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# The Role of Pharmacist Intervention in Improvement of Patient Adherhence to Medication and in preventing Complication After Bariatric Surgery

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**Abstract** **Background:** Bariatric surgery is the most successful treatment for obesity regarding the degree and duration of weight loss. **Aim of the Study:** Evaluate the impact of pharmacist educational intervention and training in improving patient adherence and its association with the prevention of clinical nutritional complications after bariatric surgery. **Patient and Method:** A randomized comparative interventional study was conducted in Najaf Governorate, Iraq. The Intervention group included 58 patients who received standard care and training educational and support programs. The standard care group included 58 patients who received standard care after Bariatric surgery. **Results:** In the intervention group, at 3 months of follow-up, the mean total score was 5.8 and increased to 6.7 at the 6 months. Conversely, the score decreased in the standard care group from 5.3 at 3 months to 2.2 at 6 months. In contrast to the standard care group, an inverse significant correlation was found between the number of incident complications and the total eight-item Morisky Medication Adherence Scale (MMAS-8) at 3 and 6 months in the intervention group. **Conclusion:** The pharmacist intervention leads to better patient adherence to gulidline after Bariatric surgery which results in decreased complications at three and six months after surgery.

**Key Words** bariatric surgery, pharmacist intervention, complications

## 1. Introduction

Bariatric surgery is one of the successful options for the treatment of obesity regarding weight loss and associated enhancements in lowering obesity-related complications and decreasing mortality [1]. Several surgical procedures are now broadly applied in clinical practice including laparoscopic roux-en-Y gastric, sleeve gastrectomy, and bypass banding [1], [2]. Bariatric surgery should be planned in patients with very high risks of complications when therapies have been inadequately effective [1]. It is indicated in the following patients; Class 3 obesity (marked or morbid obesity) and class 2 obesity (severe obesity) with complications like type 2 diabetes mellitus or obstructive sleep apnoea in addition to some evidence-based guidelines suggest that patients who have body mass index > 30 kg/m2 with recent-onset diabetes are also indicated for bariatric surgery [1], [3]. In addition to complications like other surgical procedures, bariatric surgery has its complications which may be dangerous is some patients [3]. Postsurgical weight loss changes the composition of water and fat in the body and changes the absorption and distribution of drugs. In addition, a restrictive procedure such as sleeve gastrectomy may alter the time of gastric emptying, pH, and mucosal exposure [4], [5].

Additional problems may arise such as pouch and distal oesophageal dilatation with effectiveness loss, persistent vomiting, constipation, hypoglycaemic or hypotensive ‘dumping’ syndromes, hypoglycaemia and micronutrient deficiencies [1], [4]. The main causes of weight regain or loss of insufficient weight include failure to follow dietary guidelines, inadequate exercise, psychiatric disorders, and postsurgical complications (e.g., dilated gastrojejunal anastomosis, large or dilated gastric pouch) [4]. Adherence has been defined as the degree to which a person complies with the therapeutic recommendation regarding taking medication, adhering to a diet, or making other lifestyle adjustments [6], it is the most significant barrier to the treatment’s efficacy [7]. Poor medication adherence is considered an important contributor to undesirable health outcomes, it is influenced by

a variety of parameters, including community background, personal traits and communications with physicians and other healthcare providers [6], [8].

### *A. Aim of the Study:*

Evaluate the impact of pharmacist educational intervention and training in improving patient adherence and its association with the prevention of clinical nutritional complications after bariatric surgery.

## 2. Patients and Method

A randomized comparative interventional study was conducted during the period from the 18th of May 2023 to the 1st of January 2024 in Al-Najaf Al-Ashraf Teaching Hospital and Al-Batool Private Hospital in Iraq. A convenient sample of 116 patients who were planned to undergo Bariatric surgery were included; The Intervention group included 58 patients who received standard care and training educational and support programs through direct and indirect communication. The standard care group included 58 patients who received standard care for post Bariatric surgery patients. Inclusion criteria included age $\geq$18 years and first time to undergo bariatric surgery.

