Effect of Multidimensional Educational Package on Body Mass Index, Biochemical Parameters, and Quality of Life among Patients Undergoing Laparoscopic Sleeve Gastrectomy

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Abstract

Background: Laparoscopic Sleeve Gastrectomy is considered the most effective and safest surgery for the management of obesity. **Aim**: The study aimed to evaluate the effect of multidimensional educational package on Body Mass Index, biochemical parameters, and quality of life among patients undergoing laparoscopic sleeve gastrectomy. **Design**: A quasi- experimental study design was used. **Setting:** The study was carried out at the obesity outpatient clinic and surgical unit at Menoufia University Hospital, Menoufia Governorate, Egypt. **Sample:** A convenience sample of 62 adult obese patients undergoing Laparoscopic Sleeve Gastrectomy were enrolled in this study. **Instruments:** Three tools were used: I. Structured interview questionnaire to collect demographic and medical data and assess patients' knowledge about Laparoscopic Sleeve Gastrectomy, II.36-Item short form survey scale for quality of life, III. Biophysiological measurements which included anthropometric measurements and biochemical parameters. **Results:** After the implementation of the multidimensional educational package, the total mean score of knowledge among the study group improved to 29.8±6.2 compared to15.8±7.2 in the control group. The mean score of Body Mass Index decreased to 27.62± 4.33 in the study group compared to 34.75± 4.21 in the control group. Also, a statistically significant improvement was found in the study group in comparison with the control group in all items of biochemical parameters at post intervention ($P < 0.001$). In addition, the total mean score of quality of life scale increased to 87.4 in the study group compared to 68.8 in the control group. **Conclusion:** The multidimensional educational package improved knowledge, reduced Body Mass Index, improved biochemical parameters, and enhanced quality of life in laparoscopic sleeve gastrectomy patients. **Recommendation:** Designing and implementing an educational program for obese patients is beneficial to enhance their knowledge and practices as regard to sleeve gastrectomy.

Keywords: Body mass index**,** Biochemical parameters, Laparoscopic sleeve gastrectomy, Multidimensional educational package, Quality of life.

Introduction

Obesity is a common medical and public health issue that carries an economic burden worldwide. It is a universal health concern caused by an excessive amount of body fat. It is influenced by both environmental and genetic factors and cannot be managed by diet only. Obesity is defined as having a Body Mass Index (BMI) of 30 kg/m^2 or more **(Luesma et al., 2022).**

Based on data from the World Health Organization (WHO), nearly one billion people worldwide are affected by obesity, including 650 million adults, 340 million teenagers, and 39 million children at risk. In Egypt, 25.9% of adult males and 44.7% of adult females aged 18 and older are obese, placing Egypt 18th in the world for obesity rates **(World Health Organization, 2022).**

Obesity impacts various systems in the body including the heart, liver, kidneys, joints, and reproductive system. It is linked with several health problems like type 2 diabetes,

hyperlipidemia, hypertension, sleep disorders, stroke, cancer, and mental health issues. Furthermore, obese individuals have a higher likelihood of hospitalization for medical issues compared to non-obese individuals **(Aboulghate et al., 2021).**

Also, obesity can affect individuals' biochemical parameters by increasing the levels of Hemoglobin A1c (HbA1C), cholesterol, triglycerides, Fasting Blood Glucose (FBG), uric acid, and liver enzymes such as Aspartate Transaminase (AST) and Alanine Transaminase (ALT) **(Batar, Demir & Bayram., 2021).** In addition, a strong relation was occurred between obesity and the deterioration in individuals' quality of life. It may be due to musculoskeletal distress and many other diseases that are caused by morbid obesity (**Grönroos, et al., 2021**).

Quality of life (QoL) refers to the ability of an individual to adore a healthy life by performing exercises without fatigue, eating healthy diet, performing any work well and having active social life. So that, improving obese individual's quality of life is an important factor for pursuing laparoscopic sleeve gastrectomy **(Barros et al., 2019).**

Laparoscopic Sleeve Gastrectomy (LSG) is a weight loss surgery and an effective bariatric procedure that involves the removal of about 75-85% of the stomach to reduce its size. This procedure helps to limit the amount of food that is consumed, leading to a sense of fullness with a smaller quantity. Sleeve gastrectomy is a valuable and effective treatment option aimed at reducing weight, eliminating or improving concomitant diseases, enhancing QoL, improving biochemical parameters, and maintaining weight loss in individuals with extreme obesity who have not been able to reduce their weight with diet and activity **(Silverman, 2022).**

In addition, this procedure is also extremely beneficial in managing those people with hypertension, hyperglycemia, sleep apnea, and hyperlipidemia. It can also help to prevent future health issues. Patients with obesity who receive LSG might expect a higher QoL and longer lifespan due to its benefits. The procedure of LSG was conducted by utilizing minimally invasive surgical procedure and tiny incisions which enable a better overall experience for patients with less discomfort and fewer problems, minimal hospital duration, and quicker recovery times. Moreover, it is incredibly secure with lower rate of complications compared to other typical procedures **(Akkayaolu, & Celik, 2020).**

Multidimensional Educational Package (MEP) for patients undergoing LSG is a comprehensive program that includes individualized face-to-face patient education, the provision of an instructional pamphlet, presentation of a video related to LSG, and a ward visit to the bariatric surgery unit **(Stenberg et al., 2022).** A multidimensional educational package and a ward visit can promote wound healing, reduce tiredness and stress, increase postoperative compliance, improve postoperative recovery, and reduce the duration of stay **(Kashihara et al., 2022)**.

Moreover, among the recommendations are practicing physical activity, supplementing patients' diet with more protein, and losing weight prior to surgery. Weight loss preoperatively of 10% reduces belly size and liver fatty tissue, boosts the intake of protein in order to protect muscular tissue, and prepares the patient for the post-operative dietary program (**Benalcazar & Cascella, 2022; Zhang et al ., 2020).**

Nurses have a vital role in caring for individuals who undergo LSG by providing education about the surgery, its potential risks, and the required lifestyle changes. The nurse can use a MEP that includes information about food choices, activity guidelines, and postoperative recommendations. Nurses can also observe patients' progress, offer emotional support, and identify any complications that may occur **(Graham, 2019)**. The nurses can work with the patients, their families, and healthcare providers to attain the well-being of individuals who will

undergo LSG. Additionally, the nurses can promote a healthy lifestyle, monitor their biochemical parameters, help improve their quality of life, monitor nutrient status, prevent nutrient deficiencies, and maximize long-standing weight loss **(Parretti et al., 2019).**

The nurses play an important role in preparing patients for surgery, educating them about potential side effects, providing discharge instructions, and conducting post-surgery investigations. Additionally, the nurses must be alert to any changes that may occur in patients after surgery in order to achieve the desired results **(Akkayaolu & Celik, 2020).**

Significance of the study

Obesity is now the second largest cause of mortality worldwide and has become a major public health concern. Obesity is usually associated with numerous debilitating diseases that lead to the death of four million people yearly. The Global Burden of Disease Obesity Collaborators stated that approximately 30% of the world's population is affected by obesity **(Poon & Rosenbluth, 2022).** In Egypt, according to the "100 Million Health" survey conducted in 2020, it was found that 29.5% of adult males and 49.5% of adult females screened had obesity **(Aboulghate et al., 2021).**

Obesity increases the risk of chronic diseases and has a significant impact on QoL and biochemical parameters. Obesity and its comorbidities can be treated with LSG, which is considered one of the most effective available interventions for severe obesity. Patients who undergo LSG often have lack knowledge about the surgery and postoperative guidelines. So, patients should receive health education to increase their understanding of the surgery, dietary patterns, exercise recommendations, discharge plan, and the importance of continuous follow-up. Following gastric sleeve surgery instructions can help reduce post-operative complications, improve BMI, and enhance QoL for the patients **(Shaaban et al., 2023).** Thus, the current research was conducted to assess the effect of a MEP on BMI, biochemical parameters, and QoL among patients undergoing LSG.

