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Research Article

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Comparative Study on the Effects of Pelvic Floor Muscle Exercises and Abdominal Muscle Training in Functional Constipation among Children

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Abstract: To compare the effects of pelvic floor muscle exercise and abdominal muscle training, breathing exercisesandabdominal massage in children with functional constipation. Functional constipation is one the most common gastrointestinal condition in pediatrics practice with an estimation prevalence ranging from 0.7% to 29.6%. It has a multifactorial pathophysiology mainly consisting of stool with holding and delayed colonic transit.30 subjects who met theRome-III criteriafor pediatric functional constipationwere randomly divided into 2 groups. Group-A was trained with pelvic floor muscle exercise along with squat walking for 5 min under supervision of parents. Exercise duration was increased 5 min per week, for two consecutive weeks and remained the same for the next six weeks and Kegels was performed for 10 seconds. Group-B was given isometric training of the abdominal muscle which was carried out in two ways. The patient was either lying down in a left lateral decubitus position with the hip and knee flexed at 90° with two series of eight contractions and relaxations until the third week and was then increased to two series of 12 contractions and relaxations for 6 weeks. In the sitting or lying down method, training began with one series of three contractions and relaxations lasting 10 s which was increased to five repetitions in the third week until the sixth week along with abdomen tuck-in exercise. Diaphragmatic breathing and abdominal massage was given to both groups in common. The intervention of the study was about 8 weeks.Results of statistical analysis showed that both Pelvic Floor Muscle Exercises and Abdominal Muscle Training are effective in treating functional constipation among children. However pelvic floor muscle exercise was better than abdominal muscle training on the basis of Wexner Construction Scoring System.

Keywords: Functional Constipation, Pelvic Floor Muscle Exercise, Abdominal Muscle Training, Diaphragmatic breathing, Non-Pharmacological Treatment, Gastrointestinal Problems.

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1. INTRODUCTION

Functional constipation (FC) is one of the most common gastrointestinal conditions in Pediatric practice with estimated prevalence ranging from 0.7% to as high as 29.6%.[1]It is a debilitating condition associated with a variety of physical and emotional problems, resulting in negative effects on quality of life of affected children.[2] FC has a multi-factorial pathophysiology mainly consisting of stool withholding (SW) and delayed colonic transit.[3] It is supported by the fact that a vast majority of constipated children who are refractory to standard medical interventions show SW maneuvers.[4] Hence, interventions aiming to cease SW are potential treatments for FC. Physical activity is essential for an adequate development of preschool children having positive effects on measures of obesity, cardio metabolic health, motor skill development, and bone health.[5]Among the gastrointestinal diseases,functional constipation is especially common in childhood.[6] which is associated with impaired quality of life.[7, 8] Childhood constipation is threatening to become a major public health problem across the world. Although it is not linked to mortality directly, constipation leads to poor health-related quality of life (HRQoL), poor school performance and consequently to deficiencies in education.[9]Constipation rarely leads to life threatening complications, but can cause emotional and physical distress for children andtheir families, ultimately impairing health related quality of life (HRQOL).[10-12] The Rome III criterion for hard and painful stools is a combined criterion, and children fulfill these criteria if they have either hard stools or painful defecation. This decreases the impact of stool consistency alone in diagnosing FC. The diagnosis of FC was confirmed using The Rome III Criteria for Functional Constipation in Children and Adolescents.[13] Pelvic floor muscle strength is important for both bowel and bladder control. Chronic straining from constipation can lead to weakening of the pelvic floor muscles, excessive stress on pelvic organs and nerves, as well as bladder dysfunction and recurring accidental bowel leakage.[14] Pelvic floor muscle training involves training the right use of the pelvic floor muscles (PFM) during contracting and straining, breathing and changes in abdominal pressure.[15-17] In case of (urine) incontinence, the treatment can be extended with additional PFM exercises Standard pelvic physiotherapy (PPT) care for the constipated child has not been described. In most cases, PPT consists of education, demystification, the use of micturition and defecation diaries, toilet training, breathing and relaxation exercises and pelvic floor muscle training (PFMT), with PFMT including exercises and biofeedback (BF).[18,19] Pelvic Floor Exercises (also known as kegel exercises) can help both men and women gain more control over bowel and bladder movements. [20] The use of physiotherapy for training intestinal function [21] results in mechanical and neurological effects. The former include stimulating colonic movements, coordinating the muscles and increasing faecal propulsion [22-25] and abdominal muscle tone.[26]The aim of the training was to increase intra-abdominal pressure and the colonic propulsive force during voluntary effort.[27, 28] Considering the indirect synergic activation between the pelvic floor and the lower abdominal muscles, voluntary isometric contraction of the upper abdomen and the simultaneous relaxation of the lower abdomen improve muscle coordination and relaxes the pelvic floor and the external anal sphincter, thus optimizing defaecation.[29]This exercise helps to improve and maintain pelvic floor muscle strength. kegel can be practiced whenever we cough, sneeze, laugh or lift. A strong back needs strong stomach muscles. Breathe holding is avoided during excercise. (h).[30] Functional constipation (FC) is one of the most common gastrointestinal conditions in Pediatric practice. This study is used to find which is the most effective between pelvic floor muscle exercise and abdominal muscle training in management of the FC in children.

