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Effect of Pender's Health Promotion Intervention on Nail Biting among School Age Children

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Abstract: Background, Nail biting is an abnormal oral habit commonly adopted by children and young adults that leads to nail injuries, oral infection, emotional and psychological issues in children. **The purpose of this study** was to examine the effect of Pender's health promotion intervention on nail biting among school age children. **Design,** A quasi- experimental research design was used (pre, post, and follow up). **Setting**, This study was conducted in Islamic primary school in Shebein Elkom in Menoufia Governorate. **Sample**, a purposive sample of 40 children and their parents were included. Five data collection instruments were used A structured interviewing questionnaire to assess mother's knowledge about nail biting habit, observational assessment sheet for nails abnormality, nail biting likert scale, Pender's health promotion structured questionnaire and measuring tape. The results of this study showed that the majority of mother's had higher level of knowledge about nail biting on post and follow -up tests than on pretest (62.5%, 100.0 % Vs 0.0%.). As well, children had moderate level of self-efficacy on posttest and follow up (52.5% and 37.5%). Therefore, It was concluded that implementation of Pender's health promotion model had a significant effect on diminishing nail biting habit in children on post and follow-up tests than pretest. The study recommended that, application of Pender's health promotion intervention to minimize nail biting habit in school age children must be implemented. Ongoing in-service health education programs based on application of Pender's health promotion model for children with nail biting should be designed and implemented in schools and others pediatric health care settings to improve the care of children with bad oral habits.

Keywords*: Nail biting, School age children, Pender's health promotion model.*

Introduction

Children are the hope for future and vital part of population. They are the priceless gift given by God to parents. It's primary responsibility for a family to meet their physical, emotional, psychological and spiritual needs competently in a way for their better development in life (Kaye-Tzadok et al., 2019). Children as students can play a key role to build and strengthening the societies (Adam Bangizwe, 2018).

Nail biting (NB) is one of the bad oral habits adopted by school children. It starts at the age of 3 to 4 years, worsens at 5 to 6 years, but it reduces in adolescence. It does not have negative impact at early stage. At the beginning, people do not take it seriously, but but with the passage of time it converts into chronic habits (Gür et al., 2018).

Worldwide, the prevalence of nail-biting ranges between 25.5% and 36% among children while it ranges between 12.9% and 68.9% in Turkey (Sisman et al., 2017). Moreover in India, the prevalence of thumb sucking and nail-biting varies widely from <1% to 25%. However, nail-biting seems to be ignored in daily clinical practices (Jawale et al., 2014). The prevalence of habitual nail biting is about 37% in pediatric population. Approximately, 36% of nail biting occurs in school children under the age of 5 years, 57% in 12 year age and 36% of adolescence until 16yrs in New York, USA (Winebrake et al., 2018). A study was conducted in Republic of Korea illustrated that NB occurs in children between ages 7 and 10 years. It ranges between 28 percent and 33 percent respectively. During puberty it occurs in 44 percent of adolescents, and 19 to 29 percent in young adults (Maraz et al., 2017; Chio et al., 2020).

In Iran, the rate of NB in boys and girls was 20.1% and 24.4% respectively. Moreover, at least one family member has nail biting behavior. Another study was conducted in USA showed that 23% of preschool children have nail biting behavior. The rate of NB in school children in Mangalore, India, was 12.7%, and it was more prevalent in girls than boys. Also, rates of NB in children less than 12 years old twins were 28% in boys and 26% in girls. It co-occurred with finger sucking in 17.7% of boys and 15.7% of girls. About 21.5% of male adults are nail biters (La Buissonnière-Ariza et al., 2021).

In Egypt, the prevalence of oral habits in school children has not been clearly documented. Hence an attempt has been made to study the prevalence of oral habits in children of 6-12 years old age group in Dakahlya governorate, Egypt. Prevalence of oral habits in Dakahlya school children was found to be 29.1%. Nail biting was found as the commonest bad oral habit (9.7%) (Farrag and Awad, 2016).

The incidence of nail biting is zero percent before the age of 3 years and rises constantly with a peak during puberty (Herdiyati and Marhani, 2017). Its prevalence is estimated to be between 6 to 45%. Although, habitual nail biting is often considered to be wanes off as age advances (Chinnasamy et al., 2019).

Nail biters typically present with abnormally short and uneven nails,

absent or ragged cuticles and nail folds in different stages of healing (Stewart and Lipner, 2020). Other visible changes in the nail and periungual regions include linear and pinpoint hemorrhages, longitudinal melanonychia, transverse grooves, brittleness, macrolunula, pterygium and a scar in the nail matrix (Shin et al., 2022).

Children with behavioral disorders have negative feelings causing mistreatment to others. In most cases they lead to be rejected by teachers and classmates, who in turn lead to loss of educational opportunities and worse disorders (Motaghi et al., 2017). They cause cosmetic problems, nail, cuticle, gingival, dental, temporomandibular joint problems and infections. Malocclusion of anterior teeth, root resorption and intestinal parasites are common complications of these habits (Alawsi et al., 2021).