Aim of the study:

The current study aimed to evaluate the effect of multidimensional educational package on Body Mass Index, biochemical parameters, and quality of life among patients undergoing laparoscopic sleeve gastrectomy.

Research Hypotheses:

H1: Patients who receive MEP (study group) will have a significant increase in knowledge score compared to patients who don't receive (control group)

H2: Patients who receive MEP (study group) will have a significant decrease in mean BMI and biochemical parameters compared to those who don't receive (control group).

H3: Patients who receive MEP (study group) will have a significant increase in total quality of life score compared with those who don't receive (control group).

Operational definition:

Multidimensional Educational package:

A Multidimensional educational package is a structured program designed to support patients in their post-operative journey. It focuses on various aspects of their health and well-being, encompassing education on the surgical procedure, psychological preparation, lifestyle modifications such as diet and exercise recommendations, medication management, emotional and social support, and a follow-up schedule to optimize weight loss, enhance obesity-related comorbidities, and improve the overall quality of life.

Body Mass Index:

This formula was used to calculate it: BMI= Weight (kg) /Height $(m)^2$ **(Chandrasekhar et al., 2023)**

Biochemical parameters:

It refers to the laboratory tests used in the study include HbA1C, cholesterol, triglycerides, FBG, uric acid, AST, and ALT.

Quality of life:

Health-related quality of life is operationally defined as the quality of life related to health. The short form SF-36 assesses eight health concepts through a single multi-item scale, including physical functioning, physical health, role limitations due to emotional difficulties, energy/ fatigue, emotional well-being, social functioning, bodily pain, and general health perception.

Method

Research Design: A quasi-experimental study (non- equivalent control group design) was used to accomplish the aim of the study.

Research Setting: The study was carried out at the obesity outpatient clinic and surgical unit at Menoufia University Hospital, Menoufia Governorate, Egypt. The surgical unit is located on the second floor of the hospital where LSG was performed, while the obesity outpatient clinic is located on the first floor. The setting was selected because a large number of obese patients attend to receive care, health education, and follow-up after LSG.

Subjects: A convenience sample of 62 adult patients who were scheduled to undergo LSG in Menoufia University Hospital and met the inclusion criteria were enrolled in the study. They were randomly selected as study or control group. The study group received a multidimensional educational package, and the control group received routine care before and after surgery and were followed up at the obesity outpatient clinic.

Sampling method and participants' follow-up:

A total of 75 adult obese patients who came to University Hospital between December 1, 2023, to the end of November 2024 and were referred from the obesity outpatient clinic to the surgical unit to undergo LSG. Only 69 patients met the inclusion criteria of the study. These 69 patients were randomly assigned to receive either usual routine hospital care or a multidimensional educational package for a duration of 3 months after surgery. From the 69 patients, 62 (study = 31 and control = 31), about 89.8% of respondents only finished the research period. Seven participants (study = 4; control =3) dropped out. Poor compliance and loss of follow-up were the most frequent causes of drop out. Other participants dropped out due to not responding to phone calls and losing follow-up in the outpatient clinic. Patients were removed from the sample if they lost more than 25% of follow-up outpatient clinic visits or phone calls, or if they did not complete the questionnaire at any phase of the study (as shown in figure 1).

Inclusion criteria:

- Adults patients between 18 to 60 years' old who undergoing LSG
- Medically, psychologically, and emotionally stable enough to provide consent to surgery and follow a diet and lifestyle change plan.

Exclusion criteria: Patients with complicated cases such as leakage, bleeding, and pulmonary embolism were excluded from the study due to the need for extended hospitalization and expected poor outcomes.

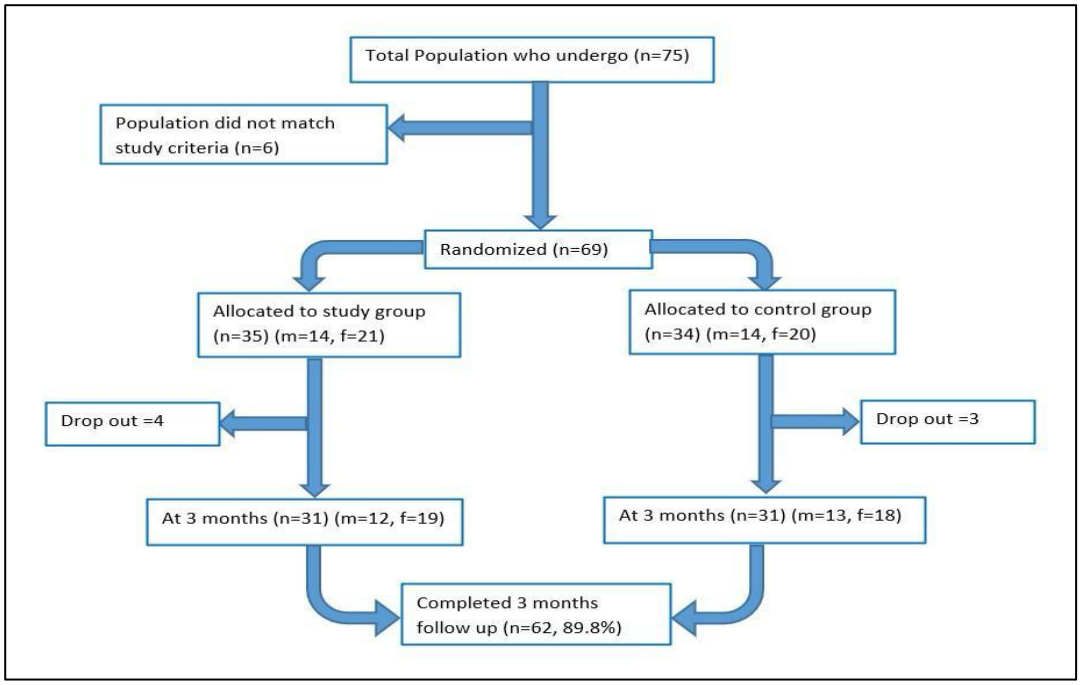

Figure (1): Flow chart of the sample selection

Tools for data collection:

Three tools were used to gather the needed data in the present study as follows:

I: Structured interview questionnaire:

Researchers constructed it based on a literature review to collect baseline demographic and medical data and assess patients' knowledge about LSG. It includes two parts:

Part one: Demographic and medical data

It included demographic characteristics and medical data such as age, sex, marital status, educational level, working condition, presence of chronic diseases, types of chronic diseases, and preoperative BMI.

Part two: Patients' knowledge about LSG

This tool was designed by the researchers after reviewing the literature. It consisted of 15 questions regarding sleeve gastrectomy, including the following: definition, reasons for performing surgery, complications, dietary management, and recommendations related to lifestyle modifications such as dietary changes and physical activities.

