Menoufia Medical Journal*, *32*(1): 120**.**

Al Saffan, A.D., Baseer, M.A., Alshammary, A.A., Assery, M., Kamel, A., and Rahman, G. (2017). Impact of oral health education on oral health knowledge of private school children in Riyadh city, Saudi Arabia. *Journal of International Society of Preventive & Community Dentistry*, *7*(l3): 186.

Albino, J., and Tiwari, T. (2016). Preventing childhood caries: a review of recent behavioral research. *Journal of dental research*, *95*(1): 35-42.

Aldakhili, A.S., Alsoqeer, A.A., Alothaim, A.K., Alkhodair, A.S., and Alsaykhan, S.M. (2018). Knowledge and Beliefs of Early Childhood Caries and Late Night Bottle Feeding among Mothers in Saudi Arabia. *The Egyptian Journal of Hospital Medicine*, *73*(9): 7492-749.

Alotaibi, A.S., Jad, A., and Al-Sadhan, A.S. (2016). The impact of school based oral health education program on the level of oral health knowledge among public intermediate school girls at Riyadh. *Dentistry*, *7*, 1-11.

Alsumait, A., ElSalhy, M., Behzadi, S., Raine, K.D., Gokiert, R., Cor, K. and Amin, M. (2019). Impact evaluation of a school-based oral health program: Kuwait National Program. *BMC oral health*, *19*(1): 1-9.

Bernabe, E., Marcenes, W., Hernandez, C.R., Bailey, J., Abreu, L.G. and Arora, A. (2020). GBD 2017 Oral Disorders Collaborators Global, regional, and national levels and trends in burden of oral conditions from 1990 to 2017: a systematic analysis for the global burden of disease 2017 study. *Journal of dental research*, *99*(4): 362-373.

Bernabé, E., Vehkalahti, M. M., Sheiham, A., Lundqvist, A., and Suominen, A. L. (2016). The shape of the dose-response relationship between sugars and caries in adults. *Journal of dental research*, *95*(2): 167-17.

Bilbilova, E. Z. (2020). Dietary Factors, Salivary Parameters, and Dental Caries. In *Dental Caries*. IntechOpen, 1(2):1-18. DOI: 10.5772/intechopen.92392 @ https://www.intechopen.com/online-first/dietary-factors-salivary-parameters-and-dental-caries

Creswell, J.W. (2012). Educational research: Planning, conducting and evaluating quantitative and qualitative research. Upper Saddle River, NJ: Prentic Hall. \http://research-methodology.net

El- Nasr, M.S. (2017). Oral health intervention program among primary school children at El-Qalyubia Governorate. *Egyptian Nursing Journal*, *14*(2): 100.

Gholami, M., Pakdaman, A., Jafari, A., and Virtanen, J.J. (2014). Knowledge of and attitudes towards periodontal health among adults in Tehran. *EMHJ-*

Eastern Mediterranean Health Journal. 2014; 20 (3): 196-202.

Griebler, U., Rojatz, D., Simovska, V. and Forster, R. (2017). Effects of student participation in school health promotion: a systematic review. *Health promotion international*, *32*(2):195-206.

Haque, S.E., Rahman, M., Itsuko, K., Mutahara, M., Kayako, S., Tsutsumi, A. and Mostofa, M.G. (2016). Effect of a school-based oral health education in preventing untreated dental caries and increasing knowledge, attitude, and practices among adolescents in Bangladesh. *BMC oral health*, *16*(1): 44.

Jürgensen, N. and Petersen, P.E. (2013). Promoting oral health of children through schools–Results from a WHO global survey 2012. *Community Dent Health*, *30*(4): 204-18.

Kawamura, M. (1988). Dental behavioral science-The relationship between perceptions of oral health and oral status in adults. *J Hiroshima Univ Dent Soc*, *20*, 273-286.

Mahmoud, S.R. (2013). Oral health knowledge, attitude and behavior of nursing school students in Assiut city. *AAMJ*, *11*(3): 27-50**.**

Otukoya, R. and Doshi, M. (2018). Selecting the right tools for mouth care delivery in hospitals. Nursing Times; 114(11): 18-21.

Ojeda, J.C., Llanos, L.S. (2017). Caries prevalence of preschool age children in community homes of the Cauca Valle and related social factors.Revista Odontológica Mexicana. 2017; 21(4): e221–e226.

Royal College of Surgeons, Faculty of Dental Surgery. (2015). The state of children's oral health in England. RCS Faculty of Dental Surgy, 1-12.@ https://www.rcseng.ac.uk/library-and-publications/rcs publications/docs/report-childrens-oral-health/

Shirzad, M., Taghdisi, M. H., Dehdari, T. and Abolghasemi, J. (2016). Oral health education program among pre-school children: an application of health-promoting schools approach. *Health promotion perspectives*, *6*(3): 164.

Vos, T., Allen, C., Arora, M., Barber, R.M., Bhutta, Z.A., Brown, A. and Coggeshall, M. (2016). Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990–2015: a systematic analysis for the Global Burden of Disease Study 2015. *The lancet*, *388*(10053): 1545-1602.

Veerasamy, A., Kirk, R., Gage, J.(2016). Epidemiology of dental caries among adolescents in Tamil Nadu, India.Int Dent J. 2016; 66(3): 169–77.

World Health Organization (WHO): Sugars intake for adults and children. Geneva: WHO, 2015; accessed 17 September 2017.

World Health Organization (WHO): Oral health surveys: Basic methods. 5th ed., Geneva, Switzerland, World Health Organization. 2013.

Wilder, R.S., Bray, K.S. (2016). Improving periodontal outcomes: merging clinical and behavioral science. Periodontol 2000. 2016;71:65–81.