The management of nail biting is a complex task and a difficult behavior to modify. It requires counseling of parents, children, siblings and teachers. Interventions can be based on behavioral change models by preparing a plan that provides education and counseling to students and their families, conducting motivational interviews, providing nail care and performing case management with necessary referrals. Punishment is not an appropriate way to deal with nail biting (Lee and Lipner, 2022).

Health promotion through lifestyle change is an important topic that has received much attention from the global scientific community. Health promotion can be described as the science or art of helping people change their lifestyle to move toward a state of optimal health, a goal that can be achieved through concerted effort to raise awareness, change behaviors and create an environment that promotes healthy behaviors. One of the prominent models developed in this area is the health promotion model introduced by Pender which is focused on empowering people to achieve higher levels of well-being (Masoudi et al., 2020).

The health promotion model (HPM) is a theoretical framework for analyzing the factors of health and their relationship with health promoting behaviors that contribute to the movement toward enhanced wellbeing and quality of life. This model is a guide for understanding the complex bio psychosocial processes that compel people to engage in health behaviors that result in health promotion (Shahroodi et al., 2021).

Nurses working with children at any setting have unique opportunities to identify students with repetitive oral habits and provide appropriate care by health screening, enrollment examination and conducting several interventions. (Gür et al., 2018).

Purpose

The purpose of this study was to examine the effect of Pender's health promotion intervention on nail biting among school age children.

Research Hypotheses

The following research hypothesis is formulated to achieve the purpose of the study:

- School age children who receive Pender's health promotion intervention had a fewer occurrence of nail biting on posttest than on pretest.

Methods

This section describes research design, setting, subject, sampling technique, data collection instruments, data collection procedure, pilot study and data analysis.

Research design:

A quasi-experimental design was utilized for this study (pre and posttest).

Research Settings

This study was conducted in Islamic primary school in Shebein Elkom in Menoufia Governorate.

Sampling:

A purposive sample of 40 school age children ranged from 6-12 years old with nail biting habit and their parents were selected from Islamic primary school in Shebein Elkom in Menoufia Governorate

Criteria for inclusion:

- School age children should have nail biting habit.
- Children should range from 6-12 years.

Instruments

In order to achieve the purpose of the study, two instruments were utilized for data collection: -

<u>Instrument one</u>: Knowledge of mothers Structured Interviewing Questionnaire:

It was developed by the researchers to collect data about characteristics of studied children, characteristics of their parents and mother's knowledge about nail biting habit. It includes the following parts:-

- **Part one**: Characteristics of studied children and their parents: It included questions about:-
  1) Characteristics of children such as age, gender, level of education, class number.
  2) Parents characteristics such as age, education, occupation and number of family members, telephone number and address.
- **Part two**: Mother's knowledge about nail biting habit: It was developed by the researchers after review of related literature such as Kumar et al., (2019). It contained 12 questions such as do you know repetitive oral habits?, Do you know nail-biting?, Do you know the adverse effects of nail-biting habit?, What are its adverse effects?, What are the treatment methods ?, Do you know the etiology of nail-biting?.

Scoring system for each question:-

Items	Score
Don't know	0
Incomplete	1
Complete	2

Total score (0-16) was determined as follows:-

Items	Score
Unsatisfactory knowledge (0-10)	< 60 %
Satisfactory knowledge (11-16)	≥ 60 %

Reliability of the instrument:-

Reliability of the study instruments were estimated among 10 participants by using test retest method with two weeks apart between them. Then Cronbach' alpha was calculated between the two scores. It was (0.886) which indicates that the instruments were have high reliability to meet the objectives of the study.

Instrument two: Observational assessment sheet for nails abnormal

It was developed by the researcher after a review of related literature related to signs of nail biting habit such as short fingernail, red and sore finger tips, damage tissues around nails and nail deformation (Siddiqui et al., 2017). It contained a list of children's name, telephone number and shape of nails.

Instrument three: Nail biting likert scale:-

The scale was adopted from the Massachusetts General Hospital (MGH) hair-pulling scale (Keuthen , Baer, and Shera et al.,1995) .Then , the design was modified by the researchers to collect data about frequency and intensity of urges of nail biting, ability to control this urges, attempts to resist nail biting, control over nail biting. The items scores were summed to represent a total score that ranged from 0 to 28.

Scoring system for each question:

Items	Score
Never	0
Rarely	1
Sometimes	2
Often	3
Always	4

Total scoring system for nail biting (0-28): -

Items	Score
None	<7
Mild	7<14
Moderate	14≤ 21
Severe	More than 21

Reliability of the instrument: -

Reliability of the study instruments were estimated among 10 participants by using test retest method with two weeks apart between them. Then Cronbach' alpha was calculated between the two scores. It was (0.947) which indicates that the instruments were have high reliability to meet the objectives of the study.

