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Original Research Article

Effect of aerobic exercise along with core muscle strengthening in young individuals with constipation: randomized controlled trial

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ABSTRACT

Background: Constipation is traditionally defined as infrequent bowel movements or hard faeces. Patients report a variety of symptoms, including decreased bowel motion frequency, straining, hard stools, the sensation of incomplete emptying, the sensation of anal blockage, or the use of digitation or positioning to aid defecation. Physical health, mental health, and social functioning are all compromised in affected individuals. Despite this, only one-fifth of constipated people seek medical attention. Constipation symptoms are reported by 10% to 20% of adults worldwide. This study investigated the effects of aerobic exercise along with core muscle strengthening on young individuals with constipation.

Methods: The study included 50 participants having constipation. The participants were randomly allocated in two groups. The intervention period was of 4 weeks. The exercises were explained to all individuals and pre and post treatment PAC SYM (patient assessment of constipation symptoms) and PAC-QOL (patient assessment of constipation quality of life) questionnaire scoring along with Rome IV criteria was taken.

Results: In group A, post-treatment values of PAC SYM and PAC QOL were significantly lower than pre-treatment values. The post-treatment comparison of two groups revealed a significant difference in PAC SYM and PAC QOL, with group B showing a significant reduction in PAC SYM and PAC QOL compared to group A.

Conclusions: The present study concluded that individuals who underwent both aerobic and core strengthening training showed more improvement than individuals who performed aerobic training alone.

Keywords: Aerobic training, Constipation, Core strengthening, PAC-QOL, PAC SYM, Rome IV criteria

INTRODUCTION

Constipation is a disorder in the gastrointestinal tract, which can result in infrequent stools, difficult stool passage with pain and stiffness. Constipation is a symptom-based disorder, and its definition is mainly subjective.[1,2] Constipation is used to describe symptoms that relate to difficulties in defecation. These include infrequent bowel movements, hard or lumpy stools, excessive straining and sensation of incomplete evacuation or blockage and, in some instances, the use of manual manoeuvers to facilitate evacuation. Symptoms may be acute, where they typically last less than a week and are commonly precipitated by a change in diet and/or lifestyle (e.g. reduced fibre intake, decreased physical activity, stress, toileting in unfamiliar surroundings). In contrast, chronic constipation is generally defined by symptoms that persist for at least 3 months. Chronic constipation can affect from 2% to 27% of the population. Constipation is physically and mentally troublesome for many patients, and can significantly interfere with their daily living and well-being. CC is a remarkably common can negatively impact the quality of life (QoL).[2]

Freedom of the bowels is the most precious, perhaps even the most essential, of all freedoms-one without which little can be accomplished- Émile Gautier, 1909.[4]

Age distribution

The relationship between age and constipation prevalence has been evaluated in a number of studies. Overall, data seem to indicate that constipation seems to become gradually more from young age (18-23 year) to middle age (45-50 years) in women.[2]

Gender prevalence

The majority of the reviewed studies reported a predominance of females in the prevalence of constipation. The F/M ratios ranged from 1.1 to 10, with a mean and median value of 2.1 and 1.5 respectively. Nine studies showed no significant relationship between gender and constipation, and one study showed an association between male gender and constipation with an F/M ratio of 0.9.[2]

Geographic distribution

Epidemiology studies included in this review originated from Asia (n=17). The range of the prevalence rate in Asia 1.4%-32.9% (median 10.8%).[2]

Race differences

The influence of race on constipation prevalence is unclear.[2]

Several factors act in concert to maintain fecal continence. If defecation is inconvenient, the desire to defecate prompts voluntary contraction of the EAS. The desire to defecate dissipates as the rectum relaxes, allowing more stool to be accommodated. Sensory-perception and physiological coordination are integral components of anorectal function. During defecation, the anal sphincters and the puborectalis relax and the abdominal and rectal contraction generate a push force to empty the rectum of stool. In patients with dyssynergia, the push effort or anal relaxation may be impaired, or the anal sphincters and puborectalis may not relax during attempted defecation, leading to incoordination and stool retention.[4]