The study was proposed and subsequently approved by the Ethical and Scientific Committee of the Faculty of Medicin/ Kufa University (the official letter dated 9/5/2023), the Scientific Committee of Research of Najaf Health Directorate (the official letter No. 20728 dated 18/5/2023), and Al-Batool Private Hospital (the official letter No. 3524 dated 24/5/2023). The permission to use the MMAS-8 was granted from MORISKY MEDICATION ADHERENCE RESEARCH, LCC, certificate number: 4425-8044-5406-6099.

The data was collected using validated questionnaires, English and Arabic versions, that have been reviewed and revised by a panel of experts. The required information was gathered at three times as follows; At base line (before surgery): The data included sociodemographic, medical, and surgical history; At 3 months after surgery: The data included assessments of postoperative complications and adherence of the patients; At 6 months after surgery: The data included assessments of postoperative complications and adherence of the patients. With the assistance of the surgeon and the radiologist, the postoperative complications were recorded and categorized into three groups including early incident postoperative complications included postoperative nausea and vomiting, abdominal pain, suture leaks or suture line bleeding, postoperative bleeding, and decreased O2 saturation; Complications at postoperative three months included cramps, constipation, hair loss, paresthesia, gastroesophageal reflux disease (GERD), abdominal pain, palpitations, muscle pain, bloody stool, and diarrhea; Complications at postoperative six months included hair loss, GERD, muscle pain, numbness, gallstone, constipation, and hernia. The MMAS-8 is reliable and valid in patients, it includes 8 questions [9], [10]. The total score of all items was calculated with a sum score ranging from 0 to 8 for adherence which was calculated if the respondent answered at least 6 of 8 items [11], [12]. The first seven items of MMAS-8 have dichotomous responses (yes=0 and no=1) to avoid acquiescence bias, whereas the eighth item has a 5-point Likert scale response indicating (low to high) level of adherence, the eighth question was assessed from "never/rarely' to "all the time", a score of one was assigned to "never/rarely' response and zero for all other responses [13]. The MMAS scores were categorized into the following 3 levels of adherence: High adherence if the score = 8, medium adherence if the score = 6-8, and low adherence if the score is < 6 [14]. The intervention was achieved through direct interviews at different times including preoperative intervention, postoperative intervention, at three months postoperative, at six months postoperative, and when the patient requested. In addition, the patients were kept in contact in the following ways: 1. Personal contact by phone call three times weekly and when the patients requested; 2. By "WhatsApp" groups for patients for daily discussion, recommendations, and group therapy. In addition, a small book was prepared and included advice and regimen of treatments, physical activity, and proper dietary practice, this book was distributed to all participants in the intervention group. The intervention included the following subjects; The main benefits of the surgery with an expected time interval to get these benefits, the main complications that would be expected and the main risk factors for these complications, mainly the preventable risk factors with proper ways to avoid them, the correct use of postoperative treatment and supplements and the importance of adherence, highlight the importance and proper ways of physical practice, and dietary practice according to the current guidelines, and psychological intervention includes psychological support and advice in addition to adding treatment as the patients need in correlation with the opinion of the surgeon.

Continous data were presented as mean ±standard deviation (SD). Descriptive data were presented as frequency and percentage. Continuous variables and the generated scores of variables were tested for statistical normality distribution, then t-test was used to compare the variables between groups. For categorical data, Chi-square test and Fisher's exact test were used. The level of significance was set as P. value of less than 0.05.

## 3. Results

The study involved two groups with 58 patients in each, namely, intervention and standard care groups. Both groups were almost matched for age and gender, (P. value = 0.906 and 0.770, respectively). Other baseline variables include education, occupation, smoking history, and alcohol use (P. value > 0.05), Table 1.