<u>Instrument four</u>: Pender's Health Promotion Structured Questionnaire:

The questionnaire was based on Pender's Health Promotion Model. It was developed by Pender, (2011) and adopted by the researcher to collect data about parents and children's perceptions about nail biting, repetitive habits experience, perceived benefits and barriers, interpersonal influences, situational influences and behavioral outcomes.

Total score will be determined as follow:-

Items	Score
Low	≤ 40 %
Moderate	40 < 70 %
High	≥ 70%

Reliability of the instrument:-

Reliability of the study instruments were estimated among 10 participants by using test retest method with two

weeks apart between them. Then Cronbach' alpha was calculated between the two scores. It was 0.677 which indicates that the instruments were reliable to meet the objectives of the study.

Instrument five :Measuring tape: -

It is a long, soft and flexible ruler used to measure the size or length of things. It is made from plastic or fiber glass with linear measurement markings. There is a centimeter scale on the back which is printed in centimeters. It ranges from 0 to 150 centimeters. Nail length was measured in millimeter. The length of all the fingernails of children was measured. The length is defined as the longest distance from the base of nail to its tip (Twohig and Woods, 2001).

Validity:

For validity assurance, the instruments were submitted to a jury of five experts in the pediatrics field (two professors and one assistant professor in pediatric nursing .One professor and another assistant professor in pediatrics were also included) to test the validity and modify any required items of the instruments. All required modifications were done.

Pilot study

It was carried out on 4 children (10% of the sample) after the instruments were developed and before starting the data collection to test the practicability, applicability and to estimate the needed time to fill the instruments. No necessary modifications were done.

Ethical Consideration:

- A written approval was obtained from the Ethical and Research Committee of the Faculty of Nursing, Menoufia University.
- A written consent was obtained from parents regarding their acceptance to share in the study.
- An initial interview with each participant was done to inform them about the purpose, benefits of the study and explain that participation in the study is voluntary and the study is harmless. Participants can withdraw from the study at any time without penalty.
- Confidentiality and anonymity of children and their parents were assured through coding all data and putting all paper in a closed cabinet.
- Participants were assured that the questionnaires were filled by the participants themselves or by the researchers through personal interview. Also, they were informed that questionnaire don't cause any physical or emotional harm to participants.

Procedure:

- Prior to data collection, an official permission to carry out the study was obtained from the Director of each school after submitting an official letter from the Dean of the Faculty of Nursing explaining the purpose of the study and methods of data collection.
- Data collection for this study was conducted for a period of 6 months starting from September 2020 to the end of February 2021.

- At the beginning the researcher introduced herself and explained the purpose and nature of the study to the children and their parents.
- On pretest, characteristics of children and their parents were assessed using a structured interview questionnaire part one. Also, assessment of mother's knowledge about nail biting habit such as characteristics and concepts using a structured interview questionnaire part two was done. An observational assessment screening sheet was filled by the researchers to differentiate between children having normal nails and children having abnormal nails Instrument two. Assessment of frequency, intensity and severity of nail biting in children was done by using nail biting likert scale instrument three. (pretest)
- Afterwards, assessment of parent's and children's perceptions about nail biting repetitive habits experience, perceived benefits and barriers, interpersonal influences, situational influences and behavioral outcomes by using Pender's health promotion structured questionnaire instrument four. (pretest)
- Assessment and measuring of the length of nail before starting the intervention was done by using a measuring tape instrument five. (pretest)
- Children with oral nail biting habits (40 children) were divided into four groups. Each group contained 10 children accompanied by their parents. Each group received five sessions. Each session lasted for 30-45min. Health education was planned according to the needs of parents, their children and Pender health promotion model.
- Health education was provided in five educational sessions to parents and their children. Two sessions were conducted weekly. Each session continued for 30-45 min. It included an oral presentation, group discussions, feedback and booklets about nail biting habits and its management based on Pender's health promotion model. Booklets and scientific brochures were provided. All precautionary measures against the COVID-19 pandemic were followed such as Wearing masks - spacing distances - using hand sanitizers - reducing the number of groups from 10 to 6 participants within the group.
- The first session contained theoretical knowledge about nail biting habit including causes, manifestations, complications and management. The session was presented by using oral presentation, group discussions, feedback and booklets.
- The second session included health education about harms and benefits of nail biting and methods of stopping nail biting habits such as cutting of nail. Group discussion, posters, booklets and feedback were used. Procedure of nail cutting was demonstrated by the researcher. Parents and their children were asked for re-demonstration.
- The third session included group discussion between parents and children related to their successful

and unsuccessful experiences and perceptions of nail biting, methods used to stop the habit and modification of wrong beliefs. Parents were instructed to avoid punishment, critique or blaming of children. They advised to use positive reinforcement and encouragement.

