

Effect of Evidence-Based Papworth Breathing Technique on Anxiety among School-Age Diabetic Children

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Abstract:

Background: Papworth breathing is a relaxation technique through which patients can change physical, emotional, and stressful behaviors using their thought. This technique is based on muscle relaxation and the patient learning how to achieve mental relaxation. Biological, social, and psychological aspects of children are all impacted by diabetes, a chronic illness. Stress and pressure from parents, doctors, and other carers are a part of everyday life for kids with diabetes mellitus. **Aim:** The study aimed to evaluate the effect of evidence-based papworth breathing technique on anxiety among school-age diabetic children. **Subjects and Method:** A quasi-experimental (pre-post-test) design implemented for 100 diabetic child (50 study group and 50 control group). **Two tools included: Tool I:** A designed direct interview form established by the investigators that included personal and clinical data of children. **Tool II:** Screen for Child Anxiety Related Disorders (SCARED). It was adopted from **Birmaher et al. (1997)**. **Results:** The mean of all symptoms of anxiety disorders in the study group is less than that of a control group in the post-program phase and follow-up phase with P. Value <0.01. **Conclusion:** Papworth technique led to an effective improvement in the management of anxiety in daily life. **Recommendations:** Hospitals should include Papworth technique in their policies and care plans as basic intervention care for children with chronic illness.

Keywords: Anxiety, Diabetes, Evidence-based practice, Papworth breathing technique & school-age children.

Introduction

Diabetes is a global epidemic, with 382 million people affected by the disease worldwide. The Middle East and North Africa region had six of the ten highest rates of diabetes incidence worldwide. Bahrain, Egypt, Kuwait, Oman, Saudi Arabia, and the United Arab Emirates are among these nations. Egypt, which makes up nearly a quarter of the Eastern Mediterranean and Middle Eastern region's total cases of presented childhood diabetes, makes the biggest contribution to the global average (**Gadallah et al., 2017**).

Biological, social, and psychological aspects of children are all impacted by diabetes, a chronic illness. Stress and pressure from parents, doctors, and other carers are a part of everyday life for kids with diabetes mellitus (**Zaffani et al., 2015**). The psychological state and the presence of signs of anxiety or sadness have an impact on diabetes control. Adolescents' higher blood sugar levels have been linked to depression and feelings of anxiousness, highlighting the significance of early detection and treatment (**Deeb et al., 2018**).

The adjustment to diabetes required a high effort and psychological difficulties as stress and anxiety, withdrawal, and reliance as a primary symptom. Additionally, various research in the literature described the forms and intensity of the psychological impacts of children's diabetes burden (**Zaffani et al., 2015**).

Depression and anxiety are the two mental health issues that affect young people with DM the most frequently. Children who experience anxiety may exhibit behavioral issues, poor emotional reactions, and physiological hyper-arousal. In addition to blood vessel constriction, elevated body temperature, increased eye dilating, muscle spasms, increased blood flow to muscles, and decreased blood flow to the skin are also physiological symptoms of test anxiety. The Educational Testing Service (ETS) and Praxis extend the list of physiological signs and symptoms associated with anxiety test to include nausea, cramps in the muscles, dizziness, and dry mouth (**Johnson et al., 2009**).

Evidence-based cognitive behavioral therapy.

Evidence-based, successful, non-intrusive and low-cost are all attributes of relaxation treatment.

Relaxation methods include several practices such as progressive relaxation, guided imagery, biofeedback, self-hypnosis, and Papworth technique. Inhaling a fresh deep breath facilitates individuals to intake more oxygen and reduces Carbon Di Oxide. Fresh oxygen is supplied to the brain for an optimum amount of blood supply and sound circulation of blood. The objective is to activate the body's natural relaxation response, which is indicated by slower breathing, lower blood pressure, and a sense of greater wellbeing (Sellakumar, 2015).