The medical and surgical history of the studied groups showed no significant differences in the frequency of chronic diseases between the studied groups (Table 2).

Post-operative nausea and vomiting were the commonest early postoperative complications reported in both groups, followed by Abdominal pain (Table 3). Three months after

| Variable | | Standard care (n=58) | | Intervention (n=58) | | P. value |
|---|---|---|---|---|---|---|
| | | No. | % | No. | % | |
| Age (year) | <30 | 20 | 34.5 | 23 | 39.7 | 0.906** |
| | 30 – 39 | 17 | 29.3 | 15 | 25.9 | |
| | 40 – 49 | 16 | 27.6 | 14 | 24.1 | |
| | ≥ 50 | 5 | 8.6 | 6 | 10.3 | |
| | Mean ±SD | 34.7 ±9.5 | - | 34.1 ±11.5 | - | 0.770# |
| Gender | Male | 12 | 20.7 | 16 | 27.6 | 0.385** |
| | Female | 46 | 79.3 | 42 | 72.4 | |
| Education | Primary school | 34 | 58.6 | 29 | 50.0 | 0.246** |
| | Secondary | 8 | 13.8 | 15 | 25.9 | |
| | Higher | 16 | 27.6 | 14 | 24.1 | |
| Occupation | Housewife | 34 | 58.6 | 32 | 55.2 | 0.931** |
| | Employed | 10 | 17.2 | 11 | 19.0 | |
| | Unemployed | 14 | 24.1 | 15 | 25.9 | |
| Smoking | Yes | 15 | 25.9 | 16 | 27.6 | 0.834** |
| | No | 43 | 74.1 | 42 | 72.4 | |
| Alcohol use | Yes | 2 | 3.4 | 1 | 1.7 | 1.00* |
| | No | 56 | 96.6 | 57 | 98.3 | |
| * Fisher's exact test: **Chi-square: #t-test | | | | | | |

Table 1: Baseline demographic characteristics of the studied groups

| Variable | | Standard care (n=58) | | Intervention (n=58) | | P. value |
|---|---|---|---|---|---|---|
| | | No. | % | No. | % | |
| DM | Yes | 16 | 27.6 | 13 | 22.4 | 0.520** |
| | No | 42 | 72.4 | 45 | 77.6 | |
| Hypertension | Yes | 13 | 22.4 | 15 | 25.9 | 0.664** |
| | No | 45 | 77.6 | 43 | 74.1 | |
| Osteoarthritis | Yes | 23 | 39.7 | 26 | 44.8 | 0.573** |
| | No | 35 | 60.3 | 31 | 55.2 | |
| Gallstones | Yes | 3 | 5.2 | 5 | 8.6 | 0.464** |
| | No | 55 | 94.8 | 53 | 91.4 | |
| GERD | Yes | 21 | 36.2 | 17 | 29.3 | 0.426** |
| | No | 37 | 63.8 | 41 | 70.7 | |
| Other comorbidities | Yes | 2 | 3.4 | 3 | 5.2 | 1.000* |
| | No | 56 | 96.6 | 55 | 94.8 | |
| Surgical history | Yes | 6 | 10.3 | 5 | 8.6 | 0.751** |
| | No | 52 | 89.7 | 53 | 91.4 | |
| Contraceptive use/women | Yes | 25 | 54.3 | 27 | 64.3 | 0.390** |
| | No | 21 | 45.7 | 15 | 35.7 | |
| * Fisher's exact test, **Chi-square | | | | | | |

Table 2: Medical and surgical history of the studied groups

surgery, hair loss was the most frequent, followed by constipation, cramps, and paresthesia but no significant difference was found in the incident complications between both groups (Table 4). Six months after surgery, fewer complications were reported. However, no significant difference was found in the incident complications between both groups except in hair loss which was significantly more frequent in the standard care group (P<0.05) as shown in Table 5. From another point of view, the number of incident complications was significantly lower in the intervention group than standard care group, (P<0.05), at both 3 months and 6 months where 32 patients, (55.2%), in the intervention group had 5 or more complications at the 3 months and only 2 patients had 3-4 complications at the 6 months compared to 43/58 (74.2%) and 17.2%, respectively, in standard care group, (P<0.05) as shown in Table 6.

