Pender's Model Guided Lifestyle Modification on Reducing of Irritable Bowel Syndrome Episodes among Adult Females

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Abstract

Background: Irritable bowel syndrome is a functional gastrointestinal disease that can cause distress and affect individuals' abilities, productivity and even quality of life. Lifestyle modification is a significant strategy to promote health behaviors, manage symptoms and lessen disease episodes. **Aim**: to examine the effect of Pender's model guided lifestyle modification on reducing of irritable bowel syndrome episodes among adult females. **Design**: A quasi-experimental design (pre/ posttest) was operated for current study. **Setting**: The current study was done at internal medicine outpatient clinic at Shebin El Kom Teaching Hospital in Menoufia governorate, Egypt. **Sample**: A purposive sample of 100 adult females diagnosed with irritable bowel syndrome was enrolled in this study. **Instruments:** Two instruments were used I: Structured interviewing questionnaire involved three parts of Pender's model as individual characteristics and experience, behavior specific cognitions and affect, and health promoting behaviors. II-Severity Symptom Scale. **Results:** After three months of application of lifestyle modification intervention, 77.0% of studied female had good knowledge compared to 10% pre intervention and knowledge total mean score was increased to 23.7 compared to 12.6 pre intervention. Total symptoms severity mean score among the studied females was decreased from 283.41±85.74 to 175.78±89.42 post intervention. Also, after intervention, a highly statistical significant improvement was noticed among studied females in relation to total mean score of health promoting behaviors than before intervention as P<0.001. In addition, a statistical significant correlation was observed between symptom severity and Pender's model components as P<0.001 **Conclusions:** Application of lifestyle modification intervention based on Pender's model had a substantial effect on increasing knowledge, improving symptoms, and succeeded in reducing episodes of irritable bowel syndrome among adult females. **Recommendation:** Frequent educational program should be implemented regularly at outpatient clinic to raise patients' awareness regarding irritable bowel syndrome episodes and its management.

Keywords: Irritable Bowel Syndrome Episodes, Lifestyle Modification, Pender's Model

Introduction

Irritable Bowel Syndrome (IBS) is one of the most prevalent gastrointestinal diseases that characterized by recurrent abdominal pain and changes in stool frequency and form. It significantly impacts the quality of life of those affected, particularly among females and young adults. IBS also poses a substantial burden on individuals' daily lives, their work productivity, and the broader economy (**Jadallah et al., 2022**).

Irritable bowel syndrome prevalence differs greatly with 1- 45% according to different diagnostic criteria. Worldwide prevalence of IBS was 11.2%, while 10–20 % of people in western countries have IBS, 4.5% of IBS prevalence was in Canada, and 4.7% was in United States. The prevalence was higher among females than males with a ratio of 1.3:3, and the syndrome often occurred in early adulthood (**Yang et al., 2022; Oka et al., 2020**). The prevalence of IBS in Saudi Arabia was 21.4% according to the study done in Qassim Region (**Almuzaini et al., 2024**). In Egypt, there was 31.7% recurrence rate of IBS with a higher frequency among women and individuals with a family history of the condition (**Elhosseiny, Mahmoud, and Manzour., 2019**).

Multiple factors can affect pathogenesis of IBS as gene effect, food intolerance, intestinal immunity activation, rising in bowel permeability and hypersensitivity, changes of the bowel's neuroendocrine system, and alteration in

gastrointestinal bacteria (**Jadallah et al., 2022**). A positive diagnosis of IBS can be made based on changes in stool characteristics and defecation frequency. Irritable bowel syndrome can be classified into three sub categories as dominant constipation (IBS-C), dominant diarrhea (IBS-D), and mix type (IBS-M) which is a fluctuation between both diarrhea and constipation (**Moayyedi et al., 2017**).

Symptoms of IBS are depended on Manning and Rome criteria. Rome criteria are categorized into four versions as Rome I, II, III and IV. Rome criteria I reveal IBS general symptoms as bloating, abdominal discomfort, diarrhea, constipation, and incomplete evacuation more than twenty five percent of the time. While Rome criteria II indicate the patient complains from inconsecutive abdominal pain in the previous twelve months (**Bhinder et al., 2023**). Rome criteria III mean repeated abdominal pain nearby 3 days/ months in previous 3 months. While fourth criteria (Rome criteria IV) refer to periodic abdominal pain about one day/week in previous 3 months. Each category of the Rome Criteria should accompany with two or more of the general symptoms (**Black et al., 2021**).

Irritable bowel syndrome cause disturbance of patients' quality of life (QoL), reduce work productivity, increase work absenteeism, and mood disorders. Also, various IBS symptoms can occur as stomach cramp and bloating, pain, a change of bowel movements pattern as the desire to enter the toilet, presence of mucus in stool, extreme gas accumulation, and incompletely bowel empty after defecation. If IBS is ignored without treatment, it can lead to colon cancer, frequent diarrhea, rectal bleeding, trouble in swallowing, weight reduction, excessive vomiting, and prolonged fatigue syndrome (**Tayama et al., 2024**).

Treatment of IBS can be achieved by using both pharmacological and non-pharmacological management. Lifestyle modification is a significant non-pharmacological treatment of IBS episodes which include many aspects as dietary modification, physical activity, sleep and rest, stress management and also adherence to IBS medication. Dietary modification comprise probiotics, food rich with solvable fiber, eat small meals at regular interval daily, hydration from 3-4 liters, and avoid caffeine and tobacco. Physical activity involves regular physical exercise about half an hour three times/week, Sleep and rest involved 7-8 hours of sleep daily. While, stress management includes meditation, engage in hobbies and speak with others (**Cyrek et al., 2024**). Lifestyle modifications have bio vital role in lessening IBS symptoms, the causing factors, and anxiety. Additionally, it enhances QoL, improve attentiveness, promote high self-esteem, reduce tiredness, and improved endurance (**Cong et al., 2018**).