Additionally, relaxation can help with chronic pain, insomnia, sadness, worry, wound healing, mental health, and post-traumatic stress disorders. (Varvogli & Darviri, 2011). Increases in alpha and theta brainwaves, lowered heart rate and respiration, decreased levels of stress hormones like corticosteroids, and a variety of immune system functions can all be attributed to relaxation. Individuals are more likely to get its benefits if they regularly practice relaxing techniques. The management of chronic health issues requires frequent, regular practice (Sheehan, 2021).

Papworth technique is the process of taking slow, deep breaths. Inhaling air through the nose and exhaling through the mouth. It is one of the best ways of calming down and relaxing. It can help to organize blood pressure and heart rate, overcome stress, and increase feelings of well-being and calm. Besides helping reduce anxiety, Papworth technique can help with other mental health conditions, such as depression and anxiety disorders (Zaccaro et al., 2018).

Significance of the study

10 to 21% of children today suffer from one of the most common childhood psychological problems: anxiety disorders. They are one of the most prevalent and persistent forms of mental disease, affecting over 40 million people globally who are 18 years of age or older (American Psychiatric Association, 2013). When compared to their healthy colleagues, children with DM exhibit higher levels of psychological discomfort, anxiety, and sadness (Zaffani et al., 2015).

In diabetes management, psychotherapy and psychoanalysis are helpful techniques. The psychological intervention seeks to assist patients and families in striking a balance between a regular family schedule and effective glycemic management. Children and adolescents with diabetes benefit from the coordination of care provided by pediatric, psychiatric, and community health nurses, who stress the value of promoting positive behavior. Collaboration between medical experts, kids, teens, and their families is necessary for managing diabetes

in children and adolescents. The greatest way to avoid psychiatric problems is to have a loving, understanding family that is supported by a skilled interdisciplinary team (Deeb et al., 2018).

Aim of the study:

The study aimed to evaluate the effect of evidence-based papworth breathing technique on anxiety among school-age diabetic children.

Research hypotheses:

Null Hypothesis: Papworth breathing technique does not reduce anxiety levels among children.

Alternative Hypothesis (H1): Papworth breathing technique is reducing anxiety levels among school-age diabetic children.

Subjects and Method:

Research design:

A quasi-experimental design (study and control group) was used in the present study.

Setting:

The Assiut University Children's Hospital's Pediatric Endocrine Unit and Out-Patient Clinic were the sites of this research. All children in the governorates of Upper Egypt are receiving the healthcare treatments they require from this institution.

Sampling and Sample Size

A purposeful represented sample of 100 children (50 study group and 50 control group) who are medically diagnosed with diabetes mellitus in both sexes was conducted at mentioned study setting. They were selected based on the number of children with diabetes mellitus who were visiting the mentioned study setting, and by using the following equation according to Steven & Thompson (2012).

$$n = \frac{N \times P(1-P)}{[N-1 \times (d^2 \div Z^2)] + P(1-p)}$$

N= total number of children with diabetes mellitus.

Z= confidence level is 0.95 and is equal to 1.96

D= the error ratio is = 0.05

P= the property availability ratio and neutral = 0.50

The subjects' inclusion criteria were:

- Age ranges from 8 to 12 years.
- Diagnosed with diabetes mellitus.
- Do not have any cognitive impairment, genetic disabilities, or other long-term illnesses.
- Both sexes.
- Agree to participate in the study.

Tools of the study:

Two instruments were applied in this research:

Tool I: A designed created direct interview form in an English language developed by the researchers that contained children's medical and personal information as; age, birth order, positive family history of diabetes, duration of illness, and residence.

Tool II: Screen for Child Anxiety-Related Disorders (SCARED):

It was adopted by **Birmaher et al. (1997)** SCARED-C instrument (the child version, 41 items) in an English language is used for screening anxiety in children between 8 to 18 years old. It has two versions, for parents and children. One scale asks parents questions about their child, and the other scale directly asks the child the same questions. The 41-item SCARED scale consists of five subscales, which screen for four specific anxiety disorders: panic disorder (13 items), generalized anxiety disorder (nine items), separation anxiety disorder (eight items), and social anxiety disorder (seven items), as well as a subscale for school phobia (four items). These items evaluated five types of anxiety, according to the DSM-IV classification, and had 5 large subscales: generalized anxiety, social anxiety, panic disorders, separation anxiety, and school avoidance.

