Effects of Bariatric Surgery on Hormonal and Joint Co-morbidities in Obese Patients in Al-Madinah Region (Western Saudi Arabia): A tertiary Hospital Experience

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Abstract

Background: As a major global public health concern, obesity is related to a number of hormonal comorbidities as well as a lower quality of life in older children and adults. Weight loss with bariatric surgery has proven to be a successful intervention. Few reports exist on hormonal and osteoarthritis comorbidities in Al-Madinah Region (western Saudi Arabia) before and after bariatric surgery.

Objectives: This study aimed at determining the prevalence of hormonal and joint co-morbidities in obese patients before and after bariatric surgery in Al-Madinah region.

Patients and methods: In older children (14-16 year) and adults, a retrospective analysis was carried out using data on hormonal co-morbidities prevalence as hypothyroidism, polycystic ovary syndrome and hyperprolactinemia in addition to joint osteoarthritis and quality of life post-bariatric surgery compared to the original conditions.

Results: A total of 170 patients were included in this study. Statistically significant differences were observed in the prevalence of hypothyroidism using chi square test ($p<0.05$) (35 patients, 20.5% of the studied sample significantly decreased after bariatric surgery to 17 patients only, 10.0% of the studied sample) and polycystic ovary (23 individuals 13.5% of the sample under study dramatically dropped to 6 patients only, 3.5%) chi square test ($p<0.01$). Prevalence of hyperprolactinemia and joint osteoarthritis decreased strongly but not significantly after bariatric surgery. Quality of life improved after bariatric surgery.

Conclusion: The prevalence of hormonal and joint co-morbidities declined after bariatric surgery while quality of life improved. This supports the advantages of bariatric surgery and obesity management while considering these comorbidities.

Keywords: Bariatric surgery; BMI; Hormonal comorbidity; Obesity; Osteoarthritis, Saudi Arabia

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Introduction

Obesity pandemic endangers millions of adults and adolescents globally. According to the World Health Organization, there are more than 1.9 billion overweight and obese individuals globally, and of those over 600 million are morbidly obese **(WHO , 2021)**. Previously, we highlighted the biochemical control of glycemia and lipidemia in diabetic patients and other health benefits through bariatric surgery on obese diabetic patients in western Saudi Arabia **(Abdel-Rahman et al., 2024)**. Over the past 20 years, obesity dramatically increased in both industrialized and developing nations **(Ogden et al., 2014; WHO, 2021)**. Obesity is problematic in Saudi Arabia due to its increased prevalence and obesity rates(20% to 30.7% among men and women) **(Madani et al., 2000)**. From 1995 onward, a high rate of obesity in the Saudi community occurred for both men (30.7%) and women (28.4%) **(Al Othaimeen et al., 2007)**. Approximately 5.5 million of the Saudis are obese, with 2.7% of them being severely obese **(Al-Nozha et al., 2005).**

Numerous negative effects on health and problems with quality of life are linked to obesity **(Katzmarzyk and Janssen, 2004; Abilés et al., 2010)**. Obesity increases diabetes risk **(Wild and Byrne, 2006)**, heart diseases **(Wild and Byrne, 2006; Boden and Salehi, 2013)**, and cancer **(Kasim et al., 2005)**. Obesity lowers a patient's quality of life and prevents them from engaging in productive employment and increased the money needed to care obese patients **(Bouchard and Bray, 2004; Bužgová et al., 2014; Farhud, 2015)**.

Bariatric surgery is promising for treating co-morbidities associated with obesity and weight loss **(Abilés et al., 2010)** causing a considerable improvement in pre-existing illnesses as diabetes **(Kim and Kim, 2016)**, and correlated co-morbidities. A noticeable decrease in obesity comorbidities was reported following surgery as compared to before surgery, both in the immediate postoperative period and the long term **(Crémieux et al., 2010; Hatoum et al., 2016)**.

This retrospective study aimed at addressing the paucity of information regarding hormonal comorbidity remission following bariatric surgery in the diverse and geographically distributed populations of Saudi Arabia. Specifically, it focused on determining the prevalence of hormonal comorbidities among obese patients in the Al-Madinah Region both before and after undergoing bariatric surgery. Additionally, this study offers insightful information about how bariatric surgery affects the general health of obese people in the Al-Madinah Region.