Pender's model or Pender's Health Promotion Model (PHMP) is one of most important models to be used in order to modify life style, reduce harmful behaviors and restore health (**Bahabadi, 2020; Gorbani, 2020**). The PHPM was developed by Nola Pender which reveals that participation in activities that endorse wellness is affected by perceptual variables as significant benefits, obstacles, perceived self-efficacy, and interpersonal effects. This model is an approach that the nurses can apply its constructs to facilitate behavior management and avoid harmful habits (**Khodaveisi et al., 2020; Tavakoly et al., 2021**). Also, the nurse helps patients with IBS to take care of their own health and perform health promoting behaviors by increasing their awareness regarding IBS symptoms and how to manage its episodes. So, this model suggested that nurses should give intensive education to IBS patients about promotive activities, and healthy lifestyle habits to prevent IBS complication (**Zanjani et al., 2021**).

Nurses play a main role in providing high quality of care to patients with IBS. Nurses help them to alleviate suffering and lessen IBS symptoms through providing supporting and teaching regarding adherence to treatment regimen. Nurses are in a unique position to give care, relief and counseling to the patients. The nurses encourage them to perform lifestyle modification in order to reduce IBS episodes, decrease symptoms burden and enhance their quality of life. Also, the nurses can enhance their knowledge and skills regarding self-efficacy, lifestyle changes, and cognitive behavioral strategies**.** Successful management of IBS episodes can improve patients' physical/social wellbeing, and decrease emotional distress **(Couts, 2019)**.

Significance of the study

Irritable bowel syndrome is a chronic syndrome of gastrointestinal system which occurs in adult people especially female. IBS symptoms may happen over an extended period of time, or even years. Symptoms severity and also duration may differ from one individual to another. Many people suffer IBS symptoms without determining their diagnosis. Irritable bowel syndrome affects about 10- 15% of world population that increase economic and social burden (**Elhosseiny, Mahmoud, and Manzour, 2019**).

Though both sexes may complain from IBS while, 60% -75% of sufferers are women. Because women are usually exposed to many stressful situation in their life as hormonal changes during menstruation, pregnancy and menopause, raising up children, nervous pressure in doing their responsibilities, and feeling embarrassment to seek medical condition (**Barazanji et al., 2022**).

Irritable Bowel Syndrome episodes include many symptoms as severe abdominal pain, flatulence, diet restrictions, and elimination difficulties as constipation, diarrhea or both. These episodes affect individual's quality of life. For instance, > 50% of people complain from IBS are need to remain beside the toilet continuously, nearly 69% of them are suffering symptoms, about 57% of individuals have inability to manage their lives, and disturbed psychologically as feeling anxiety, depression, upset, low self-esteem, low self-confident and embarrassment owing to unexpected bowel habits (**Qura et al.,2018) .**

Therefore, lifestyle modifications based on pander's model are significant intervention for managing IBS episodes among females to decrease severity of symptoms and enhance their quality of life. The nurse uses PHPM because it emphasizes on relationship between person's characteristics, knowledge, behavior specific cognitions, and health promoting behaviors **(Cyrek et al., 2024; Gorbani, 2020).** Also, this model assumes that the people have the main role to keep healthy behaviors and modify their life to support these behaviors. So, the nurse encourages the females with IBS to follow heath instructions regarding diet, exercise and stress management. In addition, encourage them make life style changes to manage IBS episodes, and achieve better outcomes **(Ruggiero et al .,2023**).Thus the purpose of this study was to determine the effect of Pender's model guided lifestyle modification on reducing of irritable bowel syndrome episodes among adult females.

Aim of the study

The current study aimed to examine the effect of Pender's model guided lifestyle modification on reducing of irritable bowel syndrome episodes among adult females.

Research Hypothesis

H1: Adult females' knowledge score about irritable bowel syndrome will be increased post implementation of lifestyle modification based on Pender's model compared with pre-implementation score.

H2: Symptoms severity level mean score among adult females will be decreased post implementation of lifestyle modification based on Pender's model compared with pre-implementation score.

H3: Adults females' health promoting behaviors score will be improved post implementation of lifestyle modification based on Pender's model compared with pre- implementation score.

H4: There will be a significant correlation between symptoms severity score among studied females and components of pander's model.

Operational definition:

Lifestyle modification: Operationally indicates non- pharmacological management that is used to reduce symptom of irritable bowel syndrome and improve behavioral outcome. It includes dietary modification, reducing weight, performing physical exercise, and managing stress and IBS medication adherence.

Irritable bowel syndrome episodes: operationally refers to a group of symptoms that are occurred and happened together. It includes recurrent abdominal pain, abdominal flatulence, stomach cramps and bowel movements changes as diarrhea, constipation, or both. It is evaluated through the use of IBS-severity symptom scale.

Pender's model: Theoretically refers to Pender's health promotion model (PHPM) is one of most prevalent used models to modify unhealthy habits and endorse health behavior (**Khodaveisi et al., 2017**). In this study, it can be measured by individual knowledge about IBS, behavior-specific cognition and affects questionnaire and health promoting behavior questionnaire.

Subjects and methods:

Research design:

A quasi-experimental design (pre/ posttest) was operated for the current study.

Research settings:

The current study was conducted at internal medicine outpatient clinic at Shebin El Kom Teaching Hospital in Menoufia governorate, Egypt. Internal medicine outpatient clinic is situated in the 1st floor and encompassed of one room with one bed. The setting was selected as the patients with IBS attended so as to obtain care, evaluate their progress of disease and followed up.

Subjects:

A purposive sample of 100 adult females were enrolled in the current study according to inclusion and exclusion criteria:

Inclusion criteria:

- Adult female aged 18- 64 years.
- Females were diagnosed with IBS- Rome Criteria IV. This criteria include symptoms which had occurred one time/week in previous 3 months. The symptoms involved frequent abdominal pain nearby 3days/month or one time/ week in previous 3 months, which allied with more than or equal two of the following: enhancement with elimination, alteration in stool form, and change in stool regularity. Adults should have IBS symptoms nearby 6 months prior to IBS diagnosis.
- Females agreed to participate in the study.

Exclusion criteria:

- Females Aged <18 years or > 64 years
- Females who not diagnosed with IBS- Rome Criteria IV.
- Adult females who had Crohn's peptic ulcer, colon cancer, or ulcerative colitis.

