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Research Article

**CLINICAL CHARACTERISTIC AND HEMATOLOGICAL
CHANGES OF PATIENTS UNDERWENT SLEEVE
GASTRECTOMY IN KING KHALID UNIVERSITY HOSPITAL,
RIYADH, SAUDI ARABIA.****Khalid A. Alsaleh¹, Falwah F. Alharthi², Ghada A. AlAlshaikh², Nouf M. Alhamid²,
Wafa F. Alqarni².**¹ Department of Medicine, Division of Hematology/Oncology, College of Medicine and King Khalid University Hospital, King Saud University, Riyadh, Saudi Arabia.² College of Medicine, King Saud University, Riyadh, Saudi Arabia.**Abstract:**

Objectives: The purpose of the present study was to compare hematological and clinical characteristics of patients who underwent sleeve gastrectomy before and after surgery

Methods: Medical records information from 2009 to 2014, for 395 male and female patients who underwent sleeve gastrectomy at King Khalid University Hospital (KKUH) were extracted according to preselected inclusion criteria. A paired t-Test was used to compare the changes in the hematological before and after surgery. Independent t-Test was used to evaluate differences among genders. All statistical analysis was conducted using SPSS version 22.

Results: Female patients were more than males by 60.3% to 39.7% with 25 years as the most frequent age, and morbid obese patients more than obese and overweight with 80.3%, 18.50% and .3%. significant changes were seen in BMI, MCV, PLT, HCT by comparing pre and post operatively results. 49 patients out of 145 showed improvement from Iron deficiency anemia after the surgery while 18 out of 250 patients developed the disease after the surgery. polycythemia was improvement in 9 patients out of 19 while 17 patients out of 376 showed development after the surgery.

Conclusion: Sleeve gastrectomy showed no significant relationship with iron deficiency anemia and polycythemia. However, it showed significant changes in hematological values such as MCV, PLT, HCT and BMI as a clinical characteristic.

Key words: Sleeve, gastrectomy, hematology, iron, polycythemia.

Corresponding author:**Nouf Mohammed AlHamid,**

College of Medicine, King Saud University, Riyadh, Saudi Arabia.

Email: Nouf.alhamid6@gmail.com

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INTRODUCTION:

The obesity pandemic pervades across the globe prompting socio-economic discord, geo-political turmoil, burdens on government with societal disparities bearing various implications on the psychology and physiology of humans. [1] The advent of weight-reducing surgical procedures have been a major breakthrough in various fields of medicine, primarily it is attributed to plummeting rates of obesity [1], which is synonymous with health risks such as hypertension, coronary heart disease, and diabetes to name a few [2] There is also a strong relationship between obesity and the development of obstructive sleep apnea which may lead to hematological issues associated, especially platelet function, and hematocrit. [3] [4]

The incremental evolution of bariatric surgical techniques has witnessed great leaps in the past two decades, progressing to its apotheosis form, i.e open duodenal switch procedure, to open sleeve gastrectomy, ultimately reaching its contemporary form of laparoscopic sleeve gastrectomy. [5] Surgical intervention in obesity is today the most effective management, mainly as a sole and definitive operation in morbidly obese. [6][7]

Sleeve gastrectomy was put forth in the 1990s and popularized by the 2000s. However, there are drawbacks that could warrant minor complications, that is, previous literature has suggested decreased levels in both vitamin B12 and iron levels [8]; hence it is advisable to perform the surgery on patients in dire straits with a body mass index of 35 kg/m² and upwards. Patients undergoing the surgery are entitled to long-term nutritional surveillance subsequent to the operation. [9] Bariatric surgery proved effective in providing weight loss of large magnitude, correction of comorbidities and excellent short-term and long-term outcomes, decreasing overall mortality and providing a marked survival advantage. [10]

METHODS:

Sample Selection

Medical records from 2009 to 2014, for 395 male and female patients who underwent sleeve gastrectomy at King Khalid University Hospital (KKUH) were

extracted according to preselected inclusion criteria, using SPSS version 22 A 729 patients' records were reviewed, 395 were found eligible in accordance with our criteria. Selection of subjects for our study was obtained on male and female gender from all nationalities who had undergone sleeve gastrectomy in King Khalid university hospital, Riyadh, Saudi Arabia from 2009 to 2014. The subjects had a pre-and post-surgery demographic measures and blood laboratory data; age, weight, height, BMI WBC, RBC, MCV, HCT, HB, PLT, CO2 were extracted. recorded. in addition to pre-and post-date of weight measure, weight, height, BMI. Patients who had The Roux-en-Y Gastric Bypass, the Biliopancreatic Diversion with Duodenal Switch, and the Adjustable Gastric Band were excluded, along with missing pre-and post-hematological laboratory results. File number, age, and date of surgery were also obtained as a part of demographic information along with the gender. The information was collected from the lab access system and Medical Records Department at King Khalid University Hospital.

Study Design

The design of the present study was a retrospective observational case series study design, with repeated measures in which each patient acted as control for himself /herself, before and after the surgery.

Statistical Analysis

A paired t- Test was used to compare the changes in the hematological before and after surgery. Independent t-Test was used to evaluate differences among genders. All statistical analysis was conducted using SPSS version 22.

RESULTS:

Demographics

395 patients met the inclusion criteria. Of which, 25 years as the most frequent age, ranges between 14 - 65 years. 157 (39.7%) were males and 238 (60.3%) were females. Almost all the patients 321 (81.3%) were morbid obese before the surgery and 73 (18.5%) obese patients, 1 (0.3%) overweight patients. (Table 1)

Table 1 Description of The Clinical Characteristics Variables Among the Study Population.

Variables	No. (%)
Age	
Mean + sd	33.97 (10.65)
Gender	
Female	238 (60.3)
Male	157 (39.7)
BMI	
Overweight	1 (0.3)
Obese	73 (18.5)
Morbidly Obese	321 (81.3)

Hematological Variables and BMI

Comparison between the mean values of pre-and post-hematological and clinical variables, significant difference in pre-and post BMI, MCV, PLT, HCT. However, no significant changes were found in HB, RBC, WBC. (Table 2)

Table 2 Comparison Between the Mean Values of Pre-and Post-Hematological And Clinical Variables. Iron Deficiency Anemia

Variables	Mean	Std. Deviation	P-value	95% Confidence Interval	
				Lower	Upper
PREMCV - POSTMCV	-1.253-	8.225	< 0.003	-2.066-	-0.439-
PREWBC - POSTWBC	-0.240-	3.140	0.130	-0.550-	0.071
PRERBC - POSTRBC	-0.980-	23.713	0.412	-3.325-	1.366
PREPLT - POSTPLT	10.378	54.479	< 0.0001	4.982	15.774
PREHCT - POSTHCT	1.549	4.437	< 0.0001	1.108	1.990
PREHB - POSTHB	2.400	60.590	0.432	-3.594-	8.394
PREBMI - POSTBMI	12.123	21.007	< 0.0001	9.889	14.357

Among 395 patients 145 (36.7%) were positive for iron deficiency anemia pre-operatively 40 (27.6%) males and 105 (72.4%) females. 49 patients showed a trend of improvement post operatively 16 (32.7%) males and 33 (67.3%) females while 96 patients remained the same postoperatively 24 (25%) males and 72 (75%) females.

However, 250 (63.3%) were negative for iron deficiency anemia pre-operative, 117 (46.8%) males

and 133 (53.2%) females. 18 patients developed iron deficiency anemia post-operative, 3 (16.7%) males and 15 (83.3%) females while 232 patients remained the same postoperatively 114 (49.1%) males and 118 (50.9%) females.