Scoring system:

Scoring system for (SCARED): It contains 41 items that describe how the child feels. Each child listens to each phrase by the researcher and decides if it is "Not True or Hardly Ever True" or "Somewhat True or Sometimes True" or "Very True or Often True" for him. 0 = not true or hardly true, 1 = somewhat true or sometimes true, 2 = very true or often true. A total score of ≥ 25 may indicate the presence of an anxiety disorder. The maximum total score is 82, and the maximum scores for panic disorder, generalized anxiety disorder, separation anxiety, social anxiety, and school phobia are 26, 18, 16, 14, and 8, respectively and Scores higher than 30 are more specific types of anxiety.

Method of data collection:

- 1- After explaining the study aim and nature to the manager of the outpatient clinic and the head of the endocrine unit at the Assiut University Children's Hospital, a verified consent was obtained from the dean of the nursing faculty.
- 2- The child Screen for Child Anxiety Related Emotional Disorders (SCARED) demonstrated good internal consistency ($\alpha = 0.74$ to 0.93), test-retest reliability (intraclass correlation coefficients = 0.70 to 0.90), discriminative validity (both between anxiety and other disorders and within anxiety disorders), and moderate parent-child agreement ($r = .20$ to $.47$, $p < .001$, all correlations).
- 3- The Assiut University Faculty of Nursing's Ethical Committee provided the ethical approval. The mothers of the children were informed of the purpose and nature of the study. The children and their moms were accordingly informed that they might agree or disagree with participating in the study. Each mother of a child participating in the

study and the control group was given the chance to give their written consent prior to enrollment, and they were informed that the information would be kept private and used exclusively for the purposes of the study. Ten percent of the examined children participated in a pilot study (10 for the study group and 10 for the control group) to assess the tool's clarity and usability as well as to determine how long it would take each participant to complete the form. The study sample also contained the pilot study sample.

The educational program: It was created by researchers based on relevant literary materials. This program aimed to lower diabetic children's anxiety levels.

It was applied into four phases as the following:

Assessment phase: The researchers evaluated the medical and personal information and medical histories of the kids, considering things like age, duration of illness, etc.

Planning phase: During this phase, the program's teaching space, sessions, audiovisual materials, videos, and handouts were all set up.

Teaching time: The time of the program starts according to the working time of the outpatient clinic and during a visiting time in inpatient clinics.

a) **Teaching place:** This work was conducted in the Endocrine Pediatric Out-Patient Clinic and Unit in Assiut University Children's Hospital.

b) **Teaching methods and materials:** The researchers taught the children through lectures, group discussions, and booklet handouts that were given to each child at the conclusion of the program.

Implementation phase: The educational program lasted four months, and each child needed two sessions of two days to finish the training and practice the technique.

Sessions: The contents of the program were divided into two sessions:

▪ **Session (1):** It was composed of teaching children that anxiety is one of the psychological complications of diabetes and the importance of practicing papworth technique to improve their psychological state and limiting its psychological complications: e.g. Definition of papworth techniques, its mechanism in the body and its importance.

▪ **Session (2):** Application of Papworth technique. It was implemented for the study group. The researcher demonstrated the technique for the study group by using data show, and video via mobile. The researchers apply the technique and trained each child in the study group to practice the technique which took about (5-20) minutes several times daily that include the following steps:

- 1- Lie down or sit in a comfortable chair, maintaining good posture.
- 2- Close your eyes and keep your body as relaxed as you can.
- 3- Scan your body for tension, pay attention to your breathing.
- 4- Place one hand on the part of your chest or abdomen that seems to rise and fall the most with each breath. If this spot is in your chest, you are not utilizing the lower part of your lungs.
- 5- Breathe through your nose, and notice if your chest is moving in harmony with your abdomen.
- 6- Now place one hand on your abdomen and one on your chest.
- 7- Inhale deeply and slowly through your nose into your abdomen as you say to yourself "breathe in."
- 8- Hold your breath a moment before you exhale. You should feel your abdomen rise with this inhalation and your chest should move only a little.
- 9- Exhale slowly and deeply as you say to yourself "relax." Through your mouth, keep your mouth, tongue, and jaw relaxed.
- 10- Pause and wait for your next natural breath. As you inhale slowly and then hold your breath for a moment, notice the parts of your body that tense up.
- 11- As you exhale, feel the tension naturally leaving your body. With each exhalation, you will feel more and more relaxed, as you let go of more and more tension.
- 12- Relax as you focus on the sound and feeling of long, slow, deep breaths.
- 13- When thoughts, feelings, and sensations catch your attention, just notice them and return to your breathing. Practice for five to twenty minutes at a time.
- 14- Once you've mastered this exercise, practice using it several times a day in neutral situations, that is, non-stressful situations. Finally, start using it in stressful situations to reduce your tension.

Evaluation phase:

During this phase, the child's anxiety level was assessed three times: before application of papworth technique, immediately (within two weeks) and follow-up; after one month for the study and control groups to evaluate the effect of the education program. Children in the study group were practicing the papworth technique daily two times per day after program implementation and evaluated their effectiveness; immediately (within two weeks), and followed up; after one month.

Fieldwork:

Data were gathered over a period of four months; from the end of January, 2023 to the end of April, 2023. The investigators met children in the Endocrine Pediatric Unit and Out-Patient Clinic at Assiut University Children's Hospital. The investigators introduced themselves to the participating children and their mothers and outlined the purpose and scope of the study during the meeting. Two meetings were required to complete the pretest. First; the researchers filled out the structured form. In the second; the researchers developed a handout brochure for the participating kids and explained the educational program's contents. About 2-3 children and their mothers were interviewed/day two times/a week. The duration for completion was about 20 minutes in total. The time needed by the child to practice papworth technique was (5-20) minutes. The post-test was done two times for children and fill tool two: Immediately (within two weeks) and follow-up was done after one month of the pretest.

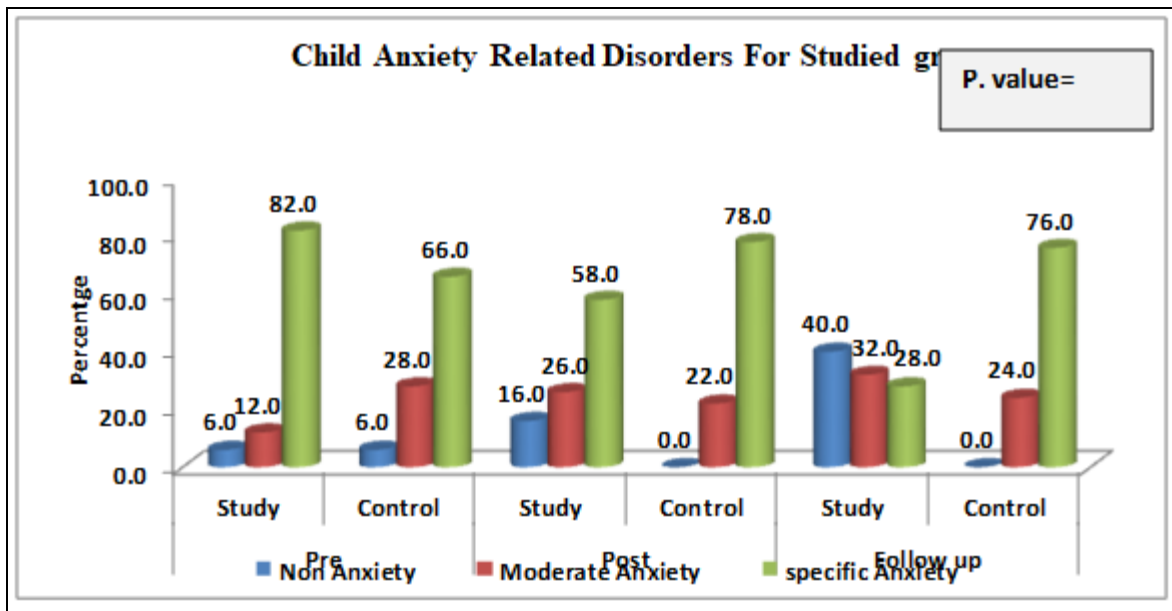
Statistical design:

Data analysis was performed using SPSS 20 statistical software. The qualitative variables were described using frequency and percentages and quantitative variables were described using the range, mean, and standard deviation. Chi-square, one-way ANOVA, and independent t-test were used. P-value <0.05 was considered significant and highly significant if P value <0.01.

