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A Case Study on Effects of Bariatric Surgery for Early Onset and Adult Onset Patients with Obesity in a Single Center Sri Lanka

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Abstract

Background: Bariatric surgery focuses on patients with diverse health complications, varying onset of obesity and total duration of obesity. Sri Lanka characterizes an escalation of morbid obesity which had transformed into a significant public health concern. Therefore, objective of this study is to explore the metabolic parameters and health complication relationships of between early onset and adult onset patients with obesity.

Objective: It has been shown that bariatric surgery is a better candidate for weight reduction for morbidly obese patients worldwide. Our goal is to investigate whether the similar principal would work out for bariatric surgery on morbidly obese patients in Sri Lanka.

Methods: A total of 110 unrelated patients from Colombo south teaching hospital, Sri Lanka were included into this study. The body fat parameters were measured to analyze percentage rate of weight loss and Body Mass Index (BMI) of patients prior to bariatric surgery and 9 months post operational. Patients were categorized into early onset obese (<18 years of age) and adult onset obese (>18 years of age).

Results: Adult onset patients with obesity had a higher body weight and body mass index compared to early onset patients with obesity. Post-operational 9 months records indicate mean weight and BMI of early onset patients with obesity reduced by 33.03 kg and 12.88 kgm^{-2} ($p<0.001$) respectively. Similarly, adult onset obese patients reduced weight and BMI by 27.63 kg and 11.34 kgm^{-2} ($p<0.001$) respectively.

Conclusion: Rate of reduction of mean weight and BMI of early onset patients with obesity were comparatively higher than the adult onset patients with obesity.

Keywords: Bariatric surgery; Early onset obesity; Adult onset obesity; Body weight; BMI

Abbreviations: BMI: Body Mass Index; %TWL: Percentage Total Weight Loss; %EWL: Percentage Excess Weight Loss; CHDR: Child Health Development Record; SPSS: Statistical Package for the Social Sciences; Weight 9 M: Weight after 9 Months; BMI 9 M: Body Mass Index after 9 Months.

Introduction

Obesity is a chronic disease which defines as excessive or abnormal accumulation of adipose tissue which causes numerous health complications such as diabetes mellitus and cardiovascular disorders [1]. It is currently escalated into one of the serious worldwide epidemics mainly by the disrupted global food chains which encourage dietary habits with energy overconsumption [2]. Consumption of high fat and lipid including meals has a significant influence on obesity [3]. About 2 billion people recorded as overweight in 2016 and 650 million of them suffer obesity [4]. As a lower middle income country, Sri Lanka faces many socio economic challenges including high levels of overweight and obesity in particular, nearly 10% of the adult populations are obese and 15.8% of obese patients found in urban areas [5-8].

Nevertheless, childhood obesity has also become a worldwide epidemic, specifically in 2016 over 18% of 5-19 years olds were affected with obesity or overweight according to the World Health Organization. The main causes of childhood obese are multi-factorial, mainly due to unhealthy food habits with lack of energy expenditure [9]. In Sri Lanka, childhood obesity is around 10.3% of the total obese population [10]. It has been shown that that about 40% of overweight children will continue to increase weight during adolescence while 75%-80% of this obese adolescence will remain as obese adults through their lifetime [11].

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Patients with obesity are at higher risk of many health complications including insulin resistance, type 2 diabetes, dyslipidemia, polycystic ovarian syndrome, cardiovascular diseases mainly heart disease and stroke, musculoskeletal disorders, cancer and psychological problems [12-19].

Bariatric surgery is a well-recognized treatment for obesity which is most efficient and effective path to lose body weight of patients with morbid obesity [20]. It serves exceptional outcomes relative to conventional drug therapy treatments on patients who have been struggling to lose weight by non-surgical methods. Earlier study conducted by one of our team in Colombo South teaching hospital shows initial rapid weight loss attributes to the first 3 months after the bariatric surgery, then plateaued after 9-12 months and at 18 months the patients approximately lose 30% of percentage Total Weight Loss (%TWL) and 70% of percentage Excess Weight Loss (%EWL).

Patients undertaking for bariatric surgery have rapidly increased over the past years. Nonetheless, patient population with morbid obesity varies with respect to factors such as gender, duration of obesity and age at onset of obesity. It is crucial to examine patients thoroughly with an accepted guideline for the candidature of bariatric surgery. This study evaluates the rate of reduction of body weight and Body Mass Index (BMI) after the bariatric surgery of early onset and adult onset patients with obesity. This study fills a critical gap in our knowledge of the efficacy of bariatric surgery.