Patients and methods

Design, context, and length of the study

From November 2022 to April 2024, a retrospective cohort study was conducted at King Salman bin Abdulaziz Medical City's Department of General Surgery, Division of Bariatric and Upper Gastrointestinal Unit. The study made use of pre-existing data on 170 patients from the hospital archives. In order to examine the changes in co-morbidities both before and after bariatric surgery, data was gathered, tabulated and Chi square for non-parametric data was done.

Ethical committee approval

The Helsinki Declaration's guiding principles were strictly followed in our study. According to Taibah University Medical College guidelines, local ethical approval was also gained. Human subject names were kept private and secret by being kept in a password-protected database. Patients' identifiers were not used.

Examining the population and sampling

Based on sample size calculations, a total of 170 patients were included in the study. King Salman bin Abdulaziz Medical City hospital had 300 patients with co-morbidities who had undergone bariatric surgery. The computed sample size was found to be 170 patients, with a 5% margin of error and an anticipated improvement proportion of 50%. Obese individuals who underwent bariatric surgery at this hospital had a one-year follow-up period with proven co-morbidities and met the inclusion criteria. To provide equitable representation, subjects with a variety of racial and ethnic origins were included. This study enrolled children fourteen years and 16 years but did not enroll obese individuals with or without co-morbidities outside of Al-Madinah region, Saudi Arabia.

Measurements

In older children (14-16 year) and adults, 170 patients' samples were selected at random from King Salman bin Abdulaziz Medical City hospital's medical records allowed for the collection of our study's data. These patients, who were obese and had undergone gastric sleeve surgery, also suffered from one or more chronic illnesses as hypertension or diabetes. The current study examined how much these chronic illnesses had improved and noted any adverse effects of the gastric sleeve procedure from reports and hospital record archives.

Statistical analysis

A data collection sheet was used to gather patients' data regarding the presence or absence of hypothyroidism, polycystic ovary syndrome, hyperprolactinemia, or osteoarthritis during a one-year follow-up period. The data acquired was inputted into and assessed employing the Statistical Package for the Social Sciences (SPSS version 22.0; SPSS Inc., Chicago, IL). For categorical data, frequencies were used using chi-square test as needed. Lifestyle improvements by obesity, sex, and age among the studied cases were evaluated. The statistical significance level was set at $p < 0.05$.

Results

Data from 170 obese patients who had elective bariatric surgery were analyzed for this study. The patients' one-year follow-up period fell between November 2022 and November 2023 in Al-Madinah region in Saudi Arabia. The purpose of this study was to evaluate how these patients' related comorbidities were affected by their surgery.

Bariatric surgery was associated with decreased prevalence of hypothyroidism.

Before bariatric surgery, 35 patients (20.5% of the studied sample) had hypothyroidism and disease prevalence significantly decreased after bariatric surgery and became 17 patients only (10.0% of the studied sample). The comparison was statistically significant with chi square test ($p<0.05$) (**Fig.1**).

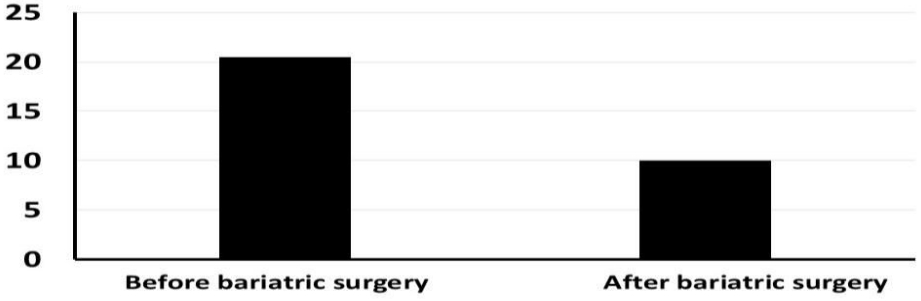

Fig.1. Hypothyroidism prevalence significantly decreased after bariatric surgery. Before bariatric surgery, 35 patients (20.5% of the examined sample) had hypothyroidism and disease

prevalence considerably decreased after bariatric surgery and became 17 patients only (10.0% of the studied sample). Using the chi square test, the comparison was statistically significant ($p<0.05$).

Bariatric surgery was associated with decreased prevalence of polycystic ovary syndrome

Prior to bariatric surgery, polycystic ovarian syndrome affected 23 individuals (13.5% of the sample under study). Following bariatric surgery, the disease's prevalence dramatically dropped to 6 patients only (3.5% of the sample under study). Using the chi square test, the comparison was statistically significant ($p<0.01$) (**Fig.2**).