Results:

Table (1): Personal data of studied diabetic school-age children (N=100)

Personal data	Study (n=50)		Control (n=50)	
	No	%	No	%
Age group				
• Less than 10 years	17	34.0	18	36.0
• From 10 years to 12 yrs	33	66.0	32	64.0
Mean ±SD	9.86+1.77		10.76+4.26	
Duration of illness (DM)				
• Less than 3 years	30	60.0	26	52.0
• From 3-5 years	12	24.0	6	12.0
• More than 5 years	8	16.0	18	36.0
Mean ±SD	3.26+2.41		4.44+3.61	
Birth order:				
• From 1 st to 3 rd	41	82.0	32	64.0
• More 3 rd	9	18.0	18	36.0
Mean ±SD	2.42±1.36 (1-6)		3.14±1.67 (1-7)	
Residence:				
• Rural	32	64.0	29	58.0
• Urban	18	36.0	21	42.0
Positive family history of diabetes:				
• No	12	24.0	14	28.0
• Yes	38	76.0	36	72.0

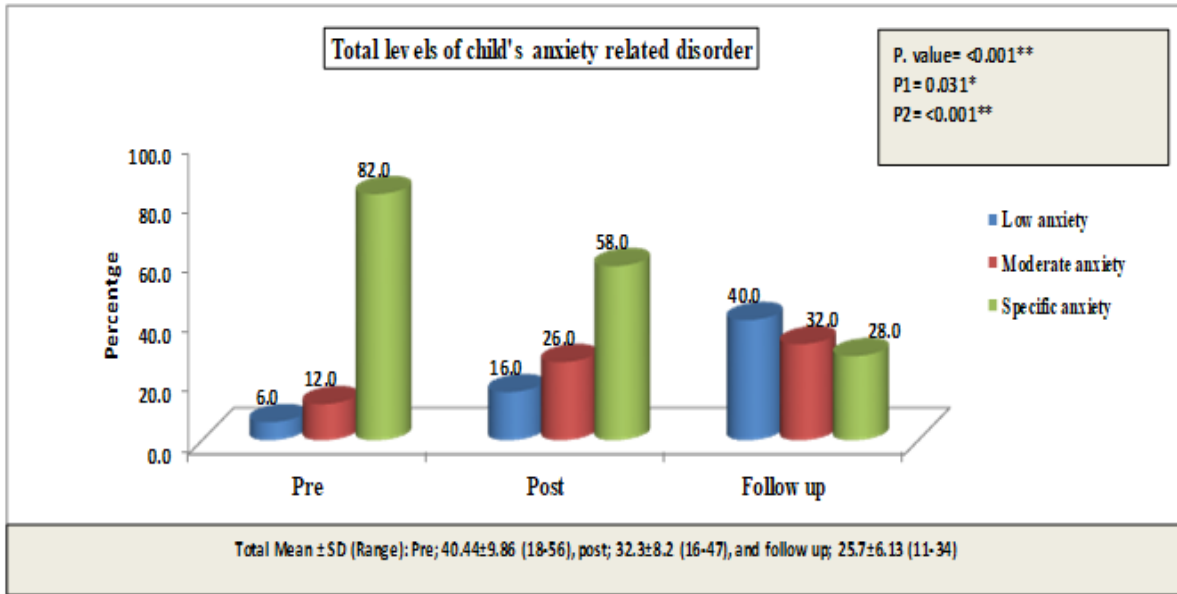


Chi-square test

*Statistically Significant Correlations at P. Value <0.05.