- Purpose of the fourth session was to improve cognition regarding nail biting problem and solution. It focused on the perceived benefits of changing the bad habits, self-efficacy as perceived by parents and their children, and interpersonal effects and situations effects.
- To increase the "Perceived self-efficacy" weekly Feedback was done to ensure their consistency and adherence to instructed intervention.
- The fifth session included suggestions for reducing the impact of interpersonal effects on the occurrence of nail biting behavior. Also, it included interventions for Situational effects during the educational sessions, parents were asked to keep a private nail scissor for each child at a reachable place, remind their children to cut their nails, and paint their nails.
- An online whats app group was developed by the researcher to facilitate communication, following children and answering mother's questions. Also, mothers received on line whats app booklet for nail biting management.
- A posttest was done one month after completion of the program to reassess mother's knowledge about nail biting habit such as characteristics and concepts using a structured interview questionnaire part two were done (posttest).
- Reassessment of the frequency, intensity and severity of nail biting in children was done by using nail biting likert scale instrument three (posttest).
- Reassessment of parent's and children's perceptions about nail biting repetitive habits experience, perceived benefits and barriers, interpersonal influences, situational influences and behavioral outcomes were done by using Pender's health promotion structured questionnaire instrument four (posttest).
- Reassessment and measuring of the length of nails after the intervention was done by using a measuring tape instrument five (posttest).
- A comprehensive revision session about harms and benefits of nail biting and methods of stopping nail biting habits based on of Pender's health promotion model was applied.
- After two months, a follow-up test was done for children and their parents to assure their adherence to the intervention program by using the study instruments which are reused in pretest, posttest and follow-up test.

Statistical Analysis:

The data collected were tabulated & analyzed by SPSS (statistical package for the social science software) statistical package version 22 on IBM compatible computer. Graphics were done using Excel program.

Two types of statistics were done:

1) **Descriptive statistics**: were expressed as mean and standard deviation (X+SD) for quantitative data or number and percentage (No & %) for qualitative data.
2) **Analytic statistics**: Repeated-Measures ANOVA: is a test of significance used when we had a single line of data for each participant, with the repeated measures entered as separate variables on that same line (used for comparison between more than two related groups of normally distributed quantitative variables).

P-value at 0.05 was used to determine significance regarding:

- P-value > 0.05 to be statistically insignificant.
- P-value ≤ 0.05 to be statistically significant.
- P-value ≤ 0.001 to be highly statistically significant.

Results:

Table 1 shows characteristics of studied children. The table revealed that more than half of studied children (57.5%) ranged from 9≤12 years old with the mean age of 7.42 ± 3.77 years. Regarding gender of studied children, more than two thirds of studied children (67.5%) were females and approximately one third of them (32.5 %) were males.

Table 2 shows levels of mothers' knowledge about nail biting habit on pre, post and follow-up tests. It was obvious from this table that about two thirds of studied mothers had satisfactory knowledge on posttest than pretest and all of them had satisfactory knowledge on follow-up test. Therefore, there were a very highly statistically significant differences between knowledge of mothers on pretest and posttests (P<0.000). Also, there was a very highly statistically significant difference between their knowledge on post and follow-up tests (P<0.000).

Figure 1 shows levels of severity of nail biting on pre, post and follow-up tests. The findings revealed that approximately, three quarters of children had mild (72.5%) and none nail biting (75.5%) on posttest and follow up test compared to pretest 62.5% respectively. Therefore, there were a very highly statistically significant differences between pre, post and follow- up tests (P<0.000).

Table 3 clarifies levels of mother's perception of children biting behavior on pre, post and follow -up tests. The findings revealed that only 30.0% of mothers had high level perception regarding nail biting behavior on pretest compared to 100.0% and 62.5% on post and follow- up test respectively. Therefore, there were very highly statistically significant differences between pre, post and follow up tests (P<0.000).

Table 4 shows mean lengths of children nails in millimeter on pre, post and follow-up tests. This table illustrated that studied children had the highest mean scores of nails length 4.39±.99 and 5.17±1.23 on post and follow-up tests respectively compared to 3.85±0.83 pre-test. Therefore, there were very highly statistically significant differences between studied

children on pre, post and follow-up tests (P<0.000).

Figure 2 shows correlation between mother's knowledge about nail biting habit and severity of nail biting. It reflected that there was a negative highly statistically significant correlation between mother's knowledge about nail biting habit, and severity of nail biting (P<0.000).

figure 3 shows correlation between mother's knowledge about nail biting habit, and total score of perception of nail biting behavior. It reflected that there was a positive very highly statistically significant correlation between mother's knowledge about nail biting habit and total score of perception of nail biting behavior (P<0.000).

Figure 4 shows effect size of applying Pender's health promotion model on mother's knowledge about nail biting habit, severity of nail biting, perception of nail biting behavior and length of nails on pre, post and follow- up tests. There was a moderate effect size regarding severity of nail biting, perception of nail biting behavior and length of nails in children. However, a large effect size was found between mother's knowledge about nail biting.