The causes of constipation are varied and may be multifactorial. The common approach groups constipation into primary and secondary causes. Primary forms of constipation arise from intrinsic defects in colonic function or malfunction of the defecation process. These causes are typically considered after secondary causes of constipation are ruled out. Secondary causes include endocrine/metabolic, neurologic, colon disorders, medications, obstruction.[1,4]

Two mechanisms explain the pathophysiology of constipation. Colonic motility dysfunction, or dysmotility, is failure of coordinated motor activity to move stool through the colon. Dysmotility results in colonic delay. The second mechanism involves pelvic floor dysfunction, or disorders of the anorectum and pelvic floor, which result in outlet dysfunction and an inability to adequately evacuate rectal contents. Functional constipation may occur as a result of disordered movement through the sigmoid colon and/or anorectum. Both mechanisms coexist in some patients, making it difficult to determine the exact underlying mechanisms for constipation.[5]

Studies show that biofeedback sessions are more effective than laxatives for treating constipation and that the effect of 5 biofeedback sessions can last up to 2 years.[6]

Other physiotherapy trainings useful for constipation are pelvic floor muscle training (Kegel's training), breathing exercises, relaxation, body awareness and postural exercises, passive exercise of the lower limbs.[7-9]

Studies also show that interventions like functional electrical stimulation, interferential therapy, transcutaneous electrical nerve stimulation, manual therapy techniques (abdominal massage), core stability and balance training improve bowel bladder dysfunction in neurologically normal as well as otherwise healthy individuals.[10]

Aerobic exercise is defined as a form of exercise with relatively low intensity of 60 to 90% of the maximum heart rate and, with a duration ranging between 15 and 60 continuous minutes. It is said to stimulate the release of endorphins that relieve pain by inhibiting the pain pathways. The patient feels more active and self-confident. The blood flow also increases after performing aerobic exercises.

According to the American College of Sports Medicine (ACSM), moderate intensity aerobic exercise is reached once a person's heart rate reaches 40-59% heart rate reserve or 64-76% of their age predicted maximal heart rate (220 − age). Exercise should be at an intensity that elicits an evident increase in heart rate and breathing. The individual should have the ability to comfortably maintain this intensity of exercise for an extended period of time (i.e., 45 minutes).[15]

It is very important to note that exercise dose, be it mild to moderate has shown positive effects on health of gastrointestinal system. In addition, compared to physically inactive individuals, physically active individuals have demonstrated a lower prevalence of constipation.[11]

As a measure of gastric motility, CTT has been shown to be correlated with physical activity level, with more

sedentary individuals showing longer CTT than their physically active counterparts. Moreover, partaking in the active practices of walking, running, cycling and other aerobic activities has been shown to significantly shorten CTT in healthy individuals.[16]

Exercises like abdominal massage, abdominal muscle contractions, pelvic tilting exercises, squatting exercises and lower abdominal muscle exercises are effective for strengthening abdominal muscles. By massaging the abdomen for approximately 15-20 minutes and by contracting and relaxing the abdominal muscles for about 8-10 repetitions can strengthen the muscles of abdomen and help decrease the colon transit time, increase the frequency of bowel movements in constipated patients, and helps in relieving pain and discomfort that accompany it.[12] One approach that may be helpful for improving GI tract motility and treat constipation are core strengthening exercises. Thoracolumbar fascia, spine, abdomen, hip and pelvis are surrounded by core muscles. The colorectal movement may increase due to increased intra-abdominal pressure on performing core muscle strengthening exercises that cause GI tract stimulation.[13]

Objective of the study

To determine the effect of aerobic training on gut motility, bowel movement and quality of life of individuals with constipation. To compare effect of aerobic training and effect of core strengthening along with aerobic training on colon transit time, bowel movement and quality of life of individuals with constipation.

METHODS

This randomized controlled trial was conducted among the students of Pravara Institute of Medical Sciences (Deemed to be University), Loni for a period of one year (April 2022 - February 2023).

Study setting

Study setting was Hostel Gymnasium, PIMS, Loni where 50 students (25- group A, 25- group B) of 18-25 years were collected through convenient sampling method.

Inclusion criteria

Both males and females willing to participate, individuals with history of constipation or diagnosed constipation according to Rome IV criteria, participants able to understand commands.