Sample size and power of the study:

In order to compute sample size needed to examine effect of Pender's model guided lifestyle modification on reducing of irritable bowel syndrome episodes among adult females. The next equation is used to compute sample size:

Sample size n = [DEFF*Np(1-p)]/ [(d2/Z21-α/2*(N-1)+p*(1-p)]

Where: DEFF = Design effect=1, P = % frequency of females with IBS, d = Confidence limits as % of 100 (absolute +/-%) (d) = 5%, Z= 1.96, N = the Population size=280, and α error = 0.05.

Assumptions include: (1- α) indicates two sided confidence level of 95%, while the power (1- β) or (% chance of detecting) = 80%, Anticipated percent frequency = 8%. In the current study, results were presented using 95% confidence Interval, with 96, which was approximated to 100 as sample size.

Data collection instruments

Two instruments were used to collect required data of the present study:

Instrument I: A structured interviewing questionnaire

This instrument was established and developed by **Pender, 2011**and modified by the researchers for culture direction of the questions to gather the needed data from adult female with IBS. The modified Pender's HPM consisted of three main parts as follows:

Part (I): Individual characteristics and experiences: This part included four sub parts

I: Demographic data. It consisted of four questions such as age, female's marital status, educational level, and also occupation.

II: Females' clinical data. It included three questions such as family history of IBS, disease duration, and also IBS complain.

III: Females' knowledge questionnaire regarding IBS. This part adopted from Issa et al., 2022 to determine patients' knowledge about IBS. It was modified by the researchers. It comprised of 30 closed ended questions as definition of IBS, risk factors, symptoms, management, … etc.

Knowledge scoring system: The obtained knowledge from females was compared with a model answer and females` responses were counted as correct answer = one point and incorrect/ don't know answer = zero point. The total knowledge score = 0-30 points and classified into three levels as the following: good knowledge = ≥70 % (21-30 points), fair knowledge= 50-70 % (15-20 points), and poor knowledge= <50 % (0-14 points) **(Issa et al., 2022)**

Reliability of part I:

Knowledge reliability was confirmed by the researchers to identify the internal consistency. Test-retest method was applied through administration of the instrument to females with IBS. Then, after 2 weeks, the researchers re-administered the same instrument to them and evaluated the results. The instrument was reliable (r = 0.88).

Part (II): Behavior-specific cognition and affects developed by **Wilt & Revelle, 2016** and modified by the researchers. It included 32 questions which divided into 5 sub parts as the following:

I- Perceived benefits of action: This sup part is developed to determine females, perception of positive consequences regarding effectiveness of numerous actions available to lessen the threat of IBS. It included seven questions

II- Perceived barriers to action: This sup part is constructed to identify females, feelings of obstacles to do a suggested life style modification behaviors to manage IBS. It consisted of ten questions

III- Perceived self-efficacy: This sup part is developed to recognize female's level of confidence to successfully accomplish life style modification to manage IBS episodes. It involved four questions.

IV- Interpersonal influences: This sup part was developed to identify cognition-regarding behaviors, beliefs, and attitudes of the others related to life style modification to manage IBS episodes. It consisted of six questions.

V- Situational influences: This sup part is developed to determine females' perceptions and cognitions that enable or obstruct performing needed action to manage IBS. It included five questions.

Scoring system: Four sub parts of behavior-specific cognition and affects as perceived benefits, barriers, self-efficacy, and also interpersonal influences had three responses on Likert scale. Responses of each question were disagree equal 1, neutral agree equal 2, and completely agree equal 3. While fifth sub part (situational influences) had two responses; Yes response took 2 points and No response took one point. Total score was 1-91 and classified into "poor perception" indicated ≤ 70% (1-64), and "good perception" indicated >70% (65-91) of total score **(Wilt & Revelle, 2016**)

Reliability of part II

It was performed using Cronbach's co-efficiency Alpha to test internal consistency. The instrument was tested by **Hauser, Pletikosic, & Tkalcic, 2014** and confirmed to be strongly reliable (r = 0.94)

Part (III): Health promoting behaviors (Behavioral outcomes): This part was developed by **Pender, 2011**and modified by the researchers. It included 33 questions. It was classified into four health promoting behaviors: Nutritional adherence and reducing weight (10 items), adherence to physical activity (6 questions), stress management (9 questions), and medication adherence (8 questions).

Scoring system: The total score ranged from (1-99). Each question response of all sub parts of health promoting behaviors was identified on three-point Likert scale as never= one point, sometimes= 2 points, and always = 3 points. The total score was classified into 3 levels; Higher adherence = >80% (81-99 points), Moderate adherence ranged from 60 - 80% (61-80 points), and Mild adherence = < 60% (1- 60 points) (**Sriyuktasu et al., 2018**)

Reliability of part III

It was done using Cronbach's co-efficiency Alpha to determine internal consistency. The instrument was tested by **Sriyuktasu et al., (2018)** and proved to be reliable (r = 0.939)

Instrument II: The IBS-Severity Symptom Scale (IBS-SSS).

The instrument of IBS-SSS was adopted from **Piegel, et al., 2010.** This scale helped in recognizing IBS symptoms severity. It consisted of 5 questions that valued with Visual Analogue Scale as: intensity of IBS pain, frequency of IBS pain, the flatulence severity, patient's satisfaction with defecation, and also IBS effects on patient's QoL. The least score and the extreme score were 0 -500. Higher scores indicated sever symptoms. The scores were classified into three levels as the following: mild symptoms=75-175, moderate symptoms=176-300, and sever symptoms=301-500.

Reliability of instrument II

Reliability was determined by **Piegel, et al., 2010** using Cronbach's co-efficiency Alpha and proved to be strongly reliable (r = 0.81).

Validity of the instruments

After developing the instruments and prior to data collection, the study instruments were evaluated for its content validity by five experts from Family & Community health nursing, medical surgical nursing and maternal and newborn nursing to identify the accuracy and comprehensiveness of the instruments to be implemented. The required modifications and suggestions were incorporated into the instruments.