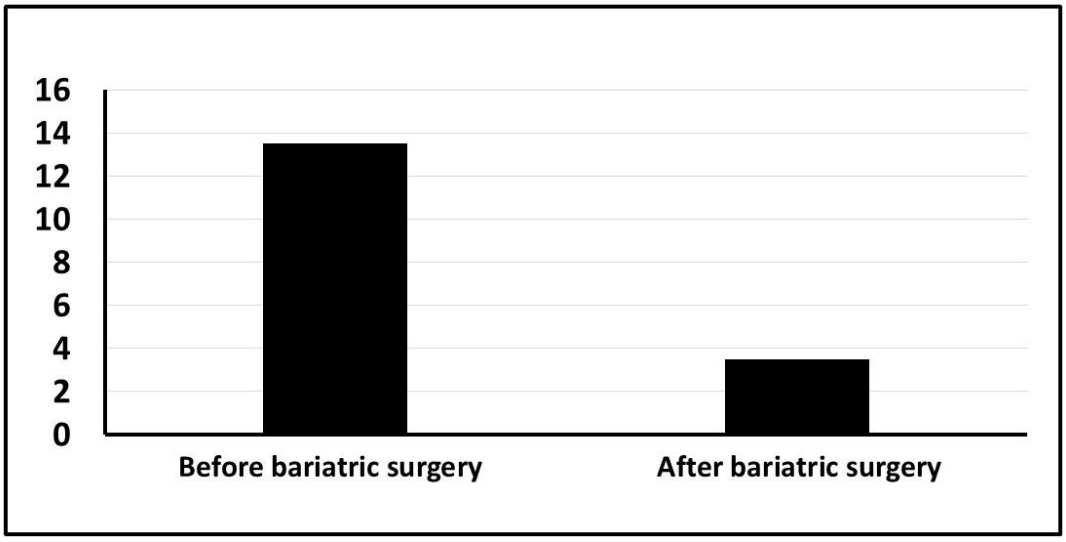

Fig.2. Polycystic ovarian syndrome prevalence significantly decreased after bariatric surgery. 23 people (or 13.5% of the study sample) had polycystic ovarian syndrome prior to bariatric surgery. Following bariatric surgery, the disease's prevalence dramatically dropped to 6 patients only, or 3.5% of the sample under study. The comparison was statistically significant ($p<0.01$) according to the chi square test.

Bariatric surgery was associated with decreased prevalence of hyperprolactinemia.

Following bariatric surgery, there was a strong but non-significant decrease in hyperprolactinemia ($p>0.05$). Bar graph displaying the X-axis hyperprolactinemia status before and after bariatric surgery, analyzed with the chi square method. 2 patients (1.2%) had hyperprolactinemia before bariatric surgery and decreased after bariatric surgery to be one patient only (0.6%). This is displayed on the Y-axis. Following bariatric surgery, several patients with hyperprolactinemia demonstrated improvement (**Fig.3**).

Bariatric surgery was associated with decreased prevalence of joint osteoarthritis.

Joint osteoarthritis decreased after bariatric surgery but that was not statistically significant ($p>0.05$). The chi square method examined the X-axis osteoarthritis status before and after bariatric surgery. 7 patients (4.1%) had hyperprolactinemia before bariatric surgery and decreased after bariatric surgery to be 2 patients only (1.2%). The Y-axis shows the proportion of patients with osteoarthritis both before and

after bariatric surgery. Some individuals with osteoarthritis showed improvements after bariatric surgery, although the difference was not statistically significant (chi square test, p >0.05) (**Fig.4**).