2. MATERIALS AND METHODS

A group of 36 subjects during the sample collection 36 subject were taken out of which3 children parents were not interested to participate and other 3 discontinued during the study and so we divided the participants equally was taken who met the ROME-III CRITERIA for pediatric functional constipation according to ROME-III CRITERIA an outcome measure for diagnosis of functional constipation. They are randomly divided into 2 groups (group-A and group-B).The study setting was at k. c. Sankaralinganadar mat. hr. sec. school. Old washer men pet , Chennai, tamilnadu, India GROUP-A was treated with pelvic floor muscle exercise along like Squat walking for 5 min under supervision of parents. Exercise duration was increased 5 min per week, for two consecutive weeks and remained the same for the next six weeks and Kegels performed with 10 seconds holds for 10 repetitions of each twice a day per week and progressively the hold time is increased by 10 seconds per week.[31] GROUP-B was treated with isometric training of the abdominal muscle training which was carried out in two ways. The patient was either lying down in a left lateral decubitus position with the hip and knee flexed at 90° or sitting or lying down. In the first case training began with two series of eight contractions and relaxations until the third week and was then increased to two series of 12 contractions and relaxations for 6 weeks. In the sitting method, training began with one series of three contractions and relaxations lasting 10 s which was increased to five repetitions in the third week until the sixth week along with abdomen tuck-in exercise.[32] Diaphragmatic breathing and abdominal massage was given to both groups in common. All these exercises were taught to the children and their parents by the physiotherapist in the beginning of the experiment. The children were made to perform those exercises under parent supervision. The physiotherapist visited once per 2 weeks and maintained the follow ups.

2.1 Selection of the patient

The patient was selected under the following inclusion criteria who are 7 – 14 years of age out of which 9 females and 21 males subjects were taken, with absence of any systemic diseases or under any medication Table 1. The subjects were excluded if the age is below 7 or above 14 years, presence of any systemic disease, and irritable bowel syndrome, children with gross motor deficit and non-cooperative subjects. Then children are assessed with ROME III CRITERIA questionnaire.

2.2 Group-A pelvic floor muscle exercise

2.2.1 Pelvic floor muscle exercise

2.2.1.1 Walking in squatting position

The patient was instructed to step forward using the right leg, keeping the weight on the heel. Bending the right knee,

lowering down is made so that it's parallel to the floor in a lunge position and pause for a beat. Further without moving the right leg, the patient was asked to move the left foot forward, repeating the same movement on the left leg.

2.3 Kegels exercise

Make sure that the patient's bladder is empty and then asked to sit or lie down. The patient is asked to tighten their pelvic floor muscles and hold tight and count 3 to 5 seconds. Thenthe muscles is relaxed and count 3 to 5 seconds is made and is repeated 10 times, 3 times a day (morning, afternoon, and night).