Ethical considerations and human rights:

The study was approved on March 17, 2024 from ethical committee for Scientific Research review at Faculty of Nursing affiliated to Menoufia University with registered number (N:982). Furthermore, a simple explanation of study purpose and its importance was given to the adult females who decided to participate in the study in order to obtain their written consent. Confidentiality was assured for all information. The females under study were given the assurance that their involvement and withdrawal in the study was entirely voluntary. Data was coded so as to approve its anonymity.

Pilot study

A pilot study was applied on 10% (ten adult females diagnosed with IBS) of total sample size to determine instruments' clarity, feasibility, and applicability and to recognize obligatory time to answer all questionnaires. Consistent with the pilot study results, no changes were done in study instruments. Pilot sample was omitted from main study sample.

Procedure

- An Official permission was gotten by the researchers to conduct the study from the provost of outpatient clinics at Teaching Hospital of Menoufia governorate, Egypt.
- The researchers gathered the required data from the first of April, 2024 to the end of October, 2024.
- The researchers made an investigative visit to the internal medicine outpatient clinic to identify frequency rate of adult females diagnosed with IBS and recognize the suitable time to gather data. Furthermore, a simple clarification about the agreements, study purpose and nature of present study were given to the physicians and nurses worked at outpatient clinic affiliated to Teaching hospital in order to obtain their cooperation.
- The researchers visited study setting in morning shift from 9:12 Am, 2 days per week (Saturday and Wednesday). The researchers determined the adult females with IBS who met inclusion criteria and asked them to join in current study. After that, the researchers gained their written approval in order to participate in the research.
- The researchers interviewed about eight to ten adult females/ week ranged from 4-5 females/day to collect study data. Interviews with studied female were scheduled depending on their follow-up time at internal medicine outpatient clinic.
- The researchers introduced themselves to the adult females with IBS and then, provided brief summary using participants, language about study purpose, and benefits gained from participation.
- After that, the researchers distributed a copy of study questionnaire (pretest) to be filled by adult females with IBS. Each female was interviewed individually using study questionnaire, Filling pretest (baseline data) took about 20-30 minutes.
- After the pretest was collected, the researchers started to clarify life style modification sessions

that grounded by Pender's health promotion model.

- Lifestyle modification intervention based on Pender's HPM educational booklet was developed by the researchers after determining evidence- based research and comprehensive literature. The designed booklet was validated by experts in specialty. The booklet was written in a simple Arabic language involved explanatory pictures regarding IBS disease. This booklet was used to increase knowledge of adult females with IBS about disease, its management and promote their health promoting behaviors regarding IBS ….etc.
- The implementation of life style modification intervention was provided on 3 sessions/2 days. The researchers divided the sample into small group (10 adult females) to promote understanding and interaction. The researchers used power point lecture, videos, group discussion, and educational booklet illustrating IBS disease and constructs of Pender's HPM.
- The researchers clarified life style modification intervention in the following sessions:

1st session: This session aimed to improve the studied females, knowledge about IBS, risk factors, its diagnosis,…etc. Group discussion was permitted to confirm understanding of adult females and feedback was obtained after finishing of each session.

2nd session: The researchers focused on enhancing studied females, behavior-specific cognition and affects constructs as perceived benefits of positive consequences, perceived barriers that imbed life style modification, perceived self-efficacy from following life style modification behaviors as performing exercises ,following diet and reducing weight….etc.

- In addition, the researchers explained the concept of interpersonal influences and situational influences. Also, teach the females the important skills based on Pender's model constructs about how to overcome these influences and manage IBS episodes. The researchers used various methods in this session such as demonstration, re-demonstration, and role play.

3rd session: The researchers explained the concept of health promoting behaviors in the light of managing IBS, reducing episodes and following healthy lifestyle. The researchers tough adult females the skills related health promoting behaviors as adherence to healthy diet, method of reducing weight, relaxation techniques, practicing physical exercise and adherence to IBS medication.

- Each session took about 35-40 minutes according to adult females, level of understanding. After each session, a complete summary of the provided knowledge, comments, feedback and the interpretations of missed items were given. Also, the participants were tested for their knowledge acquisition and practice.
- Prior the following session, group discussion and re-demonstration was made with the females about the previous session to recognize their understanding of the given instructions; any ambiguous items were clarified by the researchers.
- After finishing all the sessions, the researchers explained the importance of following lifestyle modification to reduce IBS episodes. Then, a copy of the designed educational booklet was given to the studied females to serve as a guide for them.
- In addition, females, phone numbers were taken. The researchers contacted with the studied females once/month for follow up and also at the time they wanted by using phone in order to determine females, adherence to the given instructions.
- **Posttest session**: After three months of implementing intervention, the researchers organized by phone a meeting with studied females at internal medicine outpatient clinic to determine their enhancement in knowledge, IBS related symptoms and management of IBS episodes. Additionally, the researchers assessed effect of pander's model guided lifestyle modification on reducing IBS episodes by filling posttest questionnaire using the same instruments of pretest. It took nearby 20-30 minutes.

Statistical data analysis:

Collected numerical data was determined and computerized by SPSS program version 22.

Numbers and percentages were expressed qualitative data while means ± SD were expressed quantitative data. Chi- square test (χ^2) and also Wilcoxon ranks test (Z) were done to compare between qualitative variables. While Paired T-test was applied to determine mean changes in data between pre and post intervention. Additionally, Pearson's correlation coefficient (r) was calculated to measure study variables correlation. Graphics were showed using Excel program. Significance level was constant at p value ≤ 0.05 for all significant tests.

Results

Table (1) denotes demographic and clinical data of studied females with IBS. Concerning demographic data, the table indicates that 51% of studied females were in the age group 30-40 years and the mean age was 38.46± 9.13 years, 76% of them were married, 53% had secondary education, and the highest percentages of IBS (61%) were among not employed females. Concerning clinical data, the table presents that 67% of females had family history of IBS, 70% had illness duration ≤ 5 years, and 55% of studied females had constipation as complain of IBS.