Table (1): Characteristics of studied children

Items	No.	%
Age		
Mean ± SD	7.42±3.77	
Age		
6<9 years old	17	42.5
9≤12 years old	23	57.5
Sex		
Male	13	32.5
Female	27	67.5

Table (2): Levels of mothers' knowledge about nail biting habit on pre, post and follow-up tests

Items	Pre (n=40)		Post (n=40)		Follow up (n=40)		FET P1 –value	FET P2 –value
	No	%	No	%	No	%		
Unsatisfactory knowledge	40	100.0%	15	37.5%	0	0.0%	36.36** .000	18.46** .000
Satisfactory knowledge	0	0.0%	25	62.5%	40	100.0%		

Figure (1): Levels of severity of nail biting on pre, post and follow-up tests

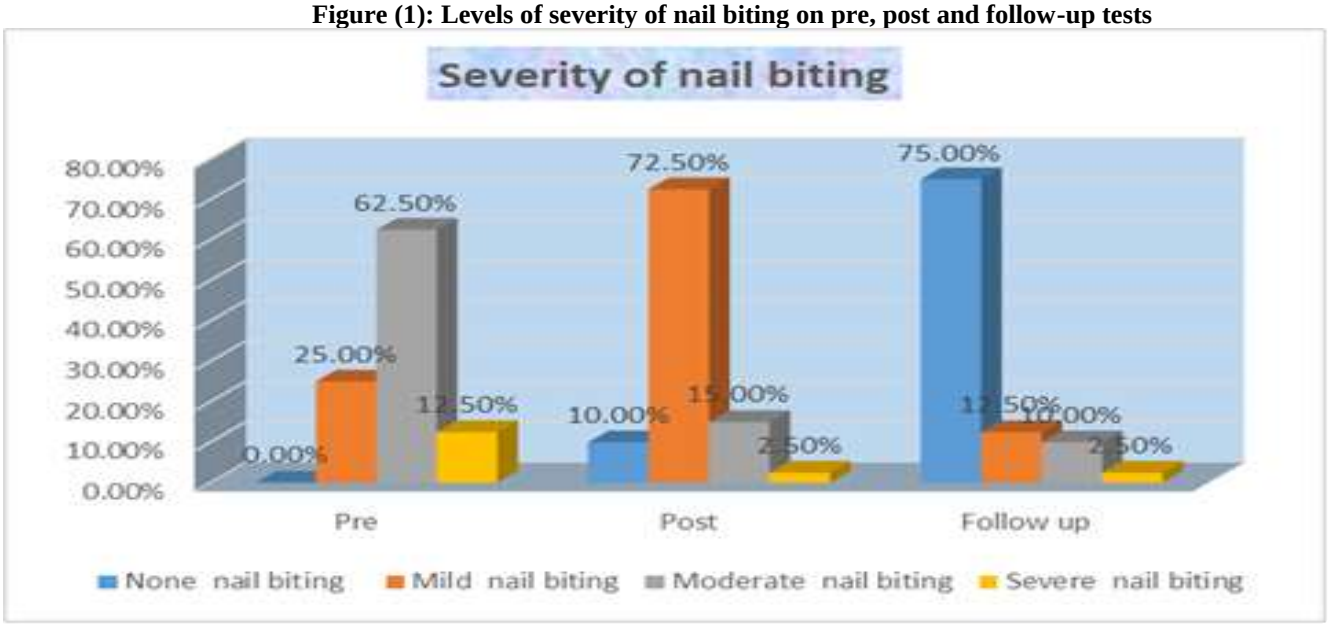


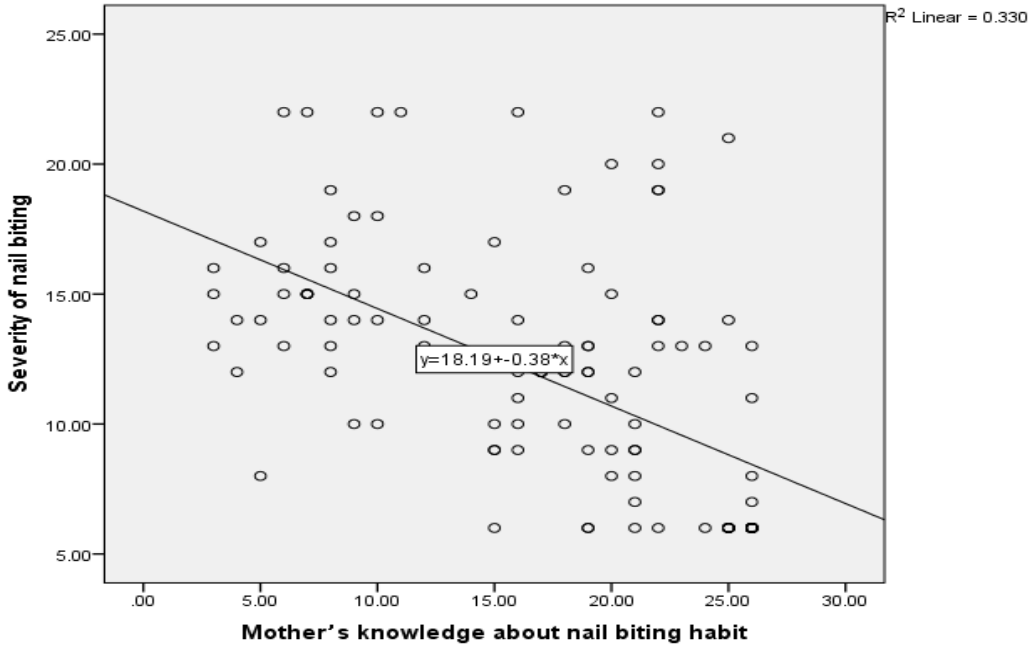
Table (3): Levels of mother's perception of children biting behavior on pre, post and follow -up tests