**Statistically significant difference at P. Value <0.01

Figure (1): Child's anxiety level among children in the study and control groups during pre, post, and follow-up program application (N=100)

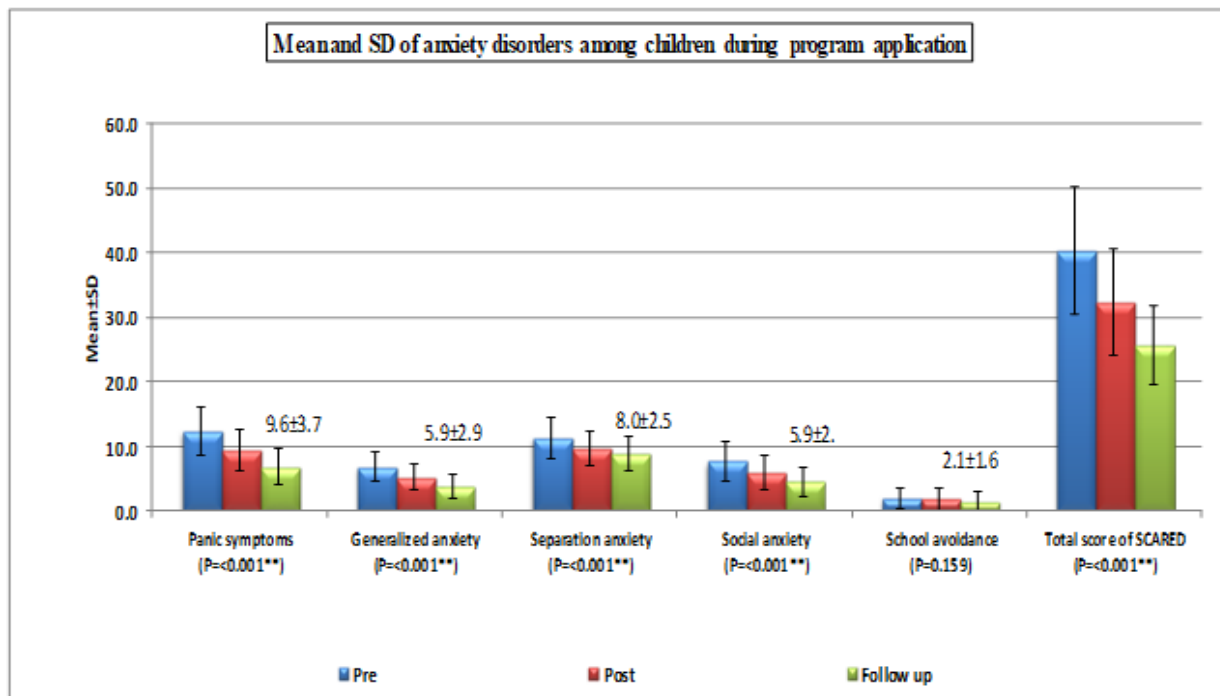


Chi-square test

*statistically significant correlations at P. Value <0.05,

**statistically significant difference at P. Value <0.01

Figure (2): The level of child anxiety-related disorder among study group in the pre, post, and follow-up program application (n=50)



One-way Anova test

**statistically significant difference at P. Value <0.01

Figure (3): Mean and SD of anxiety symptoms among the study group in the pre, post, and follow-up program application (n=50)

Table (2): Comparison between anxiety disorders among children during three program phases for study and control group (pre, post and follow-up (N=100))

Anxiety disorders	Pre Mean and SD		P. Value	Post Mean and SD		P. Value	Follow up Mean and SD		P. Value
	Study	Control		Study	Control		Study	Control	
Panic disorder	12.4±3.73	13.06±4.8	0.444	9.4±3.3	13.8±4.4	0.000	6.9±2.7	12.28±2.65	0.000
Generalized anxiety disorder	6.88±2.2	7.88±2.88	0.054	5.3±2	8.52±2.45	0.000	3.84±1.81	8.12±2.11	0.000
Separation anxiety disorder	11.34±3.13	7.02±3.15	0.000	9.74±2.58	7.76±2.73	0.000	8.94±2.76	7.08±1.88	0.000
Social anxiety disorder	7.8±3.06	7.62±2.91	0.764	5.98±2.56	7.86±2.65	0.000	4.6±2.21	7.22±1.95	0.000
School phobia	2.02±1.7	2.54±1.7	0.130	1.88±1.62	2.88±1.51	0.002	1.42±1.55	2.8±1.43	0.000
Total child anxiety related disorders	40.44±9.86	38.12±12.76	0.311	32.26±8.21	40.8±11.34	0.000	25.7±6.13	37.5±7.11	0.000