Figure (1) illustrates that, 71.0% of the studied females had poor knowledge regarding IBS pre implementation of lifestyle modification, which reduced to 9.0 % post intervention. Also, 10.0% of them had good knowledge regarding IBS pre implementation of lifestyle modification, which improved to 77.0% post intervention. In addition, a statistical significant differences were observed among the studied females in relation to pre/ post intervention of total levels of knowledge as (P<0.001).

Figure (2) shows that total mean knowledge score regarding IBS among studied females was 12.6 in pre intervention of life style modification which increased to be 23.7 post intervention. Also, a highly statistical significant improvement was noticed in relation to pre/ post intervention of total mean knowledge score among studied females as P<0.001.

Table (2) demonstrates that a statically significant improvement of IBS symptoms was occurred after intervention than before intervention (P<0.001). As proved, severe symptoms level was reduced from 32.0% to 18.0%, while moderate symptoms level was declined from 55.0 % to 22.0%. However, mild symptoms level was improved from 13.0% to 60.0%. Also, the table presents that a significant improvement was found among studied females in relation to total symptoms mean score as 283.41±85.74 pre intervention was reduced to 175.78±89.42 post intervention.

Table (3) represents that, a statically significant improvement of mean scores of all items of behavior- specific cognition and affects were noticed post intervention than pre intervention (P<0.001). As ascertained, mean score of perceived benefits was improved from 13.34±2.16 to 17.12±2.77, mean score of perceived barriers was declined from 21.13±3.11 to 15.90±4.04, and mean score of perceived self-efficacy was increased from 6.83±1.36 to 9.31±1.66. Also, mean score of interpersonal influences was improved from 13.06±2.35 to 15.21±1.97 and mean score of situational influences was increased from 6.75±1.25 to 8.27±1.13. In addition, this table shows that a statically significant improvement in the total mean score of behavior- specific cognition and affects was noticed post intervention than pre intervention as 61.11±5.04 increased to 65.81±5.41.

Table (4) displays that, a statically significant improvement of all items mean scores of health promoting behaviors regarding IBS were seen among studied females post intervention than pre intervention as P<0.001. As ascertained, mean score of nutritional adherence and weight reduction improved from 18.09±2.40 to 23.49±3.98, and mean score of physical activity was increased from 7.16±1.75to 10.36±1.92. Also, mean score of stress management was improved from 16.51±2.08 to 18.28±2.72 and mean score of medication adherence was increased from 16.11±1.55 to 19.89±3.55.

Figure (3) shows that total score of health promoting behaviors regarding IBS among studied females was 57.87 in pre intervention of life style modification which improved to be 72.02 post intervention. In addition, a highly statistical significant improvement was observed in relation to pre/ post intervention of

total score of health promoting behaviors among studied females as P<0.001.

Table (5) denotes correlation between symptoms severity score pre/post intervention among studied females and component of pander's model. It displays that a statistical significant correlation was noticed between symptoms severity score among studied females in relation to all components of Pender's model in pre and post intervention as p < .05.

Table (1): Distribution of demographic and clinical data among the studied females (n=100)

Demographic data	The study females (n=100)	
	No	%
Age (years):		
18-	12	12.0
30-	51	51.0
40-	26	26.0
50-	8	8.0
60-64	3	3.0
Mean ± SD	38.46± 9.13	
Marital status:		
Single	6	6.0
Married	76	76.0
Divorced	5	5.0
Widowed	13	13.0
Educational level:		
Illiterate	10	10.0
Basic education	15	15.0
Secondary education	53	53.0
Highly educated	22	22.0
Occupation:		
Employed	39	39.0
Not employed	61	61.0
Clinical data		
Family history		
Yes	67	67.0
No	33	33.0
Disease duration		
≤ 5 years	70	70.0
> 5 years	30	30.0
Complain		
Diarrhea	29	29.0
Constipation	55	55.0
Mixed	16	16.0

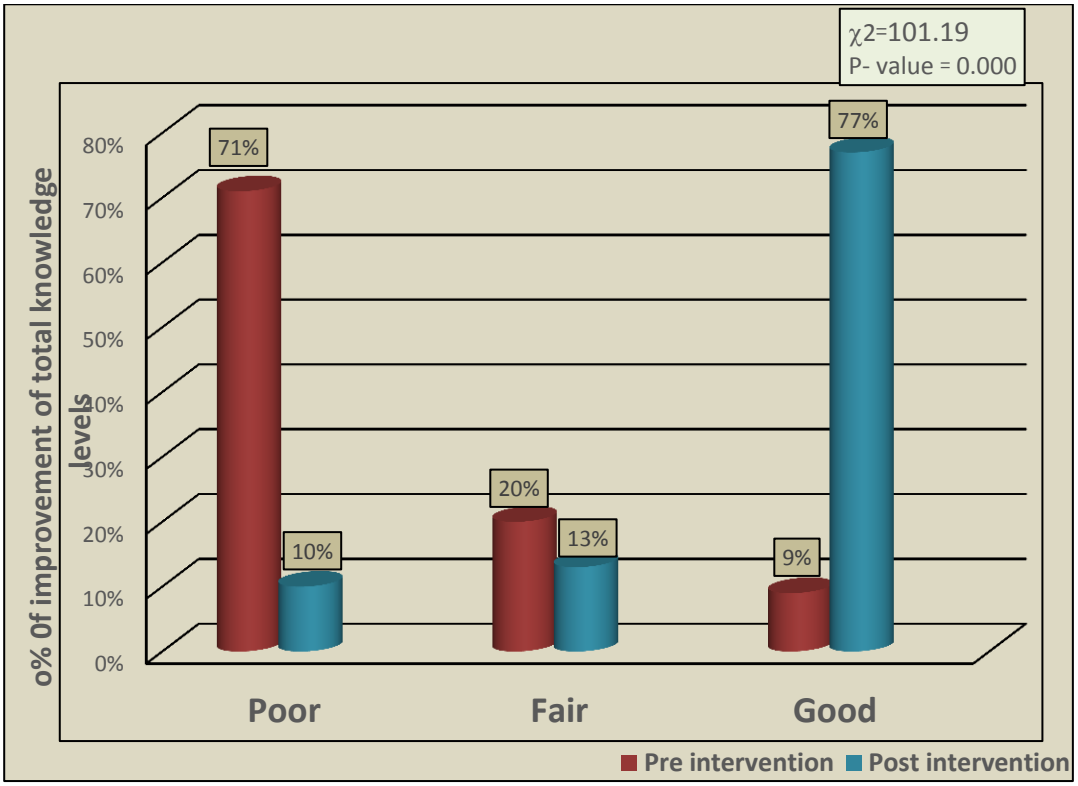

Figure (1): Effect of pre/ post lifestyle modification on knowledge levels regarding irritable bowel syndrome among studied females. (n=100).