Comparison of total MMAS-8 score between the studied groups revealed that in the intervention group, at 3 months of follow up the mean total score was 5.8 and increased to 6.7 at the 6 months assessment with a mean difference of 0.94 and a change rate of 16.2% (P<0.001). Conversely, the MMAS-8 score decreased in the standard care group from 5.3 at 3 months to 2.2 at 6 months with a reduction rate of 57.9% and the effect size was large (3.74), (Table 7, Figures 1, and Figure 2).

Three months after surgery, the level of adherence was medium in 32 (55.2%) patients and low in 26 (44.8%) patients in the intervention group while at 6 months 51 (87.9%) patients showed medium and only 7 (12.1%) patients showed low adherence levels. In the standard care group, at 3 months 13 (22.4%) patients had medium and 77.6% had low adherence levels while at 6 months frequency of low adherence levels increased to 54 (93.1%), (Table 8).

To assess the correlation between MMAS-8 scores and the number of developed complications, bivariate correlation analysis (Pearson's test) was performed. In the intervention group, an inverse significant correlation was found between the number of incident complications and total MMAS-8

| Complications | Standard care (n=58) | | Intervention (n=58) | | P. value |
|---|---|---|---|---|---|
| | No. | % | No. | % | |
| PONV | 34 | 58.6 | 39 | 67.2 | 0.442 |
| Abdominal pain | 31 | 53.4 | 34 | 58.6 | 0.708 |
| Suture leaks or suture line bleeding | 3 | 5.2 | 5 | 8.6 | 0.714 |
| Postoperative bleeding | 2 | 3.4 | 4 | 6.9 | 0.675 |
| Decreased O2 Saturation | 2 | 3.4 | 2 | 3.4 | 1.000 |

Table 3: Distribution of early incident postoperative complications of the group

| Complication | Standard care (n=58) | | Intervention (n=58) | | P. value |
|---|---|---|---|---|---|
| | No. | % | No. | % | |
| Cramps | 42 | 72.4 | 27 | 46.6 | 0.008 |
| Constipation | 39 | 67.2 | 31 | 53.4 | 0.184 |
| Hair loss | 41 | 70.7 | 37 | 63.8 | 0.552 |
| Paresthesia | 28 | 48.3 | 24 | 41.4 | 0.575 |
| GERD | 25 | 43.1 | 14 | 24.1 | 0.049 |
| Abdominal pain | 23 | 39.7 | 21 | 36.2 | 0.848 |
| Palpitations | 22 | 37.9 | 20 | 34.5 | 0.846 |
| Muscle Pains | 19 | 32.8 | 22 | 37.9 | 0.697 |
| Bloody Stool | 12 | 20.7 | 8 | 13.8 | 0.460 |
| Diarrhea | 9 | 15.5 | 11 | 19.0 | 0.805 |
| Progressive decrease in oral intake | 9 | 15.5 | 7 | 12.1 | 0.778 |
| Fever | 4 | 6.9 | 6 | 10.3 | 0.741 |
| Shock | 2 | 3.4 | 1 | 1.7 | 1.000 |

Table 4: Distribution of incident complications at postoperative three months in both groups

| Complication | Standard care (n=58) | | Intervention (n=58) | | P. value |
|---|---|---|---|---|---|
| | No. | % | No. | % | |
| Hair loss | 22 | 37.9 | 9 | 15.5 | 0.011 |
| GERD | 19 | 32.8 | 11 | 19.0 | 0.138 |
| Muscle pain | 13 | 22.4 | 10 | 17.2 | 0.641 |
| Paresthesia | 12 | 20.7 | 9 | 15.5 | 0.629 |
| Gall stone | 11 | 19.0 | 5 | 8.6 | 0.178 |
| Constipation | 7 | 12.1 | 5 | 8.6 | 0.760 |
| Hernia | 2 | 3.4 | 2 | 3.4 | 1.000 |