Materials and Methods

Patient enrollment

A total of 110 unrelated individuals were enrolled in this study. All individuals underwent bariatric surgery in the main tertiary hospital, Colombo South teaching hospital between June 2011 and December 2021 were included in this study. Following the institution bariatric surgery procedure, these patients were followed up on at 2 weeks, 1 month, 3 months, 6 months, 9 months, 12 months, 15 months and 18 months after surgery by the same clinical team. For this study, patients attended for the 9 months follow up clinic after the bariatric surgery was included until March 2022. During the whole study period, a detailed medical record of patients who underwent bariatric surgery was obtained to a predesigned datasheet, including detailed clinical history of obesity and full physical examination. In all subjects, anthropometric measurements (body weight and height) data were gathered and BMI was calculated as the ratio of weight in kilograms to the square of height in meters. A patient's age at onset of obesity was determined by a physician before the bariatric surgery, based on previous medical records which include body weight measurements.

Analytical procedures and diagnostic criteria

A non-invasive data collection and monitoring procedures were utilized to collect data from the patient cohort. All the patients have had systematic pre-op bariatric investigation. A comprehensive medical record, along with a health information, is essentially examined. With the patient facing straight ahead and body back against the instrument's vertical support, height was measured with a stadiometer and noted to the nearest 0.1 centimeter. On a digital weight scale, weight was measured without shoes (Omron weight scale version). Each day, the weight scale was calibrated against a known weight standard. Each person underwent a complete physical examination and was found to be patient with obesity by the criteria of morbidly obesity (BMI>35).

Prior to being classified for bariatric surgery, a physician determined a person's age at the onset of obesity based on a study of medical records in which previous body weight measurements were given.

Childhood obese were noted down by the patient's previous pediatrician records and the patients verbal data collection. Childhood onset of obesity was confirmed by Child Health Development Record (CHDR) of all patients by assessing weight for height graphs WHO child growth standards below 5 years age and assessing BMI for 5-18 years WHO growth standards. Adult onset of obesity confirmed when the patient attended to the pre-operational investigations.

Statistical analysis

Analysis of data is done using SPSS 22 software, through descriptive statistics of demographic data, graphical analysis and using sample tests. Mainly 4 variables were considered and 110 responses were collected in which the researcher gathered data from 110 patients. All the missing data were checked which were not filled properly to achieve a greater precision of the collected data. Data cleaning process was done before analyzing the collected data to get accurate results. Outlier detection is performed using boxplot diagrams and no outliers were detected which conclude that collected all data can be used for the data analysis. Paired samples t-test was utilized to calculate the mean difference between pairs of measurements early onset patients with obesity and adult onset patients with obesity. Paired sample correlation was calculated for early onset and adult onset patients with obesity groups to see the pair wise correlation.

Results

Descriptive statistics for demographic data

Data from 110 patients from June 2011 and December 2021 who attended bariatric surgery clinical team at Colombo South teaching hospital for the 9 month follow up clinic were analyzed. The descriptive statistical analysis was performed for the gender of patients recorded in the clinical documentation and shown in Figure 1a. Out of all 110 patients, there were only 19.09% of male patients (n=21) whereas the majority represents an 80.91% of female patients (n=89) in the total patient cohort. Hence, the overweight conditions likely to be observed more on female patient cohort who followed up with 9 months post-operative bariatric clinic. During the initial pre-operational bariatric investigation by the surgical physician, the patient's age at the onset of obesity was determined according to the previously established standards. Then the patients were classified into early onset and adult onset obese, in which, the data shows that 57.27% of bariatric patients in the study are early onset patients with obesity. In contrast, 42.73% of total patients in the cohort classified into adult onset obese category (Figure 1a).

Interestingly, 53 female bariatric patients 48.13% of total female cohort were early onset patients with obesity characteristics since childhood compared to the 36 adult onset patients with obesity reported. From the total 21 male patients, 11 were identified as adult onset patients with obesity while 10 patients were identified as early onset patients with obesity (Figure 1b).