Scoring system:

Each question received two scores for a correct answer, one score for an incomplete answer, and zero score if the answer was "I don't know" or incorrect. All questions were added up to produce a score ranging from 0 to 30. The percentage of the score was calculated as follows: obtained score / total score x 100. The score was classified as follows: a score < 60% (0-17 points) indicated poor knowledge, a score from 60% - 75% (18-22 points) indicated fair knowledge, and a score > 75% (23-30 points) indicated good knowledge (**Ibrahiem et al., 2021).**

Reliability:

The test-retest reliability method was used by the researchers to assess the reliability of part II for testing internal consistency. They administered the instrument to the patients and then re-administered the same instrument to them after 2 weeks, after comparing the results. The

instrument showed high reliability with a correlation coefficient of 0.87.

II: 36-Item short form survey scale (SF- 36):

It was constructed by **Ware et al. in 1994** to evaluate health-related quality of life (HRQoL). This scale involved eight health concepts as follows: physical functioning (10 items), physical health (4 items), role limitations due to emotional difficulties (3 items), vitality or energy (4 items), emotional well-being (mental health) (5 items), social functioning (2 items), bodily pain (2 items), as well as general health perception (6 items). Three out of the eight domains assess either behavioral or mental health (emotional well-being, emotional role, and social functioning) while five out of eight assess physical health (physical functioning, physical role, vitality/energy, bodily pain, and general health perception).

Scoring system:

The questionnaire focuses on evaluating one's health and quality of life (QoL). The weighted sums of the eight scaled scores' items in their area make up the SF-36. Each component is graded on a scale of 0 to 100, with scores indicating the portion of the potential score attained. Assuming each question has equal weight and that the lower the score, the greater the disability, items from the same scale are averaged together to obtain the 8 scale scores. A high score indicates a healthy state because all items are scored. Additionally, the lowest and highest possible scores for each item are 0 and 100, respectively.

Reliability:

The Cronbach alpha values of the eight scales ranged between 0.73 and 0.90, indicating a significant internal consistency reliability. The 8-factor solution was supported by confirmatory factor analysis (CFA). These findings suggested that the scale is an accurate, valid, and reliable tool for assessing the quality of life of laparoscopic sleeve gastrectomy patients **(Musa et al., 2021).**

III: Bio-physiological measurements:

It included two parts:

Part I: Anthropometric measurements (BMI):

The researchers measured weight and height to compute BMI for both the case and control groups before surgery and three months post-intervention. Body mass index was computed using the following formula: weight (kg)/height $(m)^2$and categorized as follows: underweight (less than 18.5 kg/ m^2), normal weight (18.5–24.9 kg/ m^2), overweight (25–29.9 kg/ m^2), and obesity (BMI of ≥30 kg/ m^2)(obesity class I 30 to <35 kg/ m^2, obesity class 2 (35 to < 40 kg/ m^2), obesity class 3 or severe obesity ≥ 40 kg/ m^2) (**Mohajan & Mohajan, 2023).**

Reliability:

The reliability of anthropometric measurements was tested for internal consistency using Cronbach's coefficient Alpha (α = 0.97) to determine the extent to which the items were related to each other. The instrument was found to be reliable (r = 0.85).

Part II: Biochemical parameters: The researchers evaluated biochemical parameters through laboratory results such as HbA1C, cholesterol, triglycerides, FBG, uric acid, AST, and ALT. The data was taken from the patients' medical records.

Validity of the tools:

The content validity of the data collection tools was confirmed by a jury of five experts: one professor in medicine, two professors in medical-surgical nursing, and two professors in family and community health nursing. The content validity was assessed to determine relevance, accuracy, and completeness. The necessary modifications were made, and suggestions were incorporated into the tools.

Ethical consideration

The Ethics Committee of Scientific Research affiliated with the Faculty of Nursing, Menoufia University granted ethical permission for conducting the current study (Research No:

1049/20-9-2023). Formal consent was obtained from the hospital manager of outpatient clinics and the head of the surgical department. A written agreement was obtained from the participants after a clear explanation of the study's aim and procedures. The participants were assured that their data would be kept confidential and that the data collection instruments would not cause them any harm. Additionally, the researchers emphasized that participation was completely voluntary and that refusal to participate at any time during the study would not affect their care.

Pilot study:

It was conducted before collection of data on 6 patients (10%) to determine the clarity, objectivity, feasibility, and applicability of all tools and to determine the actual time required for data collection. All adjustments were made. Participants in the pilot study were not included in the main study sample.

Procedures and data collection

- The University Hospital director in Menoufia Governorate, Egypt granted official permission. The researchers then explained the study's agreements and objectives to the physicians and nurses in the obesity outpatient clinic and the gastric sleeve surgery unit to secure their cooperation.
- Data was collected over nearly 12 months from December 1, 2023, to the end of November 2024.
- The researchers made an exploratory visit to an obesity outpatient clinic to determine the frequency rate of obese patients who had undergone LSG and to assess the appropriate time for data collection. The researchers visited this clinic from 9:12 AM, two days a week (Saturday and Tuesday) to collect baseline data from the patients because the obesity outpatient clinic specified these days for patients who undergo LSG and for following up with them after surgery. The researchers met with about 1-2 patients a week for data collection.
- At the obesity outpatient clinic, the researchers identified patients who met the inclusion criteria and invited them to participate in the study. After establishing a rapport and building a trusting relationship, the purpose of the study was explained. The patients enrolled in the current study were randomly divided into two equal groups: a study group and a control group, with even numbers assigned to the study group and odd numbers to the control group.
- Every patient was interviewed individually by the researchers to obtain demographic, medical data and baseline assessment (pretest for patient's knowledge) by using structured interviewing questionnaire. During this time, body weight, height, and a BMI were calculated. Filling the questionnaire was completed within 30-40 minutes.
- The patients' lab investigations, including HbA1C, cholesterol, triglycerides, FBG, uric acid, AST, and ALT, were ordered by the physician on the first day of admission to the surgical unit. The results were then retrieved from the patients' medical records.
- The multidimensional educational booklet was designed by researchers and supported by illustrative pictures which included information about LSG, its needed preparation and instructions, etc. This booklet was reviewed by five experts in specialty of community health nursing and medical-surgical nursing. Booklet was written in Arabic language and was printed out according to the sample size.
- The researchers interviewed each subject in the study group individually for four teaching sessions. All patients in study group received multidimensional educational package regarding LSG. The researchers used numerous teaching methods and materials in implementation of intervention,

which included lectures and group discussion. In addition, the researchers used PowerPoint presentation combined with posters and videos related to educational sessions.

- The researchers conducted multidimensional educational package with the study group through the following four sessions:

1st session: This session took place at the obesity outpatient clinic in the waiting room after the decision for surgery was made. It included definition of LSG, causes for performing LSG, the simple explanation about surgical procedure, potential side effects, general instructions related to the laboratory investigations required before surgery.

2nd session: This session was conducted in the surgical unit on the first day of admission. It covered information on preoperative preparation and instructions, such as informed consent, preoperative fasting hours, premedication, and the type of anesthesia to be used during surgery. Additionally, it included an orientation to the operating theater, the instruments used, the expected duration of surgery, postoperative pain management, and the timeline for ambulation.

3rd session: This session was delivered on the second day of admission to the surgical unit. The patient received instructions regarding recommended exercises to be performed after LSG surgery. These exercises included breathing, coughing, weight training, and flexibility exercises. The patient also received guidance on medication management and dietary changes early postoperatively. It was emphasized to focus on liquids containing protein and vitamins, such as protein shakes, milk, or creamy liquids in the first two weeks to prevent dehydration, vitamin deficiencies, and muscle tissue loss.