2.3.1 Group-B

2.3.1.1 Abdominal muscle training

2.3.1.2 Isometric abdominal contraction

The patient was asked to lie down with both knees bent and to keep both hands behind their head. Then the patient was asked to lift their shoulder and head off the ground until they feel a squeezing sensation in their abdomen and hold it as long as they can. Repeat it for 10 - 15 contractions.[32]

2.3.1.3 Abdominal tuck-in exercise

When the patient is in bed, they were asked to contract the abdomen tightly. The procedure should contract the lower abdominal muscles and hold it for 8 seconds and relaxed and this procedure is repeated for 10 times. The diaphragmatic breathing exercise and abdominal exercise were given to both groups commonly to increase the effects of those exercises

2.3.1.4 *Diaphragmatic breathing exercise*

The patient was asked to sit or stand comfortably with good posture while placing their hands on the sides over their lower ribs. Then they were asked to feel their lower ribs move down as they exhale slowly through pursed lips. Later the patient was asked to inhale slowly through the nose, while feeling the expansion of their lower ribs . Rest takenafter 3 or 4 breaths.

2.3.1.5 *Abdominal massage*

The patient was instructed to use the palm of their hand to massage their entire stomach in a clockwise direction several times. Then thecentre line of abdomen was massaged, starting below the sternum and ending at the pubic bone. The patient was asked to perform this massage three more lines an inch apart down the left side of the abdomen. The same was done on the right side of the abdomen.

2.4 Ethical Concern

The procedures were followed according to the recommendations of Helsinki Declaration of 1964 (as revised in 2008). This study was registered under Faculty of Physiotherapy, Dr.MGR educational and Research institute with [C-24/PHYSIO/IRB/2019-2020]. The study was carried out during November 2019 to june 2020 since the study was on the childrens of age group 7-14 years the procedure was completely explained to the parents and the written informed consent was obtained for the study.

3. STATISTICAL ANALYSIS

The collected data were tabulated and analyzed using both descriptive and inferential statistics. All the parameters were assessed using the statistical package for social science (SPSS) version 24. Paired t-test was adopted to find the statistical difference within the groups & Independent t-test (Student t-Test) was adopted to find the statistical difference between the groups. The data were presented as mean, standard deviation (SD), probability value (p) less than 0.0001 was considered as statistically significant

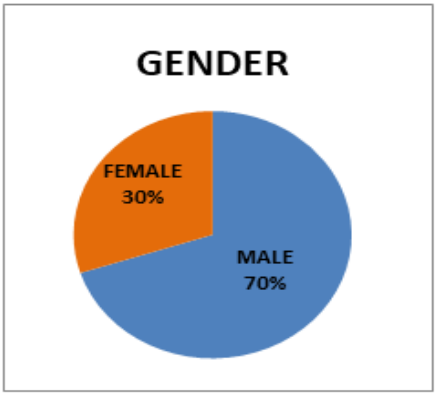
4. RESULTS

On comparing the mean values of Group A & Group B on Wexner Construction Scoring System, it showed significant decrease in the post test mean values in both groups, but (Group A - Pelvic Floor Exercises) shows 16.06 which has the lower mean value is effective than (Group B - Abdominal Muscle Training) 17.73 at P ≤ 0.001(Table 2). Hence Null Hypothesis is rejected. Hence it is it is significant. On comparing Pretest and Posttest within Group A& Group B on Wexner Construction Scoring System shows highly significant difference in Mean values at P ≤ 0.001. Table 3

TABLE - 1

Variables	N	Minimum	Maximum	Mean SD	Skewness	
					Statistics	Std. Error
AGE	30	7.00	14.00	11.5333+2.16	-.510	.427

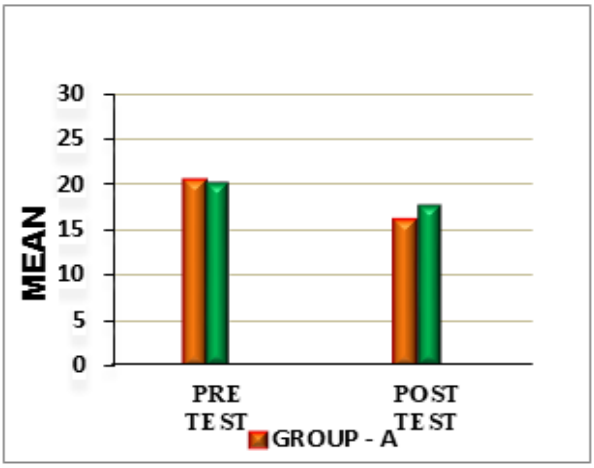
The descriptive statistic of demographyic characteristic showsmean&SD 11.53 +2.16 at p value greater than 0.05.Hence the age characteristic are normally distributed.