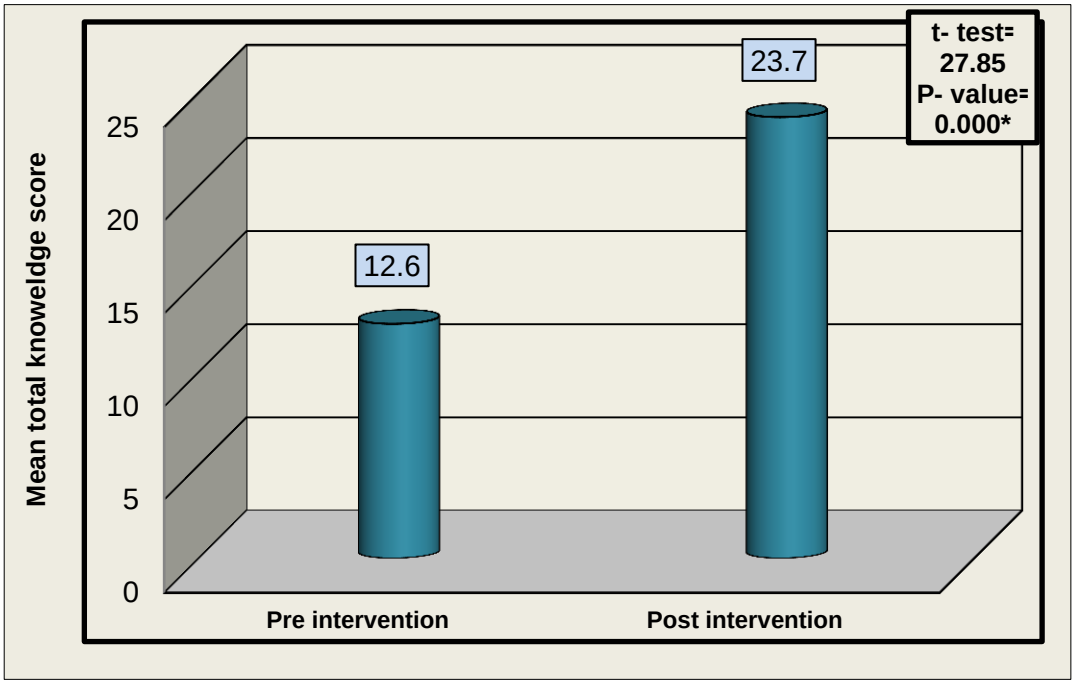

Figure (2): Effect of pre/ post lifestyle modification on mean total score of knowledge regarding irritable bowel syndrome among studied females. (n=100).

Table (2): Effect of pre/ post lifestyle modification on symptoms severity levels among studied females. (n=100).

Symptom severity levels	The study females (n=100)				χ^2 P
	Pretest		Post test		
	No	%	No	%	
Mild symptoms (75–175)	13	13.0	60	60.0	48.32 0.000**
Moderate symptoms (176–300)	55	55.0	22	22.0	
Severe symptoms (301–500)	32	32.0	18	18.0	
Mean ±SD	283.41±85.74		175.78±89.42		**Z:** 8.66 0.000**

X^2: chi square test *Z: Wilcoxon test* ** Highly significance*: P<0.001

Table (3): Effect of pre/ post lifestyle modification on behavior-specific cognition and affects mean scores among studied females (n=100).

Behavior-specific cognition and affects main items	The study females (n=100)		t-test	P
	Pretest	Post test		
	Mean ±SD	Mean ±SD		
Perceived benefits	13.34±2.16	17.12±2.77	11.313	0.000*
Perceived barriers	21.13±3.11	15.90±4.04	11.477	0.000*
Perceived self-efficacy	6.83±1.36	9.31±1.66	11.468	0.000*
Interpersonal influences	13.06±2.35	15.21±1.97	9.083	0.000*
Situational influences	6.75±1.25	8.27±1.13	8.928	0.000*
Total scores of Behavior- specific cognition and affects	**61.11±5.04**	**65.81±5.41**	**6.123**	**0.000***

Significance test: paired t-test ** High significance: P<0.001*

Table (4): Mean scores of health promoting behavior items (behavior outcome) among the studied females pre and post lifestyle modification (n=100).

Health promoting behavior (Behavior outcome) main items	The study females (n=100)		t-test	P
	pretest	posttest		
	Mean± SD	Mean± SD		
Nutritional adherence and weight reduction	18.09±2.40	23.49±3.98	13.325	0.000*
Adherence to physical activity	7.16±1.75	10.36±1.92	13.702	0.000*
Stress management	16.51±2.08	18.28±2.72	7.041	0.000
Medication adherence	16.11±1.55	19.89±3.55	10.745	0.000*