Exclusion criteria

Individuals with history of abdominal surgery, individuals with ongoing laxative therapy, individuals with excessive intake of dairy products in diet.

The present study consisted of 50 participants according to the inclusion and exclusion criteria. The inclusion criteria was both males and females willing to participate, individuals with history of constipation or diagnosed constipation according to Rome IV criteria and participants able to understand commands while the exclusion criteria was individuals with history of abdominal surgery, individuals with ongoing laxative therapy and individuals with excessive intake of dairy products in diet.

Outcome measures used for this study was patient assessment of constipation symptoms questionnaire (PAC SYM) along with Rome IV criteria was used to assess constipation and constipation quality of life questionnaire (PAC QOL) was used to assess the quality of life (QOL)

Informed written consent was obtained according to inclusion and exclusion criteria from the participants regarding the procedure prior to the study. All the participants underwent patient assessment of constipation symptoms along with Rome IV criteria for constipation and constipation quality of life questionnaire for quality of life due to constipation. They were divided into two groups, group A and group B. A physician was referred for proper consultation before stopping any type of medical treatment and to avoid side effects. Group A was controlled group and group B was experimental group.

Group A: controlled group

Aerobic training to be given for 60 minutes, 3 times per week for weeks: warm-up exercises: 10 minutes including butt kickers-10 each leg, lunges-10 each leg, jumping jacks-15, stretching- it can improve flexibility and increase range of motion of a joint. Moderate intensity exercise: 40 minutes including treadmill-10 minutes; aerobic strength unit: squats-20, lunges-20, push-ups-10, stationary bicycle-15 minutes. Cool down exercises- 10 minutes including Spot marching-30, upper body stretch, standing quadriceps stretch, standing forward bend, seated forward bend.

Group B: experimental group

Aerobic training along with core strengthening was given for 60 minutes, 3 times per week for weeks: Warm up exercises-10 minutes including butt kickers- 10 each leg, lunges- 10 each leg, jumping jacks- 15, stretching- it can improve flexibility and increase range of motion of a joint. Low intensity exercises- 20 minutes including low impact jumping jacks- 30 (15 each side), squat to jab- 30 (15 each side), standing oblique crunch- 30 (15 each side), treadmill-5 minutes. Core strengthening exercises-20 minutes including crunches- 25, Russian twists-15 each side, butterfly sit-ups-25, marching with twist-15 each side, pelvic bridges-30, plank-1 minute. Cool down period-10 minutes including spot marching- 30, upper body stretch, standing quadriceps stretch, standing forward bend, seated forward bend.

Ethical Clearance was obtained on 6th April, 2022.

Statistical Analysis

Software used for calculation of data was Openepi.

RESULTS

The present study conducted on "the effects of aerobic training along with core muscle strengthening in young individuals with constipation" in Pravara Institute of Medical Sciences (DU), Loni consisting of 50 participants demonstrated that subjects treated with aerobic training along with core strengthening in young people with constipation experienced significant improvement in their condition rather than undergoing Aerobic training alone.

Table 1: Demographic details.

Parameters	Mean±SD
Age	21.93±1.40

Table 2: Comparison of pre- and post- PAC QOL Scores within group A and group B.

	Pre-treatment (Mean±SD)	Post-treatment (Mean±SD)	t-value	P value	Significance
Group A	28±3.8727	27±3.0506	3.797	0.0009	Extremely significant
Group B	38.44±6.6900	28.08±2.1779	9.318	<0.0001	Extremely significant

Table 3: Comparison of pre- and post- PAC SYM scores within group A and group B.

Group	Pre-treatment (Mean±SD)	Post-treatment (Mean±SD)	t-value	P value	Significance
Group A	11.96±6.2481	11.12±5.8759	3.674	0.0012	Not significant
Group B	21.32±5.265	17±4.821	6.423	<0.0001	Extremely significant

Table 4: Comparison of mean of pre and post AC QOL and PAC SYM scores between group A and group B.