4th session: This session was conducted before discharge. The researchers explained to the patients a discharge plan instructions which included physical activities, vitality, and daily calorie intake (300 and 600 calories) for the first two months following surgery. Also, it involved guidelines for long-term dietary management as avoiding trigger foods, consuming the necessary amount of vegetables, fresh fruits, fats, and sweets, and following a Protein-Rich Diet. In addition, the significance of follow-up was stressed by the researchers in this session and the patients in the both groups were informed about a follow-up schedule visit at the obesity outpatient surgical clinic at Menoufia University Hospital once a week until the sixth week and at three months postoperatively.

- Each session lasted about 35-45 minutes, depending on the patient's level of understanding. After each session, a summary of the knowledge discussed, comments, feedback, and interpretations were provided to address any missing points. Before starting the next session, a discussion with the patients regarding the previous session was conducted to ensure their understanding and orientation about the instructions given. Any ambiguous items were clarified and re-explained by the researchers.
- After completing the sessions, the researchers confirmed the importance of adhering to the multidimensional educational package to enhance quality of life, BMI, and biochemical parameters. Subsequently, each patient in the study group received a copy of the designed booklet to serve as a reference for them.
- The researchers coordinated with the patients to schedule specific follow-up times at the obesity outpatient clinic. Additionally, the researchers followed up with each patient in the study group once a month by telephone

and in person if necessary to assess their adherence to the multidimensional educational package.

- **Post-test session:** The researchers followed up with the participants in both groups for three months postoperatively. After three months of implementing the intervention, the researchers used a telephone to coordinate with the patients in both groups regarding the time of their meeting at the obesity outpatient clinic for follow-up and completion of the posttest. The patients were instructed to undergo lab investigations (HbA1C, cholesterol, triglycerides, FBG, uric acid, AST, and ALT) and bring the results with them. The posttest involved filling out part two of the tool used in the pre-intervention to assess the impact of the multidimensional educational package on knowledge. Anthropometric measurements were taken, and BMI was calculated during the posttest. The patients' lab investigation results were also collected from the patients. Filling out the questionnaire required approximately 30-40 minutes to be completed.

Statistical analysis:

The SPSS program version 25 was used to analyze the numerical data, which was collected and computerized. The qualitative data were presented as numbers and percentages, while quantitative data were presented as means ± standard deviation. An independent t-test was conducted to compare the two groups before the intervention and three months after the intervention. The Mann-Whitney test was used for variables that were not normally distributed. The results were considered significant when the p-value was ≤ 0.05.

Results:

Table (1): It is evident from the table that the mean age of the study group was 33.60 ± 9.28 and the control group was 34.90 ± 7.94. More than half of the studied sample, 61.2% and 58.0%, were females. In addition, 61.2% and 64.5% were married in the study and control groups, respectively. Furthermore, 61.2% and 54.8% had secondary education in the study and control groups, respectively. Regarding occupation, the table shows that 58.0% of the study group and 64.5% of the control group had no work. As for the presence of chronic diseases, 70.9% of the study group and 64.5% of the control group had chronic diseases. Nearly more than one-third of the study and control groups (45.4% & 40.0% respectively) had hypertension, and about one-quarter of both groups had diabetes mellitus (27.2% & 25.0% respectively). Also, the table indicated that BMI was 40.21 and 40.77 respectively in the study and control groups. No significant differences were found between the two groups regarding all demographic and medical data ($p<0.05$).

Table (2) reveals that the total mean score of knowledge is the same (9.1±3.96) for both groups at pre-intervention. The total mean knowledge score for the study group was 29.8±6.2, and for the control group, it was 15.8±7.2 at 3 months post-intervention. A highly statistically significant increase occurred in the total mean score of knowledge in the study group compared to the control group post-intervention ($P<0.001$).

Figure (2) shows that 74.1% of the study group and 70.9% of the control group had a poor level of knowledge at pre-intervention. Meanwhile, 70.9% of the study group had a good level of knowledge compared to 12.9% of the control group at 3 months post-intervention.

Table (3) represents a comparison between the study and control groups regarding weight and BMI pre-intervention and post-intervention. It indicates that no statistically significant difference was observed between both groups at pre-intervention regarding body weight and BMI. Meanwhile, at 3 months post-intervention,

the mean body weight of the study group was 85.33 ± 7.65, while in the control group it was 99.27 ± 10.36. Moreover, the mean BMI was 27.62 ± 4.33 in the study group and 34.75 ± 4.21 in the control group. Additionally, a highly statistically significant decline in weight and BMI was found between the study group and control group at post-intervention ($P < 0.001$).

Table (4) shows that there was no statistically significant difference between the studied groups in terms of all biochemical parameters before the intervention. However, after 3 months of intervention, HbA1C, cholesterol, triglycerides, FBG, uric acid, AST, and ALT showed significant improvements in the study group compared to the control group. Additionally, there was a statistically significant difference in all biochemical parameters between the study group and the control group post-intervention ($P<0.001$), except for FBG and uric acid.

Table (5) shows that the mean scores of the physical health domain for both the study and control groups were 63.05 ± 20.28 and 62.25 ± 20.28, respectively, at pre-intervention. At 3 months post-intervention, the mean scores improved to 82.01 ± 18.78 in the study group, while in the control group, it increased slightly to 67.22 ± 15.23. In terms of the mental health domain, the mean score of the study group was 64.87 ± 13.92 at pre-intervention, and in the control group, it was 63.09 ± 14.66. At 3 months post-intervention, the mean score of the study group was 81.87 ± 12.22, and in the control group, it was 69.45 ± 16.33. The table indicates a highly statistically significant increase in the physical and mental domains of QoL among the study group compared to the control group post-intervention ($P < 0.001$). It also shows that there was no statistically significant difference between the study and control groups in terms of the mean score of QoL subdomains at pre-intervention. However, at 3 months post-intervention, a highly statistically significant improvement was reported in all mean scores of QoL sub-domains among the study group compared to the control group ($P < 0.001$).

Figure (3): The comparison between the study and control groups regarding the total mean scores of quality of life at pre and post intervention is illustrated. The total mean scores of the scale in the study and control groups were 63.7 and 62.7, respectively, at pre-intervention. Furthermore, in the post-intervention, the total mean score of the QoL scale was 87.4 in the study group and 68.8 in the control group. A statistically significant improvement was found in the total mean scores of the QoL scale among the study group compared to the control group at post-intervention ($P < 0.001$).

Table (1): Distribution of patients in the two groups according demographic characteristics and medical data (n=62)

Variables	Study group (No = 31)		Control group (No = 31)		Significance
	No	%	No	%	
Age (Mean ± SD)	33.60 ± 9.28		34.90 ± 7.94		P= 0.30
Sex					
Male	12	38.71	13	41.94	P =0.999
Female	19	61.29	18	58.06	
Marital status					
Single	9	29.03	7	22.58	P= 0.318
Married	19	61.29	20	64.52	
Widow	3	9.68	4	12.90	
Educational Level					
Read and write	4	12.90	5	16.13	P= 0.476
Secondary education	19	61.29	17	54.84	
High education	8	25.81	9	29.03	
Working condition					
Working	13	41.94	11	35.48	P= 0.536
Not working	18	58.06	20	64.52	
Presence of chronic diseases					
Yes	22	70.96	20	64.51	P= 0.459
No	9	29.04	11	35.49	
Type of chronic diseases					
Diabetes	6	27.27	5	25.00	
Hypertension	10	45.46	8	40.00	
Diabetes & hypertension	4	18.18	4	20.00	P0.761
COPD	2	9.09	3	15.00	
Preoperative BMI	40.21± 5.33		40.77± 4.21		p= .842

Significant at P≤0.05

Table (2): Comparison between the study and control group regarding total mean score of knowledge pre- and post-intervention (n=62).