Items	Pre (n=40)		Post (n=40)		Follow up (n=40)		$X^2$1 P1 –value	$X^2$2 P2 –value
	No	%	No	%	No	%		
Low	12	30.0%	0	0.0%	0	0.0%		
Moderate	28	70.0%	40	100.0%	15	37.5%	14.11**	36.36**
High	0	0.0%	0	0.0%	25	62.5%	.000	.000

Table (4): Mean lengths of children nails in millimeter on pre, post and follow-up tests

Items	Pre test X±SD	Post test	Follow-up test	Anova test	P-value
Length of nails	3.85 ±0.83	4.39 ±.99	5.17 ±1.23	16.746	.000**

Figure (2): Correlation between mother's knowledge about nail biting habit, and Severity of nail biting.



Figure(3): Correlation between mother's knowledge about nail biting habit and total score of perception of nail biting behavior.

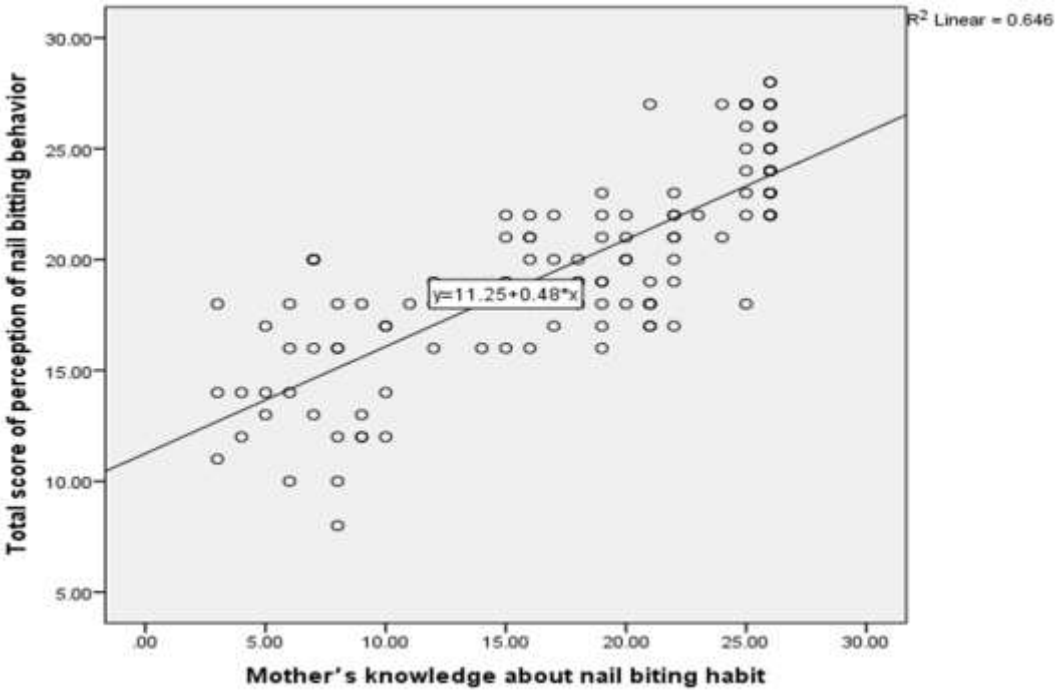
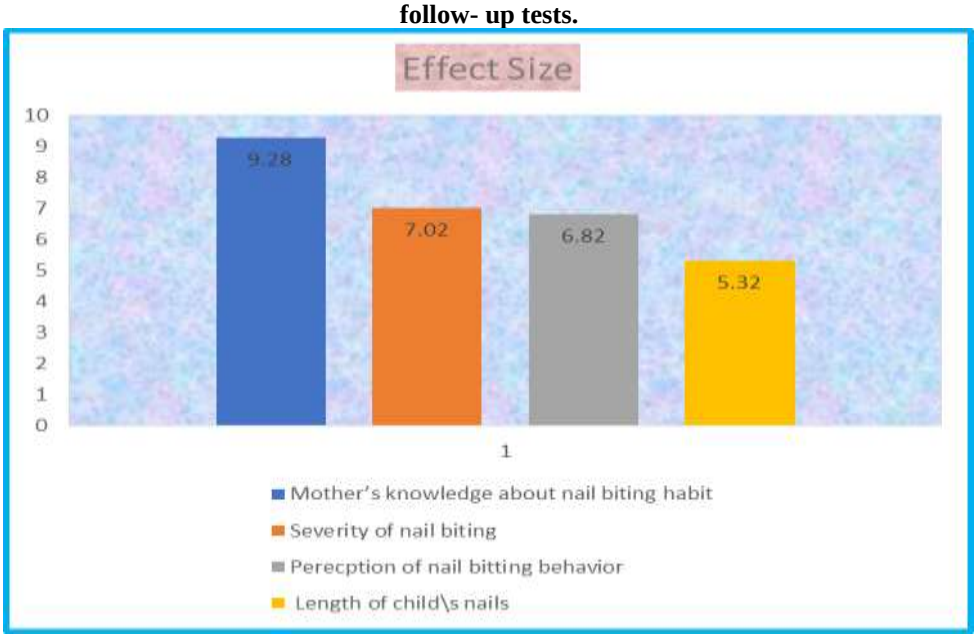