Significance test: paired t-test ** High significance: P<0.001*

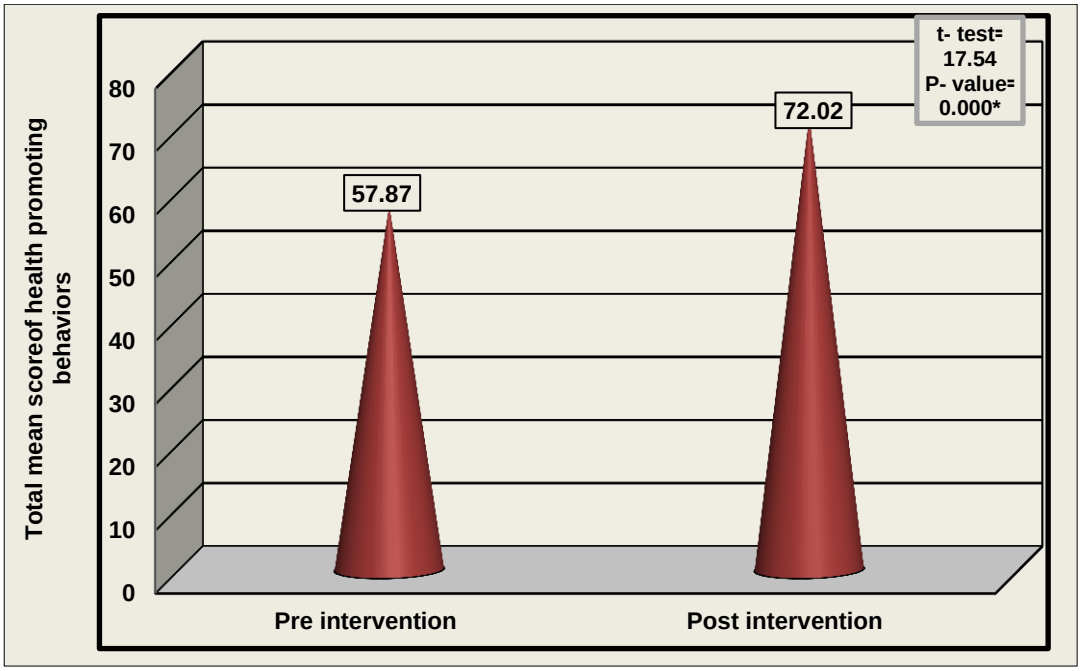

Figure (3): Effect of pre/ post lifestyle modification on total score of health promoting behaviors among studied females (n=100).

Table (5): Correlation between pre/posttest symptoms severity score among studied females and component of pander's model (n=100)

Components of Pender's model	IBS Symptoms severity score			
	Pre intervention (n=100)		Post intervention (n=100)	
	r	P	r	P
Knowledge	- 0.745	0.000*	- 0.526	0.000**
Behavior-specific cognition and affects				
Perceived benefits	-0.206	0.040*	0.202	0.044*
Perceived Barriers	0.253	0.011*	0.211	0.35*
Perceived self-efficacy	0.252	0.12*	0.226	0.23*
Interpersonal influences	0.203	0.43*	0.198	0.049*
Situational influences	0.351	0.000*	0.196	0.51*
Health promoting behavior (Behavior outcome)				
Nutritional adherence and weight reduction	0.355	0.000**	0.333	0.001**
Adherence to physical activity	- 0.352	0.000**	-0.338	0.001**
Stress management	0.282	0.004*	-0.214	0.032*
Medication adherence	0.230	0.021*	-0.211	0.035*

r mean Pearson Correlation **Significance : p < 0.05*

Discussion

Irritable bowel syndrome is a chronic gastrointestinal disease that distresses QoL among those who have disease than others and can lead to rectal bleeding and colon cancer if not treated. Also, it leads to social and economic burden and put a heavy burden on all health care system worldwide. Control of IBS can lessen disease complication, so the adherence to IBS drugs and life style modification show a vital role in reducing IBS episodes (**Chen et al., 2022; Cong et al., 2018**). Individuals who have IBS had less information and practices regarding management of disease. So, the nurses have main role in IBS management through providing education to individuals about disease and encouraging

practice of lifestyle modification. Education based on theoretical framework as Pender's HPM is very important to increase patients' knowledge regarding disease, improve their perception and promote practicing of healthy behaviors (**Ruggiero et al .,2023**; **Bahabadi, 2020**|).

According to hypothesis No (1): Adult females' knowledge scores about irritable bowel syndrome will be increased post implementation of lifestyle modification based on Pender's model compared with pre- implementation scores.

Concerning to the effect of lifestyle modification on knowledge levels regarding IBS among studied females. The result indicated that, three quarters of studied females had a good level of knowledge post intervention compared to one tenth of them pre intervention. Meanwhile, the majority of them who had fair and poor knowledge level at pre intervention were significantly declined to one quarter post intervention. Also, a statistically significant improvement in knowledge levels were noticed among studied females after intervention than before intervention (P<0.001) (figure 1). The result was congruent with **Hafez, Elbasiony, & Zahran., 2023.** They reported that, a significant difference in patient's knowledge levels regarding IBS was occurred in relation to pre & post intervention among study and control group and the study group had more improvement compared with control group. Similarly, the result was consistent with **Vo Duy, Nguyen, & Bui, 2020**. They stated that, after educational intervention, a decrease in misconceptions about IBS and an improvement of knowledge levels were observed compared with pre intervention. This agreement might be allocated to that well-designed lifestyle modification educational sessions have a quantifiable impact on improving knowledge of studied females regarding IBS disease.

In relation to effect of lifestyle modification on studied females' mean total knowledge score about IBS. The current study demonstrated that, total mean knowledge score was increased among studied females to 23.7 post implementation of life style modification intervention compared to 12.6 pre intervention. Moreover, this result highlighted that, the observed improvement in relation to pre/ post intervention of total mean knowledge score was statistically significant as p < 0.001(figure 2). This findings agreed with **Ghareeb, Abouelala, &Elesawy., 2020**; they revealed that, mean total knowledge score among study sample had enhanced from 34.07 pre intervention to 77.0 post three months of implementing the intervention. Also, the result was agreed with **Hafez, Elbasiony, & Zahran., 2023.** They stated that, total mean knowledge score regarding IBS was increased from 6.66 to 12.26 among study group than in control group and a significant improvement was perceived after implementation of educational sessions (p < 0.001). This correspondence in result might be assigned to the shortage of the educational services, unavailability of knowledge sources regarding IBS disease and management in outpatient clinics. As the physician only prescribed the medication and not give complete education lead to lack of patients knowledge in relation to IBS. So, the present study asserted on effectiveness of application lifestyle modification on enhancing females' knowledge about IBS.