Chi square table showed that there is no statistically significant association between iron deficiency anemia and sleeve gastrectomy. (Table 3)

Table 3 Comparison for Iron Deficiency Anemia Between Male and Female Gender Patients Who Undergone Sleeve Gastrectomy

Iron Deficiency Anemia Patients				Non-Iron Deficiency Anemia Patients					
Gender	No. (%)	Chi-square	P-value	Gender	No. (%)	Chi-square	P-value		
Pre	Male	40 (27.6)	14.147a	<.0001	Pre	Male	117 (46.8)	14.147a	<.0001
	Female	105 (72.4)			Female	133 (53.2)			
	Total	145 (100)			Total	250 (100)			
Post	Male	24 (25)	.951a	0.329	Post	Male	114 (49.1)	7.074a	<.008
	Female	72 (75)			Female	118 (50.9)			
	Total	96 (100)			Total	232 (100)			
Recovered	Male	16 (32.7)			Developed	Male	3 (16.7)		
	Female	33 (67.3)				Female	15 (83.3)		
	Total	49 (100)				Total	18 (100)		

Polycythemia

Polycythemia before sleeve gastrectomy was reported in 19 (4.8%) patients out of 395, 10 (52.6%) males and 9 (47.4%) females. 9 patients showed improvement after sleeve gastrectomy 3 (33.3%) males and 6 (6.67%) females while 10 patients remained the same postoperatively 7 (70%) males and 3 (30%) females.

In the other hand, 376 (95.2%) patients were negative for polycythemia before sleeve gastrectomy, 147 (39.1%) males and 229 (60.9%) females. 18 of them reported positive for polycythemia after sleeve gastrectomy, 13 (76.5%) males and 4 (23.5%) females while 359 patients remained the same postoperatively 134 (37.3%) males and 225 (62.7%) females. Chi square table showed that there is no significant association between polycythemia and sleeve gastrectomy. (Table 4).

Table 4 Comparison for Polycythemia Between Male and Female Gender Patients Who Undergone Sleeve Gastrectomy

polycythemia Patients				Non-polycythemia Patients					
Gender	No. (%)	Chi-square	P-value	Gender	No. (%)	Chi-square	P-value		
Pre	Male	10 (52.6)	1.384a	0.239	Pre	Male	147 (39.1)	1.384a	0.239
	Female	9 (47.4)			Female	229 (60.9)			
	Total	19 (100)			Total	376 (100)			
Post	Male	7 (70)	.2554a	0.110	Post	Male	134 (37.3)	10.445a	<.001
	Female	3 (30)			Female	225 (62.7)			
	Total	10 (100)			Total	359 (100)			
Recovered	Male	3 (33.3)			Developed	Male	13 (76.5)		
	Female	6 (66.7)				Female	4 (23.5)		
	Total	9 (100)				Total	17 (100)		

DISCUSSION:

This study was conducted to observe the clinical characteristics and hematological changes that were seen in patients who have undergone sleeve gastrectomy. We have come to realize that there were few previous researches observed the effect of sleeve

gastrectomy and its hematological changes after the surgery.

It targeted a population of 729 enrolled patients of both genders to observe the clinical characteristics

and the hematological changes seen preoperatively and postoperatively in patients who have undergone sleeve gastrectomy. Including-excluding criteria was developed to establish who were fit to be included in this study, and upon that we were left with 395 patients with 25 years old as the most frequent age, with a minimum of 14 years and a maximum of 65 years. A study that was established in King Saud University by Alqahtani, Alamri, Elahmedi & Rafiuddin (2012), focused on Laparoscopic sleeve gastrectomy in adult and pediatric obese patients mentioned that 114 adult patients aged 22–55 years, with a mean age of 32.2 years. [11]

Our study showed that 157 (39.7%) were male patients and 238 (60.3%) were female patients, which gave a close percentage as a study in 2008 was established by Iannelli, Dainese, Piche, Facchiano & Gugenheim, that aimed to study the Laparoscopic sleeve gastrectomy for morbid obesity in February 2008 that stated a total of 96 males (32%) and 201 females (68%) had undergone the procedure. [10] Also (a BMI above 40) was accounted for 321 (81.3%) of our population. In Ben-Porat et al. study that was published in (2015),

have detected the mean BMI as 42.9 kg/m². [12] In comparison between the mean values of preoperative and postoperative hematological and clinical variables, we found significant changes in preoperative and postoperative BMI, MCV, platelet count, hematocrit and carbon dioxide. However, no significant changes were found in hemoglobin, red blood cells nor white blood cells.