Table 5: Distribution of incident complications at postoperative six months in both groups

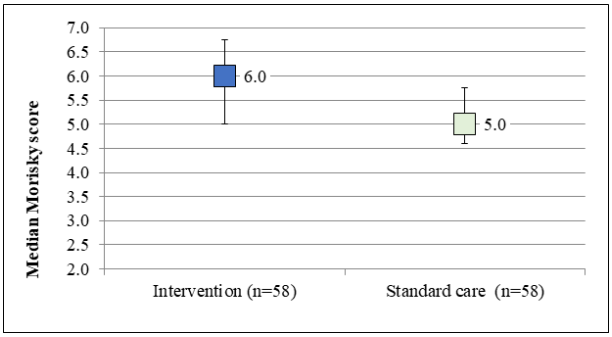


Figure 1: Marker-Line Plot showing the comparison of median MMAS-8 score (Marker) and interquartile range (upper-lower lines) at the third month of follow-up

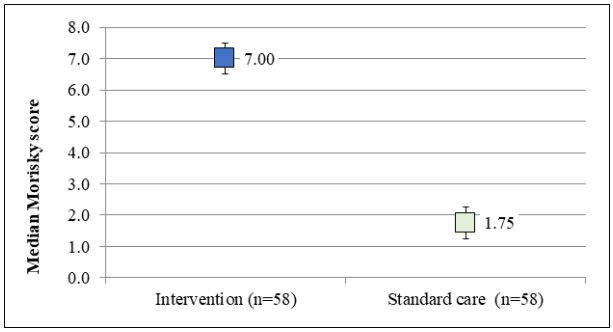


Figure 2: Marker-Line Plot showing the comparison of median MMAS-8 score (Marker) and interquartile range (upper-lower lines) at the sixth month of follow-up

score at 3 months (R = -0.290, P=0.027, significant) and 6 months (R = -0. 417, P=0.001, significant). In contrast, there were no significant correlations between the number of incident complications and total MMAS-8 score at 3 months (R = -0.112, P=0.401, significant) and 6 months (R = -0. 138, P=0.303, significant) in the standard care group. As shown in Table 9.

## 4. Discussion

The present study revealed that the incidence of complications was significantly higher in the standard care group at three and six months after surgery. In agreement, concluded that Clinical pharmacists can help to promote patient safety and improve the bariatric surgery experience for patients by utilizing their deep knowledge of drug formulations and phar-

| Complications | | Group | | | | P. value |
|---|---|---|---|---|---|---|
| | | Standard care (n=58) | | Intervention (n=58) | | |
| | | No. | % | No. | % | |
| At three months | None | 2 | 3.4 | 1 | 1.7 | 0.004* |
| | 1 – 2 | 5 | 8.6 | 6 | 10.3 | |
| | 3 – 4 | 8 | 13.8 | 19 | 32.8 | |
| | 5 – 6 | 16 | 27.6 | 23 | 39.7 | |
| | >6 | 27 | 46.6 | 9 | 15.5 | |
| At six months | None | 14 | 24.1 | 37 | 63.8 | <0.001** |
| | 1 – 2 | 34 | 58.6 | 19 | 32.8 | |
| | 3 – 4 | 10 | 17.2 | 2 | 3.4 | |
| *Chi-square test, **Fisher's exact tests | | | | | | |