Independent t-test

*statistically significant correlations at *P. Value* <0.05,

**statistically significant difference at *P. Value* <0.01

Table (1): Shows that two-thirds of the studied diabetic school-age children are 10 years old and more (66.0%) compared to 64.0% in the control group. Also, more than half of the studied children have diabetes for a period less than 3 years in the control and study groups (52.0 and 60.0 % respectively). The majority of the children in the control and study groups were lived in the rural areas (58.0 and 64.0 % respectively). More than three-quarters of studied children have a family history of diabetes in studied groups (76.0% and 72.0% respectively)

Figure (1): Illustrates the level of anxiety among the control and study groups. In the pre-test phase, the level of specific anxiety in the study group was equal 82.0% compared with 66.0% for the control group. In the follow-up stage, the level of specific and is more in the control group rather than the study group (76.0% &28.0% respectively) while moderate anxiety is high in study group than control group and only (32.0% &24.0% respectively).

Figure (2): Shows the level of anxiety in the study group was changed by the application of the program. In the stage of pre-program, the level of specific anxiety was very high (82.0%) this level begins to decrease in the post-stage of the program (58.0%) and is followed by a low level of anxiety in the follow up which reached (28.0%).

Figure (3): Reveals that the mean and SD of-anxiety is tending to be low during follow-up after the application of Papworth technique and the mean and SD of anxiety in panic disorders, generalized anxiety disorder, separation anxiety, social anxiety, and school avoidance were **9.6±3.7, 5.9±2.9, 8.0±2.5, 5.9±2.5, and 2.1±1.6** respectively.

Table (2): Shows a comparison between anxiety disorders among children during three program phases for the study and control group (pre, post, and

follow-up). As regards anxiety symptoms there were highly statistically significant relations between the study and control group in the post test and follow-up stages. The same table illustrates the mean of all symptoms of anxiety disorders in the study group is less the mean of a control group in the post-program phase and follow-up phase with **P. Value <0.01**

Discussion:

Diabetes is a chronic illness, and managing it comes with many difficulties, especially when treating children (Ferenčić et al., 2018). Symptoms of anxiety disorders frequently co-occur with pediatric diabetes mellitus (DM) and seem to be associated with treatment regimens (such is worse metabolic regulation and DM regimen adherence when measuring glucose), intensive medical complications, and consequently the impaired quality of life. Children face the risk of experiencing psychological problems and distress due to the effort needed for self-care and adjusting to diabetes (Deeb et al., 2018).

This study aimed to evaluate the effect of evidence-based papworth breathing technique on anxiety among school-age diabetic children. According to the current study results; the level of specific anxiety is very high in the study and control groups among school-age children with diabetes in the pretest and there is no statistical significance difference found between the control and study groups.

Along the same line, another study stated that many complications due to diabetes negatively affect the quality of life, including psychological stress and anxiety, which are major causes of depression and reduce concentration in this patient population (Schram et al., 2009). Also, (Johnson et al., 2009) found that there were no significant pre-test variations in mean scores between the experimental and control

groups, indicating that there were no meaningful differences in the levels of anxiety between the groups prior to the start of the experimental therapy.

The result of the current study showed that there is a high statistical significance difference between the study and control group in post-test and follow up and this is consistent with (Sellakumar, 2015) who indicated that there is a significant difference found between experimental and control group in the post-test condition and the mean scores of the experimental group are remarkably reduced compared to the pretest condition. This result is attributed due to the practice of slow Papworth technique exercise which evidenced by the posttest mean score overall anxiety of the experimental group is significantly reduced compared to the pretest mean score.