After our extensive research and observation our results confirmed our concerns regarding the relation between iron deficiency anemia and sleeve gastrectomy (LSG). The final number of included patients in our study were 395 within these patients 145 patients were positive for iron deficiency anemia pre-operative, 40 (27.6%) males and 105 (72.4%) females. On the other hand, the reminding 250 from our total samples size were negative and they have normal iron levels pre- operative, 117 (46.8%) males and 133 (53.2%) females. As a result of the Sleeve Gastrectomy, the total number of patients that remind positive after the operation were 96 patients, 24 (25%) males and 72 (75%) females, meaning that 49 patients were seen to have an improved iron level and no longer considered to have iron deficiency anemia. However, 18 (7.2%) showed a development for iron deficiency anemia post-Operative, 3 males (16.7%) and 15 (83.3%) females which is not significant. To conclude, our total samples size from the pre-and-post operation that had positive results were 114 patients of 395 patients which shows a decrease in patients' comparison with the 145 patients that were

recorded to have iron. A Study that occurred at King Faisal Specialist Hospital and research in 2009 by Hakeam, O'Regan, Salem, Bamehriz & Eldali, their study focused on the effect of laparoscopic Sleeve Gastrectomy on iron after one year. Their total sample size consisted of 61 patients, among these patients 3 patients (4.9%) developed an iron deficiency, one male and two females. Taking into consideration their patients were given an iron-free multivitamin formula. [1] In a recent study that were established by Ben-Porat et al. (2015), they aimed to evaluate the nutritional deficiencies pre-and-post sleeve gastrectomy for 77 patients. They stated that one of the frequent nutritional deficiencies previous to the sleeve gastrectomy was iron deficiency anemia. They recorded that (47.1%) respectively in their sample size has been positive for anemia and iron deficiency. Moreover, women were having higher scores when it came to iron and ferritin deficiency compared to men in their study, were women (56.2%) and men (26.4%). However, after the sleeve gastrectomy the iron deficiencies improved over the follow up period. (27.7%). Noting that men showed a great improvement in their iron levels than women. [12] in addition, in 2009 a study by Schweiger, Weiss, Berry & Keidar that had the same aim as the previous study which is to study the nutritional deficiencies in Bariatric surgery for 114 patients. 34 of their total patients who were candidate to the operation showed that they were positive for iron deficiency and it was significant in women than in men. [13] In our study, it was also noticed that females were half more in number than male in suffering of iron deficiency anemia.

Furthermore, polycythemia didn't show any significant relationship with sleeve gastrectomy. Polycythemia before sleeve gastrectomy was reported a very low number compared to the population, improved polycythemia patients were half the number of the positive preoperatively. On the other hand, almost all the patients didn't have polycythemia before the surgery, but a very low number devolved this complication after the surgery.

CONCLUSION / RECOMMENDATIONS:

This study showed Most of the patients who have undergone sleeve gastrectomy were morbid obese patients with 25 years' age and above, female patients were more than males.

Sleeve gastrectomy showed significant changes in hematological values such as MCV, PLT, HCT and BMI as some clinical characteristics. And no significant relationship with iron deficiency anemia and polycythemia.

More studies about the complications and benefits should be conducted since sleeve gastrectomy gained enormous popularity as bariatric procedure.

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Abbreviations			
KKUH	King Khalid University Hospital	HCT	Hematocrit
BMI	Body Mass Index	WBC	Weight Blood Cells
SPSS	Statistical Package for The Social Sciences	RBC	Red Blood Cells
MCV	Mean Corpuscular Volume	HB	Hemoglobin
PLT	Platelet	CO2	Carbon Oxide