Knowledge score	Study group (No = 31) Mean ± SD	Control group (No = 31) Mean ± SD	Independent t-test
Total mean knowledge score:			
Pre intervention	9.1±3.96.	9.1±3.96.	P = 0 .332
Post intervention	29.8±6.2	15.8±7.2	P=0.001**

Significant at P≤0.05 (**) Highly significance

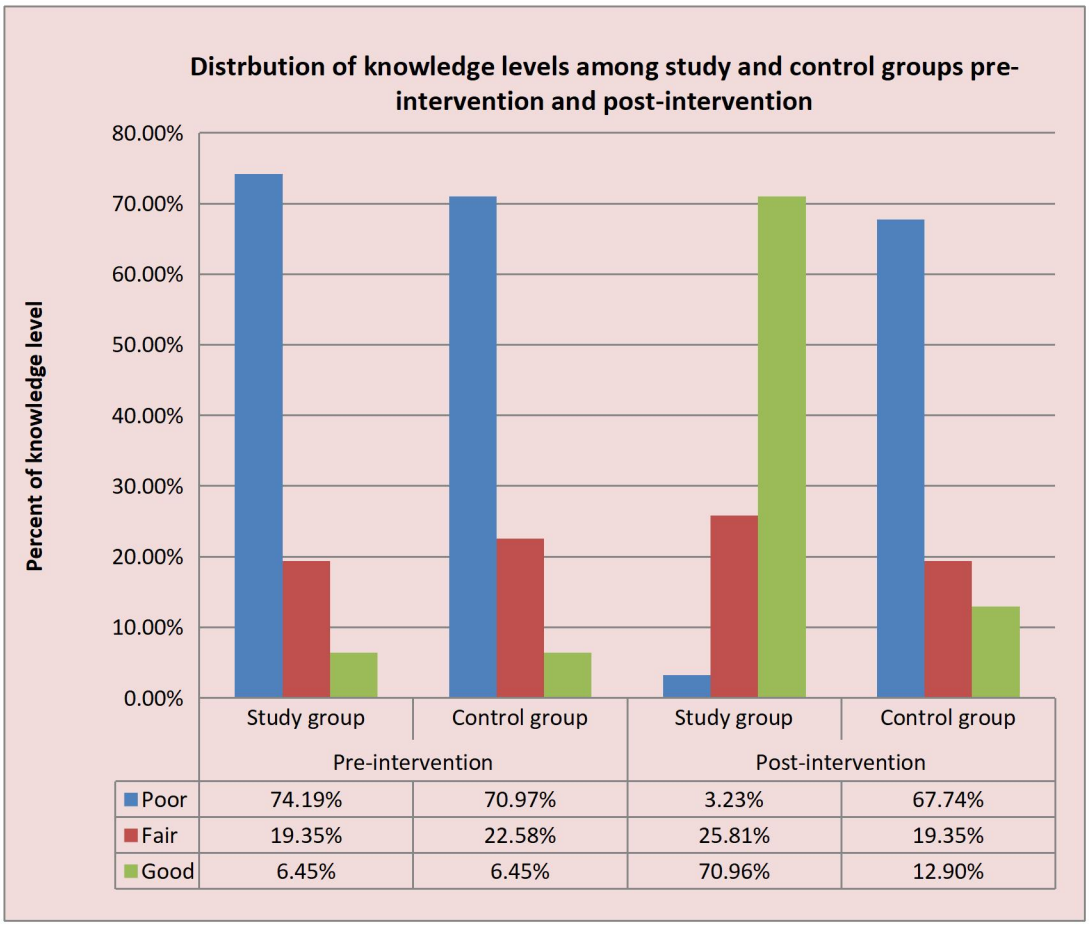

Figure (2): Distribution of knowledge levels among study and control groups pre intervention and post intervention.

Table (3): Comparison between the study and control groups regarding the mean scores of weight and BMI pre- and post-intervention (n= 62).

Variables	Study group (No = 31) Mean ± SD	Control group (No = 31) Mean ± SD	t-test P values
Body weight (kg).			
Pre-intervention	120.79 ± 9.52	121.27 ± 12.36	p= .842
Three months post-intervention	85.33 ± 7.65	99.27 ± 10.36	P =0 .0001**
Body mass index			
Pre-intervention	40.21± 5.33	40.77± 4.21	P = 0.532
Three months post-intervention	27.62± 4.33	34.75± 4.21	p = 0.000**

Significant at P≤0.05 (**) Highly significance

Table (4): Comparison between study and control groups regarding mean score of biochemical parameters pre- and post-intervention (n=62).

Biochemical parameters	Study group (No = 31) Mean ± SD	Control group (No = 31) Mean ± SD	Mann Whitney test P values
Hb1AC:			
Pre-intervention	6.11± 0.16	6.17± 0.14	P = 0 .332,
Three months post-intervention	5.2±1.33	5.9 ±1.43	P=0.003*
Cholesterol (mg):			
Pre-intervention	293.3±2.7	291.3±2.7	P= 0.456
Three months post-intervention	195.1±.3.2	245.1±2.9	P=0.002*
Triglyceride (mg):			
Pre intervention	193.30±2.3	191.71±2.3	P= 0 .337
Three months post-intervention	130.4±2.5	170.22±2.5	0.000**
FBG (mg/dL):			
Pre-intervention	113±38.19	114±28.11	p= 0.771
Three months post-intervention	104.23±41.16	110.17±31.14	P=0.310
Uric acid (mg/dL):			
Pre-intervention	6.25±1.14	6.99±1.17	p= 0.0891
Three months post-intervention	5.64±1.16	6.01 ±1.13	P=0.07
ALT (U/L):			
Pre-intervention	42.85±26.58	41.91±18.31	p= 0.897
Three months after intervention	24.12±18.31	34.95±20.58	P=0.0001**
AST(U/L):			
Pre-intervention	43.31±13.27	41.52 ±13.27	p= 0.882
Three months post-intervention	21.80±8.21	37.10±9.11	P=0.0001**

Significant at P≤0.05 (**) Highly significance

Table (5): Distribution of the mean scores of physical and mental health domains of QoL among study and control groups pre- and post-intervention (n=62).