Also, other studies such as Dighore & Gadkari (2013) & Franco et al., (2011) showed that mindfulness was effective in reducing anxiety showed that yogic exercises and meditation reduced anxiety.

The current study showed that there is no statically significant difference in the pre, post-test, and follow-up in the control group. This agrees with Sellakumar, (2015) who stated that there is no significant difference between the pretest and post-test mean scores of the control group. Therefore; it is evident that the intervention influenced reducing the level of anxiety. Also, Johnson et al., (2009) showed that there was no significant difference found between pre-and post-test mean scores for the control group.

As regards current study results, Papworth technique leads to decrease anxiety levels in the post and follow-up test than in the pretest phase. It can be explained by when the child inhales, the air is drawn in through his nose, and Alveoli are surrounded by tiny blood arteries (capillaries), which take in oxygen and deliver it to the heart. All the body's organs receive oxygenated blood through the heart. An exchange take place. To maintain relaxation and lessen sensations of tension or worry, it is essential to use this effective way of moving and exchanging oxygen and carbon dioxide. (Davis et al., 2019). This agrees with Johnson et al., 2009 who stated that a significant difference between pre-and post-test mean scores was found for the experimental group.

Moreover, the present study stated that the level of panic attacks decreased after Papworth technique was applied by diabetic children. Similarly, one study done by Bhagat et al., (2017) demonstrated that practicing deep breathing can improve your breathing comfort and help you overcome many of the physical signs of a panic attack. The body's innate response to stressful situations can be countered through breathing exercises. When done correctly, a breathing exercise is a potent strategy that can be used to combat unexpected panic attacks.

It could be noted that the level of separation anxiety among children was down after doing the Papworth technique. This finding can be explained by Papworth technique is the fast way to calm a child with anxiety and a child can apply this exercise during blowing into straws or blowing bubbles. For children that are experiencing fear and anxiety about separating from their mothers, helping them learn how to breathe deeply can be such a game changer.

Regarding school avoidance, the current study found that by doing Papworth technique among school-age children with diabetes, the level of anxiety was decreased. The main explanation for this finding is that Children who were taught to breathe deeply and slowly experienced greater physical and mental calmness. They are furthermore compelled to pause and consider their current emotions in order to distance themselves from intense feelings and maintain their ability to participate in school activities.

According to social anxiety, the current study reached that helped reduce anxiety among diabetic children that face social anxiety when dealing with stranger persons in the hospital ward in which repeated practice of the Papworth technique give the child courage and self-confidence and calms the mind, and induces a state of relaxation in his body when he is surrounded by many persons and be able to deal with them without being afraid.

Conclusion

Based on the results of the present study, it could be concluded that repeated practice of the Papworth breathing technique has a great effect on reducing anxiety levels among diabetic school-age children evidenced by a highly statistically significant difference found between the study group who practice the technique and control group who did not practice the technique in posttest and follow up. The Papworth technique led to an effective improvement in the management of anxiety in daily life and it has a positive influences on the child's condition that face during the duration of illness and treatment. However more research is necessary to know the efficacy of this method among pediatric population that have chronic illness. It can be suggested that nurses in hospitals should include this technique and other relaxation techniques in the schedule of care provide to children with various health problems.

Limitations of the study:

1. Small sample size.
2. The study should include children with various health problems, not only diabetic children.

Recommendations:

Based on the results of this study, the following recommendation is suggested:

1. Healthcare professionals in hospitals should use and teach different types of relaxation techniques e.g. Papworth technique and other techniques to promote the psychological well-being of diabetic children.
2. Hospitals should include the Papworth technique and other types of anxiety and stress management strategies in their policies and care plans as basic intervention care for children with chronic illness.
3. Educational programs should be provided to nurses in hospitals and nursing faculties and schools about how to use and teach anxiety and stress management strategies to children.
4. Audiovisual material related to anxiety and stress management strategies and different relaxation should be available in all hospitals for children.

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