Figure (4) Effect size of applying Pender's health promotion model on mother's knowledge about nail biting habit, severity of nail biting, perception of nail biting behavior and length of nails on pre, post and follow- up tests.



Discussion

Nail-biting is one of the most common behavioral problems in children that can harm teeth and adjust their structure. The behavior of nail-biting generally starts at the ages of 3- to 4-years-old. It is not a life-threatening condition. However, the border between its healthy and unhealthy

associations still need conclusive decision. When this habit becomes problematic, they interfere with the person's wellbeing.

The health promotion model is one of the models which help to change behavior by providing the possibility to understand the behavior problem and gives their solution as well (Pender, 2011). This model shows its effectiveness in school based activities in changing the behavior when it was used in different studies (Fidanci et al., 2017). According to literature there are few studies conducted internationally on nail biting prevention or changing habits in children (Ergun et al., 2013).

The current study hypothesized that school age children who receive Pender's health promotion intervention will have fewer occurrence of nail biting on posttest than on pretest. Fortunately, the present study is one of the pioneer research studies in investigating the effect of Pender's health promotion intervention on nail biting among school age children.

Regarding age, the current study revealed that more than half of studied children were between 9≤12 years old. This result was consistent with Farrag and Awad, (2016) who conducted a study about " Prevalence of oral habits among a group of Egyptian school children, and their knowledge regarding its bad effect on oral health". And Herdiyati and Marhani, (2017) who conducted a study about "A description of nail biting habit in elementary school children ". They were found that most participants aged 9≤12 years old.

On the contrary, Mohamed et al., (2021) who conducted a study about "Effect of oral health promotional program on knowledge, attitudes and practices regarding dental caries among primary school children in Minia City, Egypt." reported that most participants more than 12 years old.

Regarding sex of studied children, more than two thirds of studied sample were females. This result was consistent with Farrag and Awad, (2016) who conducted a study about" Prevalence of oral habits among a group of Egyptian school children, and their knowledge regarding its bad effect on oral health. ". And Anila et al., (2018) who conducted study about "Prevalence of oral habits among 4-13-year-old children in Central Kerala, India." They found that the majority of participants were females.

On the contrary, Herdiyati and Marhani, (2017) who conducted a study about "A description of nail biting habit in elementary school children." And Waseem et al., (2020) who conducted a study about "Prevalence of nail biting in children and its association with mental health in Karachi, Pakistan." They found that nail biting was more common among boys than girls. From the investigator's point of view, this could be attributed to the tendency of boys to openly fight against family's or surrounding society's rules than girls.

For mother's knowledge about nail biting habit, on pretest, more than three quarters of mother's don't know about repetitive oral habits, approximately half of mothers don't know nail biting, etiology or its adverse effects. This could be attributed to limited media

programs that cover this topic as more than half of mothers consider social media as a main source of knowledge. On posttest, the current study showed that mothers had a higher level of knowledge concerning nail biting on post-test than on pre-test.

This result comes in agreement with Salama et al., (2020) who conducted a study entitled "Mothers' knowledge, attitude, and practice regarding their primary school children's oral hygiene". They found that there was a highly statistically significant difference between mothers' knowledge on post-test than on pre-test. From investigator's point of view mothers' knowledge increased due to provision of health education about nail biting habit and its management. Also, the researcher facilitated communication with mothers through forming online groups to facilitate communication, follow-ups and answer questions. Besides, booklets about management of nail biting were sent on what-app to mothers.