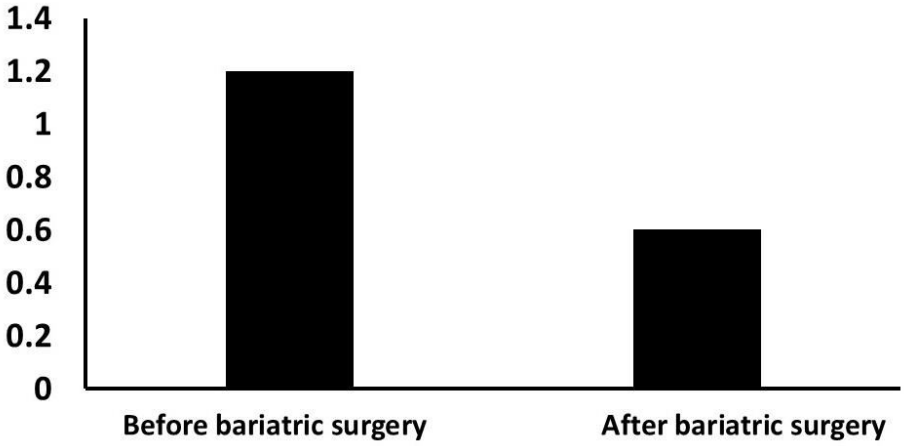

Fig.3. Hyperprolactinemia prevalence decreased after bariatric surgery. After bariatric surgery, hyperprolactinemia decreased strongly but not significantly (p>0.05). Bar graph is showing the state of X-axis hyperprolactinemia before and after bariatric surgery, using chi square analysis.

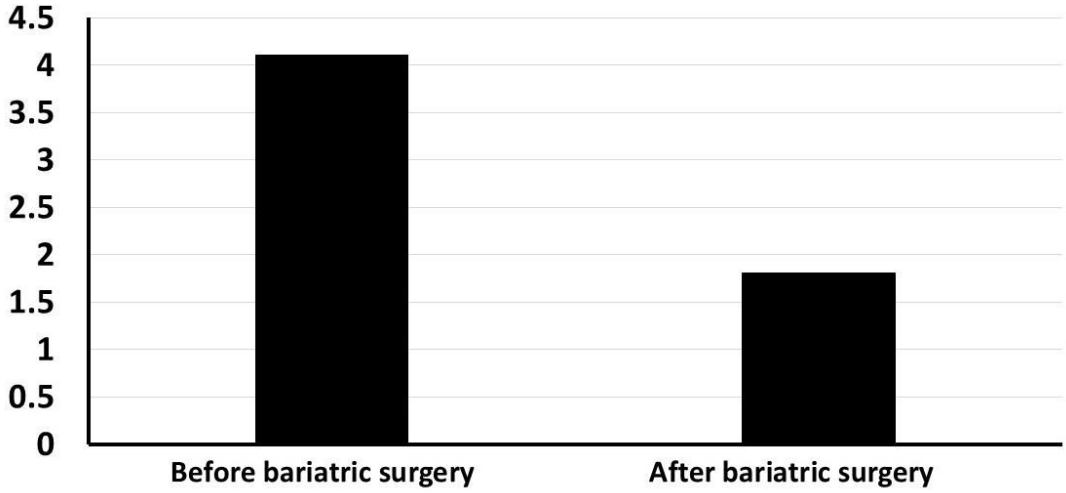

Fig.4. Bariatric surgery was associated with decreased prevalence of joint osteoarthritis. Joint osteoarthritis decreased after bariatric surgery but that was not statistically significant (p>0.05). Bar graph is using the chi square method to examine the X-axis osteoarthritis status before and after bariatric surgery.

(**Table.1**) illustrates the impact of bariatric surgery on lifestyle improvements categorized by obesity, sex, and age among the examined cases. While no statistically significant differences were found, it is worth noting that cases with a BMI below 40 kg/m2 (48.9% vs. 43.2%) and female cases (48.2% vs. 38.3%) tended to exhibit higher levels of lifestyle improvements.

Table 1. Effects of bariatric surgery on lifestyle improvement by obesity, sex, and age among the studied cases

Lifestyle improvement	Yes	No	p value
BMI (kg/m^2)			
< 40	22 (48.9)	23 (51.1)	
≥ 40	54 (43.2)	71 (56.8)	0.51
Sex			
Male	23 (38.3)	37 (61.7)	
Female	53 (48.2)	57 (51.8)	0.21
Age in years			
< 40	45 (44.6)	56 (55.4)	
≥ 40	31 (44.9)	38 (55.1)	0.96

*Significant

Discussion

This study is the first study and investigation to examine the lifestyle improvement and prevalence of comorbidities in obese patients before and after bariatric surgery in Al-Madinah Region in western Saudi Arabia (table 1).

Based on the baseline characteristics, the majority of the 170 patients in the study were classified as obese (26.5%) or morbidly obese (73.5%). Bariatric surgery is among the best long-term option for losing weight, especially for patients who are extremely obese **(Kruseman et al., 2010)**. Unfortunately, demographic population, and lifestyle changes alone typically result in very modest weight loss, and these improvements are typically not followed with great consistency **(Assakran et al., 2023)**. Women made up a sizable majority—roughly two-thirds (64.7%) of the study sample and were more likely to undergo bariatric surgery compared to males. 61% of the 520 patients who underwent bariatric surgery in a recent Saudi retrospective study at King Fahad Specialist Hospital in Al-Qassim (Buraydah), Saudi Arabia, were females **(Assakran et al., 2023)**. Also, in a previous similar study on 794 surgery candidates **(Samuel et al., 2006)**, the majority of individuals asking for a gastric bypass surgery was mostly women (84.8%).