QOL sub-domains	Study group (No = 31) Mean ± SD	Control group (No = 31) Mean ± SD	Independent t-test P values
Physical health sub-domains			
Physical functioning			
Pre-intervention	83.37 ± 14.79	81.50 ± 13.37	p= .742
Three months post-intervention	92.10± 11.21	83.60 ± 12.01	P =0 .001**
Physical role			
Pre-intervention	61.39± 36.66	62.87± 37.21	P = 0.532
Three months post-intervention	89.87± 31.25	68.75± 32.21	p = 0.000**
Vitality/Energy			
Pre intervention	53.17±14.89	52.48 ±13.11	P = 0.332
Three months post-intervention	81.69±14.58	59.33 ± 12.44	P = 0.002*
Body pain			
Pre-intervention	77.79±18.33	76.87 ±22.11	P=0.243
Three months post-intervention	94.08±15.01	80.48 ±23.22	P= 0.004*
General health perception			
Pre-intervention	60.58±25.15	59.55 ±28.61	P= 0.167
Three months post-intervention	94.14±17.59	66.48 ±24.33	P= 0.000*
physical health domain			
Pre-intervention	63.05 ±20.28	62.25 ±20.28	P=0 .332
Three months after intervention	82.01±18.78	67.22±15.23	P=0.000**
Mental Health sub-domains			
Emotional wellbeing			
Pre-intervention	59.17 ±15.74	60.01 ± 17.22	P= 0.442
Three months post-intervention	83.86 ± 15.92	67.77 ±18.62	P= 0.001*
Emotional role			
Pre-intervention	52.48 ±22.37	53.99 ±25.33	P = 0.422
Three months post-intervention	79.01±20.10	58.48 ±23.15	P= 0.006*
Social functioning			
Pre-intervention	65.38±15.57	63.97 ±16.32	P=0.089
Three months post-intervention	80.89±17.89	67.87 ±20.11	P= 0.000**
Mental health domain			
Pre-intervention	64.87± 13.92	63.09± 14.66	P= 0.456
Three months post-intervention	81.87±12.22	69.45±16.33	p= 0.000**

Significant at P≤0.05 (**) Highly significance

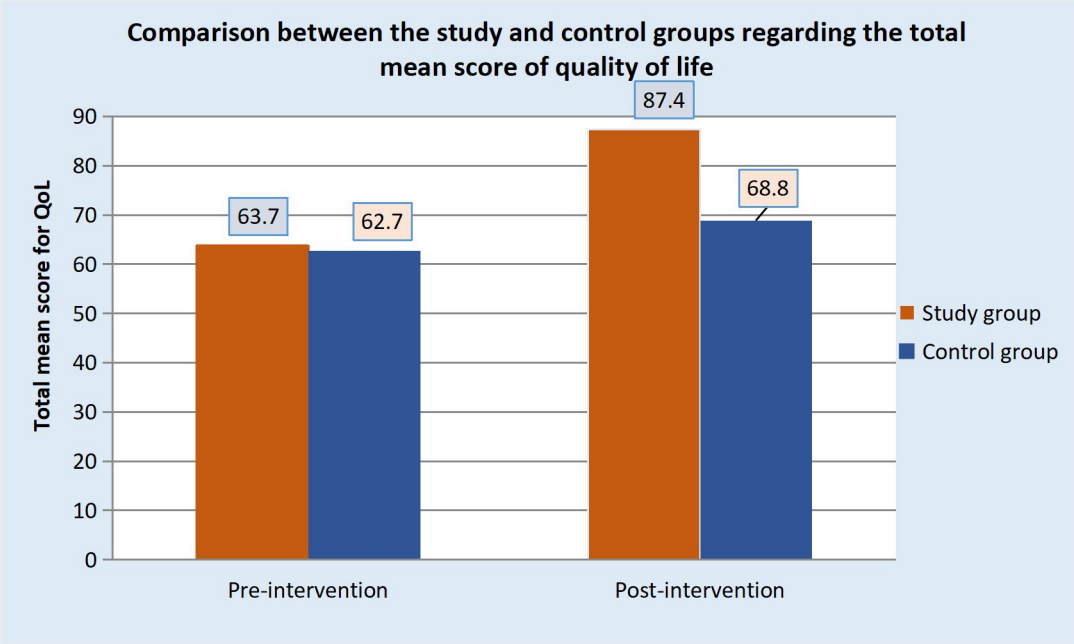

Figure (3): Comparison of the total mean quality of life scores pre- and post-intervention in both the study and control groups

Discussion

Obesity has become a worldwide health priority because it increases the economic burden, causes numerous chronic diseases such as diabetes and hypertension, and has negative effects on individuals' quality of life. Therefore, laparoscopic sleeve gastrectomy is the best choice as it causes long-term weight loss and prevents intestinal bypass. Also, it has become the most popular bariatric surgery technique due to its simplicity and efficacy (**El-Maghawry et al., 2021; Telem et al., 2025**).

Patients who undergo LSG often have a deficit in knowledge about the surgery and post-operative instructions. Therefore, nurses play a crucial role in providing additional attention to these patients by utilizing educational packages to increase their understanding, assist them in following instructions to promote weight loss, prevent gastrointestinal issues, and enhance their overall quality of life (**Ibrahiem et al ., 2021).**

According to hypothesis 1: Patients who receive a MEP (study group) will have a significant increase in knowledge scores compared to patients who do not receive it (control group). In the current study, the total mean scores of knowledge among the study and control groups showed a highly statistically significant increase in the total mean knowledge scores among the study group compared to the control group at 3 months post-intervention. This finding was consistent with El-Maghawry et al. (2021), who indicated that after applying an educational program, there was a statistically significant increase in the total knowledge score among patients post-operatively compared to pre-operatively. Additionally, the finding agreed with Hablass et al. (2023), who concluded that the knowledge of the studied patients improved post-program implementation compared to pre-program implementation. From the researchers' point of view, the consistency in results might be due to the implementation of multidimensional educational sessions and their effectiveness in increasing practical knowledge of bariatric patients regarding LSG.

Regarding the distribution of knowledge levels between the studied groups pre-intervention and post-intervention, the present

study reported that two-thirds of both the study group and control group had a poor level of knowledge pre-intervention. While two-thirds of the study group and one-tenth of the control group had a good level of knowledge at 3 months post-educational sessions. This finding was similar to **Ali (2019),** who stated that the majority of both groups had a low level of knowledge pre-implementation of nursing guidelines; even though a significant improvement was found in the knowledge level in the study group post-intervention compared to the control group. Also, this finding agreed with **Mousa et al. (2024)**, who reported that the majority of studied patients had a good knowledge level, though the minority of them had fair and poor knowledge levels regarding sleeve gastrectomy. These findings also were proven by **Köhler et al. (2020**), who indicated that three-quarters of the studied patients had a good knowledge level, while one-quarter of them had a poor knowledge level regarding sleeve gastrectomy after the intervention. The commonality in findings suggested that patients are motivated to seek information to better understand their condition and treatment, leading to improved knowledge levels and adherence to guidelines.

According to hypothesis 2: Patients who receive a MEP (study group) will have a significant decrease in mean BMI and biochemical parameters compared to those who don't receive (control group).

Regarding the weight and BMI comparison between the groups under study pre-intervention and post-intervention, the present findings concluded that there were no statistically significant differences between both groups concerning of body weight at pre-intervention. However, at post-intervention, the mean body weight of the study group was reduced to 85.33 ± 7.65 compared to 99.27 ± 10.36 in the control group. Additionally, there was a statistically significant decrease in body weight among the study group compared to the control group post-intervention. These results were consistent with **Alhuzaim et al. (2023)**, who reported a significant decrease in body weight post-sleeve gastrectomy compared to preoperatively.

Moreover, the current study findings showed that there was no statistically significant difference between the study and control groups regarding BMI at pre-intervention. However, at post-intervention, the mean BMI decreased to 25.62 ± 4.33 in the study group compared to 34.75 ± 4.21 in the control group. These findings were consistent with **Ryu et al. (2021),** who mentioned that, following a sleeve gastrectomy, the investigated sample's BMI dramatically dropped over time. Additionally, these results were supported by **Shaaban et al. (2023)**, who reported that a statistically significant difference was found among the studied patients regarding BMI level after the application of nursing guidance. This finding was aligned with **Mahran et al. (2022)**, who showed that a significant change occurred in BMI post-program compared to pre-program.