GRAPH – I Frequency Percentage of Gender Distribution

Table-2 Comparison Of Wexner Construction Scoring System Between Group – A And Group - B In Pre And Post Test					
WCS	Group - A	Group - B	T - Test	Df	Significance
	Mean Sd	MeanSd			
Pretest	20.33+2.05	20.26+2.05	.089	28	.930*
Posttest	16.06+1.53	17.73+2.01	-2.54	28	.000***

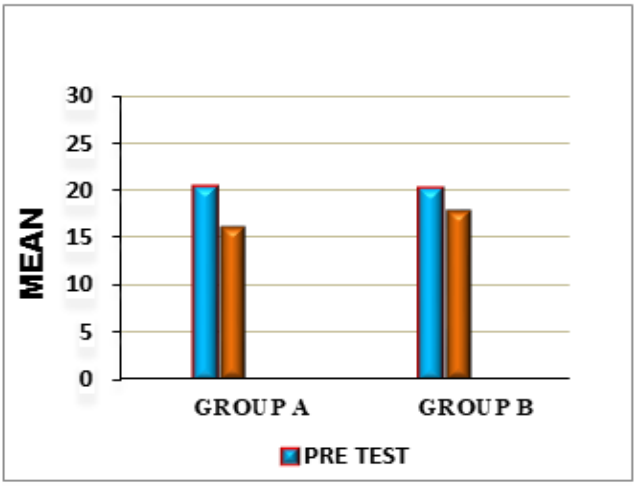
*The above table reveals the Mean, Standard Deviation (S.D), t-test, degree of freedom(df) and p-value between (Group A) & (Group B) in pre test and post test weeks. This table shows that there is no significant difference in pre test values between Group A& Group B (*P > 0.05). This table shows that statistically highly significant difference in post test values between Group A& Group B (***- P ≤ 0.001)*
(- P > 0.05), (***- P ≤ 0.001)*



GRAPH – II Comparison of Wexner Construction Scoring System between Group – A and Group - B in Pre And Post Test

Table-3 Comparison Of Wexner Construction Scoring System Within Group– A & Group – B Between Pre & Post Test Values				
#WCS	Pre Test	Post Test	T - Test	Significance
	Mean Sd	Mean sd		
GROUP- A	20.33+2.05	16.06+1.53	16.00	.000***
GROUP- B	20.26+2.05	17.73+2.01	8.71	.000***

*The Table 3 reveals the Mean, Standard Deviation (S.D), t-value and p-value between pre-test and post-test within Group – A & Group – B. There is a statistically highly significant difference between the pre test and post test values within Group A and Group B (***- P ≤ 0.001). (***- P ≤ 0.001) There is a statistically significant difference between pre and post value within group A and group B.*



GRAPH – Iii Comparison OfWexner Construction Scoring System Within Group– A & Group – B Between Pre & Post Test Values