The associated hormonal comorbidities identified in our study included hypothyroidism, hyperprolactinemia and polycystic ovary syndrome. Our results demonstrate a relatively high prevalence of such comorbidities among patients pursuing bariatric surgery. It supports the idea that obesity frequently coexists with a number of other medical disorders, which can have a significant effect on a person's general health and well-being. Numerous obese patients exhibited a significant ($p<0.05$) improvement in their hormonal state following bariatric surgery, which resulted in decreased hypothyroidism (Figure 1). In a similar context, polycystic ovary decreased after bariatric surgery ($p<0.05$) (Figure 2). Nevertheless, following bariatric surgery, hyperprolactinemia decreased but not significantly ($p>0.05$) (Figure 3). Interestingly many obese patients who underwent bariatric surgery exhibited an improvement in osteoarthritis status and a returned to normal (Figure 4).

A significant reduction in the rate of hypothyroidism was found in our present study after bariatric surgery (Figure 1). This is in agreement with a recent retrospective study on 215 obese patients in Brazil, with a follow-up of at least 2 years, before the

surgery, 9.3% of patients had subclinical hypothyroidism. After 12 months of Roux-en-Y gastric bypass, 89.5% of patients saw an improvement in their subclinical hypothyroidism. Following bariatric surgery and subsequent weight loss, thyroid stimulating hormone levels tend to return to normal for the majority of patients, suggesting that regular monitoring of thyroid function post-obesity treatment is a sensible approach **(Granzotto et al., 2020).**

Regarding polycystic ovary syndrome (the most common endocrine disorder in women of reproductive age associated with obesity), a previous study reported a high baseline incidence of hirsutism among obese subjects (70.0–95.8%), which decreased to 20.8–50.0% at 12-month follow-up after bariatric surgery. The authors also reported a significant reduction in testosterone levels and significant improvements in the menstrual cycle irregularities conception rate among the studied women after surgery **(Ghobrial et al., 2023)**. Our study findings revealed a significant reduction in the prevalence of polycystic ovary syndrome following bariatric surgery where polycystic ovarian syndrome affected 23 individuals (13.5% of the sample under study) and dramatically dropped to 6 patients only, or 3.5% of the sample under study. Using the chi square test, the comparison was statistically significant ($p<0.01$) (Figure 2).

After bariatric surgery, hyperprolactinemia decreased but not significantly ($p>0.05$)using chi square analysis. Prior to bariatric surgery, hyperprolactinemia affected two patients (1.2%); following the procedure, it affected just one patient (0.6%) (Figure 3).

Also, significant improvements in joint pain were found after bariatric surgery in a previous study on obese patients **(Eymard et al., 2024)** wherebariatric surgery could enhance pain relief, quality of life, and functionality in early-stage knee osteoarthritis. This is in partial agreement with our data where the osteoarthritis improvements were found but not significant possibly due to the small sample size in our study.

Individuals with less severe obesity can benefit from bariatric surgery in terms of medication reduction or cessation. The impact of age on lifestyle improvements following bariatric surgery was not statistically significant in this study. This implies that age alone may not be a determining factor in the degree of lifestyle improvement experienced after the surgery. However, it is important to consider that age-related factors and individual circumstances may still influence an individual's ability or willingness to make lifestyle changes.

Although no statistically significant differences were observed, cases with a BMI below 40 kg/m^2 showed a slightly higher level of lifestyle improvement compared to cases with a BMI of 40 kg/m^2 or higher (48.9% vs. 43.2%). Furthermore, female cases tended to exhibit higher levels of lifestyle improvement compared to male cases (48.2% vs. 38.3%). These findings highlight the potential variability in lifestyle improvements after bariatric surgery among different subgroups. The trends observed suggest that individuals with a lower BMI and females may be more likely to experience positive changes in their lifestyle behaviors (table 1).

It's crucial to recognize this study's limitations include the inclusion of patients from a single hospital the results might not apply to a larger group.

Conclusion

Bariatric surgery was related with a considerable reduction in hormonal and joint co-morbidities.

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Conflict of interest

The authors declare that they have no competing interests.

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