The study findings were similar to **Hablass et al. (2023)**, who showed a significant statistical reduction in body weight and BMI among the studied patients post-program implementation at a P-value of ≤ 0.001. This consistency could be attributed to the effectiveness of the pre- and post-operative educational sessions of the MEP and surgery in reducing body weight and BMI among the studied patients.

Regarding the mean scores of biochemical parameters pre and post-intervention, the current study found that, there was no statistically significant difference between the studied groups at pre-intervention with respect to all items of biochemical parameters. However, at post-intervention, all items of biochemical parameters decreased more in the study group than in the control group. These findings were consistent with those of **Dalli and Erdem (2025)**, who reported that during the post-operative period, patients' biochemical measurements such as fasting blood glucose, uric acid, total cholesterol, triglycerides, and calcium levels were above the

reference range in the preoperative period but within the normal range in the postoperative period (P<0.001).

Moreover, the findings were consistent with **Batar, Demir & Bayram (2021)**, who indicated a significant drop in the values of biochemical parameters postoperatively compared to preoperatively. Additionally, these results were aligned with **Zuhal et al. (2020)**, who showed that preoperative laboratory investigations improved postoperatively among the studied patients. This similarity could be explained by the fact that the patients followed the instructions of the MEP postoperatively, especially dietary instructions, which led to a reduction in BMI and improvement in biochemical parameters.

According to hypothesis 3: Patients who receive MEP (study group) will have a significant increase in total quality of life score compared with those who don't receive (control group).

Regarding the distribution of the mean scores of sub-domains of the QoL scale pre and post-intervention, the present study reported that there was no statistically significant difference among the study and control groups regarding the mean scores of QoL subdomains at pre-intervention. However, a significant improvement in the mean scores of all QoL subdomains occurred among the study group compared to the control group at post-intervention (P<0.001). This finding was consistent with **Tulucu (2022)**, who concluded that there was a significant improvement in the mean scores of all QoL subdomains among the studied sample after surgery compared to before surgery. This consistency might be related to the patients who were keen on following the instructions of the MEP after surgery, which helped them improve their QoL.

As regards the distribution of the mean scores of physical and mental health domains of QoL pre-intervention and post-intervention, the study findings reported that the mean scores of physical and mental health domains for both groups were almost the same pre-intervention. However, at 3 months post-intervention, the mean scores of the physical and mental domains were improved in the study group compared to the control group. These findings were consistent with **Usta (2020)**, who reported that patients who received training and counseling sessions regarding sleeve gastrectomy showed improvements in the mean scores for the physical and mental components post-intervention compared to pre-intervention. Additionally, the findings were aligned with **Albarrán et al. (2021)**, who indicated that the physical and mental components of QoL were significantly increased among the studied group at 12 months after surgery.

These findings also were aligned with **Tulucu (2022)**, who stated that there was a significant improvement in the mean scores of the physical and mental dimensions of the QoL scale among the studied sample postoperatively compared to preoperatively. This agreement in results could be attributed to the effectiveness of the teaching sessions of the multidimensional package in improving patients' QoL in physical and mental health domains.

Concerning the total mean scores of QoL pre-intervention and post-intervention, the current results revealed that the mean total scores of QoL for both groups were similar at pre-intervention. However, the total QoL mean scores improved significantly among the study group compared to the control group at post-intervention (P<0.001). This finding was consistent with **Ali (2019),** who demonstrated a significant improvement in QoL after the implementation of nursing guidelines in the study group compared to the control group. Additionally, this finding was in line with **Alkassis et al. (2019)**, who reported an improvement in the mean scores of QoL among patients who experienced weight loss after surgery.

These findings were supported by **Mousa et al. (2024)**, who indicated that more than two-thirds of patients had a good total quality of life level after sleeve gastrectomy surgery. Moreover, these findings were consistent with **Moustafa et**

al. (2021), who found that nearly three-quarters of patients who underwent gastrectomy surgery had a good level of quality of life. This similarity in results might be related to patients' knowledge improvement after educational sessions and its significant effect on reducing their weight, decreasing postoperative complications, and thus improving their QoL.

Conclusion:

The results of the current study concluded that, after the implementation of a multidimensional educational package, two-thirds of the study group had a good level of knowledge compared to one-tenth of the control group. There was a statistically significant decrease in BMI and biochemical parameters in the study group compared to the control group. Additionally, there was a significant improvement in the quality of life among the study group compared to the control group. Moreover, the multidimensional educational package proved its efficacy in improving knowledge, reducing Body Mass Index and biochemical parameters, and enhancing the QoL of patients undergoing LSG.

Recommendations

- Designing and implementing an educational program for obese patients is beneficial to enhance their knowledge and practices as regard to LSG.
- Training sessions should be given to nurses in obesity outpatient clinics to increase their knowledge regarding the care of patients undergoing LSG.
- The application of a MEP as a routine care in obesity outpatient clinics is very important.
- Future research with a carefully constructed large sample size is required to gain more insight into the effects of the MEP on BMI, biochemical parameters, and QoL among patients undergoing LSG.

References:

Aboulghate, M., Elaghoury, A., Elebrashy, I., Elkafrawy, N., Elshishiney, G., Abul-Magd, E., & Voko, Z. (2021). The burden of obesity in Egypt. *Frontiers in public health*, *9*, 718978. https://doi.org/10.3389/fpubh.2021.718978

Akkayaolu, H., & Celik, S. (2020). Eating attitudes, perceptions of body image and patient quality of life before and after gastric sleeve surgery. *Applied Nursing Research*, 53, 151270. 10.1016/j.apnr.2020.151270

Albarrán, S., Aldo, F., Etual, E., Mario,M., &Victoria, M. (2021). Quality of life evaluation in Mexican patients with severe obesity before and after bariatric surgery 2021. *Gac Med Mex*. 2021;157:64-69 DOI: 10.24875/GMM.M21000522

Alhuzaim, W. M., Alajlan, R. M., Alshehri, R. A., Alanazi, R. M., Alsarhan, L. K., Alamri, H. K., & Alajlan, R. (2023). Post-gastric sleeve surgery chronic symptoms from a sample of patients in Saudi community. *Cureus*, 15(7).

Ali, G. (2019). Effects of Nursing Guidelines on Postoperative Complications and Quality of Life in Patients Undergoing Bariatric Surgeries. *Tanta Scientific Nursing Journal,* 17(2), 99-122.

Alkassis, M., Haddad, F.,G., Gharios, J., Noun, R., & Chakhtoura, G.(2019). Quality of Life before and after Sleeve Gastrectomy in Lebanese Population. *Journal of Obesity,*(2019):1-6.

Barros, L., Brandão, M., G., Barbosa, O., Fontenele, N., Ximenes, M., Neto, N., Caetano,J. (2019). Perception of quality of life. *Journal of Nursing Education and Practice*, 9 (5): 32-38.

Batar, N., Demir, H. P., & Bayram, H. M. (2021). Assessment of nutritional status, body composition and blood biochemical parameters of patients following sleeve gastrectomy: 6 months follow up. *Clinical Nutrition ESPEN*, *43*, 184-190

Benalcazar, D. A., & Cascella, M. (2022). Obesity surgery preoperative assessment and preparation. In *StatPearls [Internet]*. StatPearls Publishing. PMID: 31536273

Chandrasekhar, T., BHAVANI, M. K. S., & MAHENDRA, M. M. (2023). Automatic BMI calculator. IX, 3077-3091.