Outcome measure	Group A (mean difference)	Group B (mean difference)	t-value	P value	Significance
PAC QOL	0.84	10.36	1.227	0.2257	Not significant
PAC SYM	0.84	4.32	3.868	0.0003	Extremely significant

Table 2 shows comparison between pre- and post- PAC QOL scores within group A and group B. Shows decrease in PAC QOL scores in group A and group B which was statistically significant p<0.0001.

Table 3 shows comparison between pre- and post- PAC SYM scores within group A and group B. Shows decrease in PAC SYM scores in Group A and Group B which is statistically significant p <0.0001.

DISCUSSION

The present study conducted on "the effects of aerobic training along with core muscle strengthening in young individuals with constipation" in Pravara Institute of Medical Sciences (DU), Loni. Total number of participants assessed were 58 from which 8 were excluded and 50 participants were included according to the eligibility criteria and randomization was done from which 25 participants were divided in aerobic training and 25 in aerobic training along with core strengthening.

Exercise program which included aerobic training was administered for 4 weeks 3 days a week and analysis was done. The result of the present study showed no significant difference on constipation in group A post intervention.

Paired t-test was done to analyse the effect of aerobic training on constipation and showed that there was extremely significant improvement on constipation in Group B (PAC QOL post- 28.08±2.1779, t value- 9.318, p value <0.0001 and PAC SYM post- 17±4.821, t value 6.423, p value <0.0001) compared to group A (PAC QOL post 27±3.0506, t value 3.797, p value 0.0009 and PAC SYM post 11.12±5.8759, t value 3.674, p value 0.0012).

Physical activity and exercise helps regulate the GI tract by influencing the autonomic nervous system, which controls digestion, respiration, and heart rate. Aerobic exercise training can increase parasympathetic nervous system activity while decreasing sympathetic activity at rest. Parasympathetic neural innervation to smooth muscle cells in the colon, in particular, plays an important role in regulating propulsive colonic motility, particularly prior to defecation.

Primary and secondary causes of constipation are frequently distinguished. Primary constipation is caused by problems with the defecation process or innate flaws in colonic function. These causes are typically taken into account after secondary causes of constipation have been eliminated. Medications, obstruction, neurologic, colon, and endocrine/metabolic disorders are a few examples of secondary causes. There are two mechanisms that contribute to the pathophysiology of constipation. Dysmotility, another name for colonic motility dysfunction, is characterised by the colon's inability to move stool through the colon through coordinated motor activity. Dysmotility is the cause of colonic delay. Anorectal and pelvic floor disorders, which cause outlet dysfunction and an inability to sufficiently evacuate rectal contents, are the second mechanism.

An obstruction in the sigmoid colon's and/or anorectum's motion can cause functional constipation. Finding the precise underlying mechanisms for constipation can be challenging because both mechanisms coexist in some patients. While structural or biochemical abnormalities like metabolic and endocrine disorders, neural tissue disorders, muscle weakness, and intestinal atresia are the most common causes of constipation, there is also functional constipation, which has no known cause.

Previously study on Effects of core strengthening exercise on colon transit time in young adult women was conducted by Song et al. The study concluded that the 12-week core strengthening exercise (CSE) program increased abdominal strength but did not improve colon transit time (CTT) compared to the control group. This study also provides preliminary data that CSE may reduce left CTT and total CTT, but additional clinical trials are needed.[13]

Similarly, Kim conducted a research on aerobic exercise improves gastrointestinal motility in psychiatric inpatients which concluded that a 12-week aerobic exercise program can benefit psychiatric inpatients by increasing intestinal motility, possibly decreasing risk of metabolic- and cardiovascular-related disease.[16]

Morisawa et al conducted a study on the effect of a physiotherapy intervention on intestinal motility in the year 2015. The subjects were 16 healthy adult males. The subjects were randomly assigned to 3 different physiotherapies, and BSs and sympathetic nerve activity were measured before and after the physiotherapies. While BSs significantly increased following all physiotherapies, the temporal changes in BSs were different among the physiotherapies. Autonomic activity (AA) measurement showed that passive exercise of the lower limbs and trunk (PELT) and TT significantly decreased the heart rate. The study found that all of the tested physiotherapies increased BSs.[9]

Harrington et al conducted a study on managing a patient's constipation with physical therapy in the year 2016. An 85-year-old woman with constipation was referred for physical therapy following unsuccessful treatment with stool softeners. The patient was instructed in bowel management as well as a daily, 10-minute home abdominal massage program. Upon re-examination, physical therapy incorporating abdominal massage appeared to be helpful in resolving this patient's constipation.[14]

As a result, the above findings demonstrated that subjects treated with aerobic training along with core strengthening in young people with constipation experienced significant improvement in their condition rather than undergoing aerobic training alone.