5. DISCUSSIONS

The present study was conducted to analyze the effects of pelvic floor muscle exercise and abdominal muscles training in functional constipation among children. This study found that exercise strengthens the abdominal muscles and improves coordination between breathing Constipation rarely leads to life threatening complication, but can cause emotional and physical distress and concern for children and their families, ultimately impairing health related quality of life (HRQOL). The impact of constipation on both HRQOL of children and their caregivers is relevant to primary care providers, gastroenterologists and health care policy makers. This study showed that pelvic floor muscle exercises have a great improvement with children with functional constipation.A study was conducted in Iran with 90 children and proved that pelvic floor muscle exercise was effective.[33] A recent study was conducted to evaluate the effectiveness of Pelvic Physiotherapy in Children with Functional Constipation Compared with Standard Medical Care and concluded that this study found that children receiving PPT had significant improvements in symptom reduction, reduced PEG use, and improved quality of life compared with children receiving SMC only. These results suggest that PPT might be a valuable treatment option for FC in children, aged 5–16.[34] Moreover another study was conducted to evaluate pelvic floor muscle exercise for pediatric functional constipation and concluded that pelvic floor muscle exercise is an effective non-pharmacologic treatment for pediatric FC.[31]A single centered double-blind randomized clinical trial study conducted in iran concluded that pelvic floor muscle exercises along with interferential electrical stimulation was effective on functional constipation in children.[35]A two armed multi centere randomized controlled trial study was conducted and they concluded that standard medical care along with pelvic pelvic physiotherapy was effective on children with functional constipation.[36]Carefully planned and regularly controlled programs including diaphragmatic breathing exercises and pelvic floor retraining lead to the normalization of uroflowmetry parameters and curve type.A study was conducted in Canada was performed to validate pediatric Rome II criteria for functional gastrointestinal disorders.[37]Another study conducted in Iran revealed that Pelvic Floor Muscle Exercise for Paediatric Functional Constipation with 40 samples and concluded that Pelvic floor muscle exercise is an effective non-pharmacologic treatment for Pediatric FC.[38] In a Prospective clinical controlled study Diaphragmatic breathing exercises and pelvic floor retraining in children with dysfunctional voiding with 43 samples and concluded that Abdominal muscle and pelvic floor retraining is beneficial in the majority of children with DV for curing urinary incontinence, nocturnal enuresis, constipation and UTIs.[39]Another single-center,double-blind randomized study assessed the effectiveness of combined interferential(IF) electrical stimulation and pelvic floor muscle exercises on functional constipation in children significantly boosts the effects of treatment among the children.[40]As these study suggest that the present study revealed pelvic floor muscle exercise was effective for children with FC. In this cross-sectional, case-control study, 152 children aged 3–6 years with FC, 176 healthy children aged 3–6 years without FC. Social characteristics of children and caregivers, duration and symptoms of FC, and family economic status significantly affected HRQOL and family function of affected children and caregivers Early recognition of symptoms and adequate treatments are necessary for successful outcomes.[41] Learner-friendly exercises can be assigned to children aged 5 or older.At the end of this study, we found that the pelvic floor exercises showed more effective than abdominal muscle training exercises. The present study included ROME III criteria for constipation and wexner constipation scoring with pelvic floor exercises and abdominal muscle training. The pelvic floor exercises and isometric exercises show the significant difference with both groups hence wexner constipation scoring show significant difference in mean values. The mean value of wexner constipation scoring[42] between group A and group B pre test does not show any significant difference. After the end of the treatment session group A showed low mean value, effective than group B.

6. CONCLUSIONS

This study concludes that the pelvic floor muscle exercises are more significant in treating constipation. These exercises help the patient to tighten the pelvic floor muscles and promote daily physical activity of the patients. However, the other group performed abdominal muscle training which is less significant than the group B.In addition, dietary protocol and fluid intake would enhance the recovery processinFC.In future thse study can be conducted with larger sample size and include fiber diet.

7. AUTHORS CONTRIBUTION STATEMENT

Kamatchi.K and , Naveen kumar.S Conceived the idea/experimental design of the study. Kamatchi.K, Naveen kumar.S and Kaviraja.NPerformed experiments/data collection .Kamatchi.K, Naveen kumar.Sand Meena.SData analysis and interpretation Kamatchi.K, Tharani.G and Yuvarani.G Primary author (wrote most of the paper or drafted the paper) Kamatchi.K, Tharani.G and Yuvarani.Gand Meena.SProvided revision to scientific content of the manuscript . Meena.SandKaviraja.NProvided stylistic/grammatical revision to the manuscript. All the authors read and approved the final version of the manuscript.

8. ACKNOWLEDGEMENT

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9. CONFLICT OF INTEREST

Conflict of interest declared none.

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