Dallı Şen, S., & Erdem, N. Z. (2025). The effect of nutrition on sleeve gastrectomy patients' weight loss, biochemical measurements, and comorbids: A clinical study. *Nutrition and Health*,3(2), 451-462. Doi: 02601060231186847

El-Maghawry, H., Said, S., Amin, M., Yehia, A. & Nofal, H. (2021). Effect of an educational program on lifestyle modification for patients undergoing laparoscopic sleeve gastrectomy surgery. *The Egyptian journal of community medicine*; 39 (1);1-11.

Graham, Y., Wilde, L., Johnson, M., Fox, A., Scott, J., & Hayes, C. (2019). Why we need to define nurses' roles in bariatric patient care. *Nursing Times*, 115(6), 34-35.

Grönroos, S., Helmiö, M., Juuti, A., Tiusanen, R., Hurme, S., Löyttyniemi, E., & Salminen, P. (2021). Effect of laparoscopic sleeve gastrectomy vs Roux-en-Y gastric bypass on weight loss and quality of life at 7 years in patients with morbid obesity: the SLEEVEPASS randomized clinical trial. *JAMA surgery*, 156(2), 137-146.

Hablass, A., Mansour, M., Refaie, A.,& Ibrahim, A. (2023). Effect of an Educational Program on Minimizing Complications for Patients Post Bariatric Surgeries. *Journal of Nursing Science Benha University*, 4(2), 732-747.

Ibrahiem, A., Kamel, S., Abdel Rahman, A., & Afif, A. (2021). Effect of Lifestyle Modification Module on Patients' Compliance Postoperative Bariatric Surgery. *Journal of Nursing and Health Science*, 21(2), 52-57.

Kashihara, H., Shimada, M., Yoshikawa, K., Tokunaga, T., Nakao, T., Nishi M., Takasu, c. ,Wada, Y. & Yoshimoto, T. (2022). Impact of preoperative intervention in laparoscopic sleeve gastrectomy. Doi: https://doi.org/10.21203/rs.3.rs-1704315/v1

Köhler, H., Dorozhkina, R. Gruner -Labitzke, K., & de Zwaan, M. (2020). Specific health knowledge and health literacy of patients before and after bariatric surgery: a cross-sectional study. Obesity facts, 13(2), 166-178.

Luesma, J., Fernando, J., Cantarero, I., Lucea, P., & Santander, S. (2022). Surgical Treatment of Obesity, Special Mention to Roux-en-Y Gastric Bypass and Vertical Gastrectomy. *Frontiers in Endocrinology*, 13, 867838.

Mahran, M., El-Sharkawy, A., Mohammed, D., & Mohammed, H. (2022). Dilemma of Local GIT Hormones after Bariatric Maneuvers. *Minia Journal of Medical Research,* 31(1), 54-59.

Mousa, M., Abd-El Azize, M., Mahmoud, A., & Abo Sree.T. (2024). Quality of Life among Patients with Sleeve Gastrectomy. Journal of Nursing *Science Benha University*, 5(2), 267-281.

Moustafa, F., Mohammed, A., Zeineldin, A., Elgeiedie, A., & Hafez, T. (2021). Laparoscopic sleeve gastrectomy versus laparoscopic single anastomosis gastric bypass: short-term outcome. *The Egyptian Journal of Surgery*, 40(1), 300-308. DOI: 10.4103/ejs.ejs_335_20

Musa, A. F., Yasin, M. S. M., Smith, J., Yakub, M. A., & Nordin, R. B. (2021). The Malay version of SF-36 health survey instrument: testing data quality, scaling assumptions, reliability and validity in post-coronary artery bypass grafting (CABG) surgery patients at the National Heart Institute (Institut Jantung Negara—IJN), Kuala Lumpur. *Health and quality of life outcomes*, 19(1), 50. Doi: 10.1186/s12955-020-01658-9

Mohajan, D., & Mohajan, H. K. (2023). Body mass index (BMI) is a popular anthropometric tool to measure obesity among adults. Journal of Innovations in Medical Research, 2(4), 25-33.

Parretti, H., Hughes, C., & Jones, L. (2019). The rollercoaster of follow-up care'after gastric sleeve surgery: a rapid review and qualitative synthesis. *Obesity Reviews,* 20(1), 88-107.

Poon, D., & Rosenbluth, A. (2022). Prevention of bariatric complications. best practices.

Mini-invasive Surgery, 6(18), 1-13..Doi: https://doi.org/10.20517/2574-1225.2021.129

Ryu, K., Bae, J., Kim, E., An, J., Choi, M., Lee, J. & Sohn, T. (2021). Long-term effect of simplified dietary education on the nutritional status of patients after a gastrectomy. *Plos one*; 16(5), e0252168.

Shaaban, E. G., Mohamed., H.E., Saleh, Y. H., El Magabi, N. M., & Khalil, S. S. (2023). Effect of Hybrid Nursing Guidance on Eating Patterns and Perception among Patients Post Gastric Sleeve. *Assiut Scientific Nursing Journal*, 11(37): 108-120.

Silverman, J. (2022). Obesity surgery and postoperative nutritional management. *Physician assistant clinic* ,7(1),665-83.

Stenberg, E., Falcao, L., O'Kane, M., Liem, R., Pournaras, D., Salminen, P., Urman, R., Wadhwa, A., Gustafsson, U. & Thorell, A. (2022). Guidelines for Perioperative Care in Bariatric Surgery: *World J Surg*, 46(1),729–751.

Telem, D., Greenstein, A . & Wolfe, B. (2025.). Up-to-date. Bariatric surgery incidence. Available at: https://www. uptodate. com/ contents/ outcomes-of-bariatric-surgery/print

Tulucu, F. (2022). Bariatric Surgery and Quality of Life in Obese Patients with Respiratory Difficulty. *Cyprus J Med Sci*, 7(5):604-608. DOI: 10.4274/cjms.2022.2022-17

Usta, E. (2020). Effects of Nursing Counseling on Self-Image, Depression, Eating Characteristics, Quality of Life and Comfort Level of Patients with Bariatric Surgery, Sakarya Universities, Turkey. ProQuest dissertations publishing. Available at: https://www .proquest .com/ docview /2700374566/fulltextPDF/ 795F68 51 A 2 9 E 4 C4BPQ/7?accountid=178282

Ware, J.,Kosinskim, M. & Keller, S. (1994). SF-36 Physical and Mental health summary scales : Auser manual .Boston: the health institute .*Medical care J*., 34 (1):220-233.

World Health Organization (2022). Non Communicable diseases. Available at: https://www.who.int/news-room/fact-sheets /detail/ noncommunicable-diseases .

Zhang, L., Yu, S., Wei, X., Wu, L. & Gao, L. (2020). Application of medical nursing integrated nursing mode in patients undergoing laparoscopic roux-en-y gastric bypass bariatric surgery. *American journal of nursing science*; 9(4): 215-219.

Zuhal,K., Burhan, H.,Nurullah, A., Nizamettin, K., Mehmet, B., Sinan, I., Selim, S. &Ali, A.(2021). Postoperative first-month biochemical parameters in laparoscopic sleeve gastrectomy patients. Laparosc Endosc Surg Sci 2019;26(4),161-164 DOI: 10.14744/less.2020.68442