Limitations were small sample size, current study only focused on collegiate level individuals suffering from constipation and gender inequality.

CONCLUSION

The study concluded that there was significant improvement in young individuals with constipation undergoing aerobic training along with core muscle strengthening. This evidence substantiates that these exercises do help in treating constipation and that only aerobic training is less effective. This evidence demonstrates that these exercises are effective in treating constipation, with only aerobic training being less effective.

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REFERENCES

1. Forootan M, Bagheri N, Darvishi M. Chronic constipation: a review of literature. Medicine. 2018;97(20):e10631.
2. Mugie SM, Benninga MA, Di Lorenzo C. Epidemiology of constipation in children and adults: a systematic review. Best Pract Res Clin Gastroenterol. 2011;25(1):3-18.
3. Bongers ME, Benninga MA, Maurice-Stam H, Grootenhuis MA. Health-related quality of life in young adults with symptoms of constipation continuing from childhood into adulthood. Health Qual Life Outcomes. 2009;7:20.
4. Andrews CN, Storr M. The pathophysiology of chronic constipation. Can J Gastroenterol. 2011;25(Suppl B):16B-21B.

5. McCrea GL, Miaskowski C, Stotts NA, Macera L, Varma MG. Pathophysiology of constipation in the older adult. World J Gastroenterol. 2008;14(17):2631-8.
6. Chiarioni G, Whitehead WE, Pezza V, Morelli A, Bassotti G. Biofeedback is superior to laxatives for normal transit constipation due to pelvic floor dyssynergia. Gastroenterology. 2006;130(3):657-64.
7. Van Engelenburg-van Lonkhuyzen ML, Bols EM, Benninga MA, Verwijs WA, Bluijssen NM, de Bie RA. The effect of pelvic physiotherapy on reduction of functional constipation in children: design of a multicentre randomised controlled trial. BMC Pediatr. 2013;13:112.
8. Krogh K, Chiarioni G, Whitehead W. Management of chronic constipation in adults. United Eur Gastroenterol J. 2017;5(4):465-72.
9. Morisawa T, Takahashi T, Nishi S. The effect of a physiotherapy intervention on intestinal motility. J Phys Ther Sci. 2015;27(1):165-8.
10. Kollen BJ, Dekker JH, Berger MY, van Summeren JJGT, Holtman GA, Leeuwen YL, et al. Vermeulen. Management of childhood functional constipation in primary care. BMC Pediatr. 2018;18:249.
11. Tantawy SA, Kamel DM, Abdelbasset WK, Elgohary HM. Effects of a proposed physical activity and diet control to manage constipation in middle-aged obese women. Diabetes Metab Syndr Obes. 2017;10:513-9.
12. El-Aziz A, Noshy H, Brahim NA, Shebl AM, Abd Elhameed SH. Effect of Abdominal Muscles Strengthening Exercises on the Severity of Chronic Constipation in Older Adults. Alexandr Scient Nurs J. 2015;17(1):91-112.
13. Song BK, Han D, Brellenthin AG, Kim YS. Effects of core strengthening exercise on colon transit time in young adult women. J Exerc Sci Fit. 2021;19(3):158-65.
14. Harrington KL, Haskvitz EM. Managing a patient's constipation with physical therapy. Phys Ther. 2006;86(11):1511-9.
15. Kyral AM, Shipherd AM, Hearon CM. The effect of moderate intensity aerobic exercise on affect and exercise intention in active and inactive college students. Int J Exercise Sci. 2019;12(5):1070.
16. Kim YS, Song BK, Oh JS, Woo SS. Aerobic exercise improves gastrointestinal motility in psychiatric inpatients. World J Gastroenterol. 2014;20(30):10577-84.

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