Table 6: Distribution of the total number of incident postoperative complications at 3 and 6 months of follow-up

| Total MMAS-8 score | Group | | | | P. value between groups |
|---|---|---|---|---|---|
| | Standard care (n=58) | | Intervention (n=58) | | |
| | Mean | SD | Mean | SD | |
| At 3 months | 5.3 | 0.8 | 5.8 | 1.2 | 0.011 |
| At 6 months | 2.2 | 1.5 | 6.7 | 0.9 | <0.001 |
| Mean difference | -3.07 | 0.15 | 0.94 | 0.14 | <0.001 |
| Percentage change | -57.9% | 4.8% | 16.2% | 2.9% | |
| P. value within group | <0.001 | | <0.001 | | |
| Effect size | | | 3.74 | Large | |

Table 7: Comparison of total MMAS-8 scores between the studied groups

| Duration | Adherence | Group | | | | P. value between groups |
|---|---|---|---|---|---|---|
| | | Standard care (n=58) | | Intervention (n=58) | | |
| | | No. | % | No. | % | |
| At 3 months | Medium | 13 | 22.4 | 32 | 55.2 | <0.001 |
| | Low | 45 | 77.6 | 26 | 44.8 | |
| At 6 months | Medium | 4 | 6.9 | 51 | 87.9 | <0.001 |
| | Low | 54 | 93.1 | 7 | 12.1 | |
| P. value within group | | 0.035 | | <0.001 | | |

Table 8: Comparison of the level of adherence between the studied groups

| Variable | Correlation vs. Total MMAS-8 score at 3 months | | | |
|---|---|---|---|---|
| | Standard care group (n=58) | | Intervention group (n=58) | |
| | R | P. value | R | P. value |
| Total number of complications at 3 months | -0.112 | 0.401 | -0.290 | 0.027 |
| Total number of complications at 6 months | 0.138 | 0.303 | -0.417 | 0.001 |

Table 9: Bivariate (Pearson's) analysis for the correlation between MMAS-8 scores and outcome variables

macokinetics [15]. The pharmacist still has a significant role to perform in the patient's therapy after the operation. Based on the Bariatric surgery type, the pharmacist can recommend the best agent and regimen for the medical therapy [16].

The present study revealed that the incidence of cramps was significantly higher in the standard care group three months after surgery and the incidence of hair loss was significantly higher in the standard care group six months after surgery. Abdominal pain following bariatric surgery can have a variety of underlying reasons, from acquired food intolerance and overindulgence to more complex conditions including ulcers, intussusception, and blockage [17]. One known side effect of bariatric surgery is hair loss. More than half of the patients experience short-term hair loss according to some studies which showed that the amounts of iron and zinc, along with other nutrients, are linked to hair loss [18]. This may explain the difference in the incidence of cramps and hair loss between the groups of the current study as it might be linked to the difference in adherence to the recommendations and compliance.

In the current study, a significantly better level of adherence was achieved in the intervention group compared to the standard care group. This agreed with the results of another study in the United Kingdom which concluded that post-surgical appointments with the pharmacist would provide support and improve compliance with medications after bariatric surgery [19]. Along the same lines, concluded that requiring patients to adhere to behavioural modifications, particularly those related to exercise and dietary restrictions, and increasing patient contact could improve the long-term results of bariatric surgeries [20].

A significant correlation was obtained in the current study

between the level of adherence and the incidence of complications. In agreement, revealed that adherence to postoperative schedules was associated with improved patient outcomes after bariatric surgery [21]. In the same line, reported that adherence to postoperative recommendations predicted the positive outcomes of bariatric surgery [22]. That poor adherence is linked to a lack of support, dissatisfaction with clinical visits, inadequate follow-up as a result of missed consultations, and discharge planning. They concluded that prompt identification and treatment could enhance patient compliance [23].

## 5. Conclusion

The pharmacist intervention led to better patient adherence to guidelines after Bariatric surgery which resulted in decreased complications at three and six months after surgery.

## Conflict of interest

The authors declare no conflict of interests. All authors read and approved final version of the paper.

## Authors Contribution

All authors contributed equally in this paper.

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