Regarding the severity of nail biting in children on pre, post and follow-up tests. On pretest, approximately three quarters of children had either moderate or severe nail biting. This could be attributed to low self-esteem, high anxiety, stress, loneliness, nervousness, or boredom (Siddiqui and Qureshi, 2020).

On posttest, the current study showed that there was a significant reduction in the severity of nail biting in children on post and follow-up tests. This result was consistent with Skurya et al., (2020) who conducted a study about "Habit reversal therapy in the management of body focused repetitive behavior disorders". And Authried & Svendsen, (2021) who conducted a study entitled " Habit reversal used to treat onychophagia: a case report." They found that there was a reduction in the severity of nail biting in children on post-test than pre-test. From the investigator's point of view, this result may be due to effectiveness of the health education methods for stopping nail biting and proper management. Also, it could be due to the improvement of children's' perception of benefits and barriers of stopping nail biting. Children increased self-efficacy could have also contributed to a reduction of nail biting severity.

In relation to lengths of children nails in millimeter, the current study illustrated that studied children had the highest mean scores of nails length 4.39 ±.99 and 5.17 ±1.23 on post and follow-up tests respectively compared to 3.85 ±0.83 pre-test. This result was consistent with Lee and Lipner, (2022) who conducted a study entitled "Update on diagnosis and management of onychophagia and onychotillomania ".They found that on post intervention nail lengths were significantly longer in the habit reversal treatment group (12.1 ± 1.9 mm compared to 8.8 ± 1.6 mm). This was attributed to reduced nail biting habit between children on post and follow-up test.

Regarding Pearson correlation between mother's knowledge about nail biting habit and severity of nail biting, the current study revealed that there was a positive highly statistically significant correlation between mother's knowledge about nail biting habit and

severity of nail biting. This result was consistent with Ranggang and Armedina, (2020) who conducted a study about "Comparison of parents knowledge of bad habits and the severity malocclusion of children in schools with different social levels." And Abdat and Ramayana, (2020) who conducted a study about" Relationship between mother's knowledge and behavior with oral health status of early childhood. " There was a significant relationship between mother's knowledge and behavior towards oral health status of the children.

Regarding Pearson correlation between mother's knowledge about nail biting habit and perception of nail biting behavior, the current study revealed that there was a positive correlation between mother's knowledge about nail biting habit and perception of nail biting behavior. This results was consistent with Varghese, (2019) who conducted a study about "A study to assess the knowledge among mothers of under-five children regarding selected behavioral problems in urban community." It was found that there was a positive correlation between knowledge of mothers and behavioral problems of children.

Regarding effect size of Pender's health promotion model on changing unhealthy behaviors and nail biting of children, the current study clarified that Pender's health promotion model had an important effect on severity of nail biting after the implementation of Pender's health promotion model. This finding was similar to Gür et al., (2018) who conducted a study entitled "The effectiveness of a nail-biting prevention program among primary school students ".And they revealed that children had high rate of reduction of nail biting after receiving the intervention.

Also, this finding was supported by Masoudi et al., (2020) who conducted a study entitled "Evaluating the effect of Pender's health promotion model on self-efficacy and treatment adherence behaviors among patients undergoing hemodialysis ". And they showed that there were positive effects of the program on patients undergoing hemodialysis, they recommended applying the program to promote the well-being of these patients.

Furthermore, such findings came in line with Shahroodi et al., (2021) who conducted a study about "Effect of a theory-based educational intervention for enhancing nutrition and physical activity among Iranian women." They revealed the use of Pender's HPM and its potential constructs could offer a promising way to develop critical techniques to behavior change success.

In the same context, this finding was consistent with Habibzadeh et al., (2021) who conducted a study entitled "The effect of educational intervention based on Pender's health promotion model on quality of life and health promotion in patients with heart failure: an experimental study ". This study demonstrated that Pender's health promotion model was effective in improving the quality of life of patients with heart failure and strengthening their health-promoting behaviors.

From the investigator's point of view, this could be related to the effectiveness

of Pender's health promotion model intervention which had a better effect in enhancing health behaviors and changing unhealthy behaviors such as nail biting habit in school age children.

Conclusion

Based on the findings of the present study and hypothesis, the following was concluded:

- School age children who received Pender's health promotion intervention had fewer occurrence of nail biting on posttest than on pretest.

Recommendations

Based on the conclusion of the current study, the following recommendations can be proposed:

1) Further studies should be implemented on a larger sample of children and their parents in other pediatrics departments to ensure the generalizability of results.

2) The implementation of Pender's health promotion intervention should be monitored for longer follow-up periods (such as 6 months, 1 year) to determine its effectiveness on decreasing nail biting habit.

3) Ongoing in-service health education programs based on application of Pender's health promotion model for children with nail biting should be designed and implemented into schools and pediatric health care settings to improve management of children with bad oral habits.

4) Integration of oral health promotion program (OHPP) into school curriculum may enhance information, attitude, and oral health practices .

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