According to hypothesis No (2): Symptoms severity level mean score among adult females will be decreased post implementation of lifestyle modification based on Pender's model compared with pre- implementation score.

In the light of the effect of lifestyle modification intervention on Symptoms Severity levels among studied females. This result reported that, the improvement of IBS symptoms post intervention than pre intervention was a statically significant (p < 0.001). As confirmed, more than half of studied female had mild symptoms, while more than one third of them had moderate and severe symptoms post intervention. In addition, the results revealed that, studied females' total mean symptoms score was 283.41±85.74 at pre-intervention which declined to 175.78±89.42 in post intervention (table 2). This result agreed with **Ju Youn& Sang., 2020;** who displayed that mean score of symptoms severity before implementation of motivational enhancement intervention was 232.33 that decreased to 155.92 after sixteen weeks, Also, they indicated that a statistically significant difference between study groups regarding symptoms severity was found (p < .05).

Similarly, **Naliboff et al., 2020** demonstrated that a significant change in IBS symptoms severity was noticed among study sample post-treatment and follow-up outcomes (p < 0.05.).

Moreover, the finding was supported by **Fernandes et al., 2024**; they confirmed that, a statistically significant decrease was found in IBS symptoms among study group after psychosocial interventions compared to control group. In addition, the finding was consistent with **Ghareeb, Abouelala, &Elesawy., 2020**. They demonstrated that a significant decrease in IBS symptoms and IBS-SSS mean score was observed after educational intervention than pre intervention. This agreement could be owed to that the adult females with IBS had the curiosity to gain information, follow instructions and practice important healthy behaviors to decrease IBS- symptoms.

According to hypothesis No (3): Adults females' health promoting behaviors score will be improved post implementation of lifestyle modification based on Pender's model compared with pre- implementation score.

Focusing on the effect of lifestyle modification on behavior-specific cognition and affects mean scores among studied females. The current result represented that, a statically significant improvement in mean scores of behavior- specific cognition and affects items as perceived benefits, perceived barriers, perceived self-efficacy, interpersonal influences, and situational influences were observed post intervention compared to pre intervention. also, this result indicated that a statically significant increase in behavior- specific cognition and affects total mean score was observed post implementation of intervention than pre intervention as P<0.001(table 3). This result approved with **Silva et al., 2023**.They revealed that after application of theory on IBS management, there were an improvement in perceived facilitators, barriers, and self-efficacy among study sample regarding management of IBS.

Also, this finding was in align with **Kiuntke et al., 2021**; who stated that patients who reported high perceptions of benefit or consequences, control of barriers and perceived emotional influences of following instructions had higher proportion of adherence to management. Similarly, **Chen et al., 2022** pointed that after application of intervention, there was an improvement of patient's self-efficacy than pre intervention. This consistency reflected the importance of application life style modification on improving adult female perception about IBS disease.

In the context of effect of lifestyle modification on total score of health promoting behaviors among studied females. The current result displayed that, a significant improvement was observed in all items of health promoting behaviors mean scores regarding IBS than pre intervention and were statistically significant as P<0.001. As ascertained, mean scores of nutritional adherence and weight reduction, physical activity, stress management, and medication adherence were increased among study sample post intervention than pre intervention (table 4). The result agreed with **Zia et al., 2016;** who reported that after the application of self-management approaches lead to improve adherence of IBS patients to dietary modification and other lifestyle behaviors than pre application. Also, **Kamp et al ., 2019** stated that after implementation of educational session with IBS individuals, there was an increase in mean score of dietary adherence, relaxation training, and other cognitive behavioral approaches than pre implementation.

In addition, the study finding was consistent with **Barandouzi et al., 2024.** They displayed that after self-management intervention and nurse-led support, the patient with IBS had a significant increase in adherence to diet, stress management, performing exercise and other lifestyle behaviors than pre intervention as P<0.001. This agreement may be associated with the interest of studied female to manage IBS disease through following instructions which result in improving their adherence to health promoting behaviors.

The current result asserts on effect of lifestyle modification on total mean score of health promoting behaviors among studied females. The result demonstrated that total mean score of health promoting behaviors regarding IBS among studied females was increased post intervention than pre intervention and the improvement was highly statistical significant as P<0.001 (figure 3). The result was supported by **Ju Youn& Sang., 2020;** who indicated that total health promoting behaviors mean score was increased after application of motivational enhancement intervention. In the same line **Zia et al.,2016**

described that total mean score of lifestyle behaviors was increased among study sample after implementation of self-management approaches than before implementation. This consistency could be related to effectiveness of application life style modification on enhancing adult female health promoting behaviors.

According to hypothesis No (4): There will be a significant correlation between symptoms severity score among studied females and components of pander's model.

Regarding correlation between symptoms severity score among studied females and component of pander's model. The current study presented a statistical significant correlation was observed between symptoms severity score among studied females and all Pender's model components in both pre and post intervention as $p < .05$ (Table 5). This result was supported by **Barandouzi et al., 2024.** They pointed that after self-management intervention and nurse-led support, the patient adherence to lifestyle behaviors lead to reducing of patients' symptoms episodes as P<0.001. Also, the study done by **Sier˙zantowicz, Lewko, and Jurkowska, 2020** proved that a highly significant correlation was found between application of individual educational program and an exacerbation of symptoms among studied patients with IBS. Similarly, **Panel et al., 1998** stated that a significant association was noticed between IBS symptoms and components of Pender's health promotion model. This similarity might be owed to that lifestyle educational sessions based on Pender's model has a vital role in improvement of IBS symptoms among studied females.

Conclusions

In the context of the present study results; application of lifestyle modification intervention based on Pender's model had a substantial effect on increasing knowledge, improving symptoms, and succeeded in reducing episodes of irritable bowel syndrome among adult females.

Recommendation

- Frequent educational program should be implemented regularly at outpatient clinic to raise patients' awareness regarding irritable bowel syndrome episodes and its management.
- A broad treatment plan supported with educational guidebook is suggested to be given to all patients with IBS to help them appreciate and follow compulsory therapeutic regimen.
- Further studies on different types of IBS are needed to be applied with a large sample size.

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