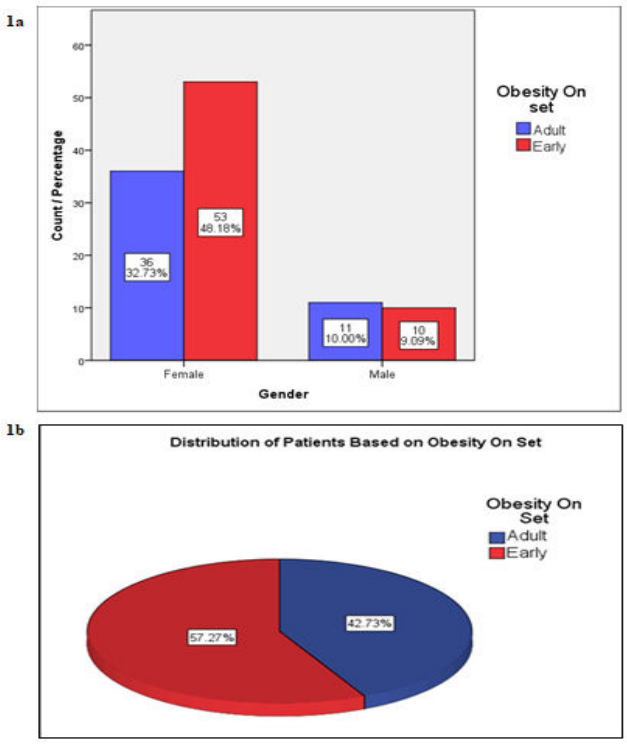

Figure 1: Descriptive statistics of the bariatric patient cohort who followed up with 9 months post-operative clinic. 1a) Obesity onset distribution of bariatric patients. 1b) Gender distribution of obesity onset bariatric patients' cohort.

Analysis on pre-operative and post-operative weight

The post-operative 9 months data of all the patients shows a reduction of the total weight (kg). The mean weight reduction for early onset patients with obesity is around 33.025kg ($p<0.05$) and for the adult- onset patients with obesity recorded a 27.636 kg ($p<0.05$) mean weight reduction. All the data were significant according to the paired t-test conducted by the SPSS 22 statistical analysis software (Tables 1 and 2). It's evident by the weight graph plotted by the data from before and after 9 months bariatric as shown in the Figure 2.

	Mean/kg	Samples (N)	Std. deviation	Std. error mean
Early onset pre-operational	115.913	48	21.994	3.175
Early onset 9 months post-operational	82.888	48	16.443	2.373
Adult onset pre-operational	109.379	62	18.727	2.398
Adult onset 9 months post-operational	81.743	62	15.401	1.972

Table 1: Weight of pre-operational and 9 months post-operational for early onset and adult onset patients with obesity.

Weight reduction	Samples (N)	Correlation	Mean/kg	Std. deviation	Std. error mean	95% confidence interval of the difference	
						Lower	Upper
Early onset	48	0.856	33.025	11.632	1.679	29.647	36.403
Adult onset	62	0.904	27.636	8.142	1.043	25.551	29.721

Table 2: The weight reduction statistical data. The sample statistics of the weight, the correlation between the two groups and the paired sample t-test comparison for the early onset and adult onset patients with obesity.

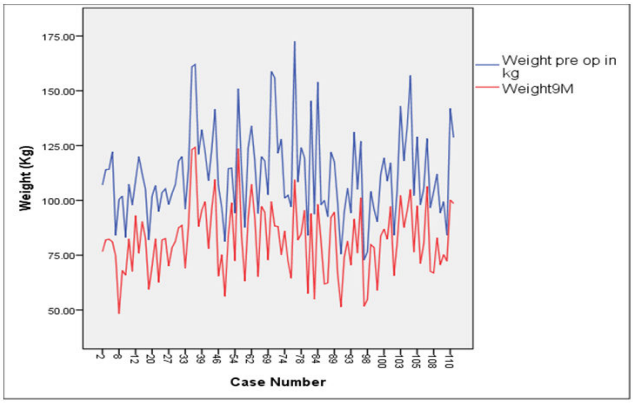

Figure 2: Distribution of weights in kilograms (kg) of patients (n=110) before (weight pre-operational in kg) and after 9 months of the bariatric surgery (weight 9 M).

Analysis on pre-operative and post-operative BMI

Similar to the weight distribution data, the BMI value distribution among all the patient cohort demonstrates that the reduction of the BMI value 9 months post-operational. The mean BMI reduction for early onset patients with obesity is around 12.882 kgm^{-2} ($p<0.05$) and for the adult onset patients with obesity recorded a 11.344 kgm^{-2} ($p<0.05$) mean reduction in their BMI value (Table 3 and Table 4). Figure 3 shows the reduction in the BMI value of all the patients which shows the reduction of BMI value post-operational.

	Mean kgm^{-2}	Samples (N)	Std. deviation	Std. error mean
Early onset pre-operational	45.277	46	6.281	0.926
Early onset 9 months post-operational	32.395	46	5.753	0.848
Adult onset pre-operational	44.925	61	6.665	0.853
Adult onset 9 months post-operational	33.58	61	5.69	0.729

Table 3: BMI of pre-operational and 9 months post-operational for early onset and adult onset patients with obesity.

BMI reduction	Samples (N)	Correlation	Mean/kgm^{-2}	Std. deviation	Std. error mean	95% confidence interval of the difference	
						Lower	Upper
Early onset	46	0.765	12.88	4.154	0.613	11.648	14.115
Adult onset	61	0.884	11.34	3.124	0.4	10.545	12.144

Table 4: The BMI reduction statistical data. The sample statistics of the BMI, the correlation between the two groups and the paired sample t-test comparison for the early onset and adult onset patients with obesity.

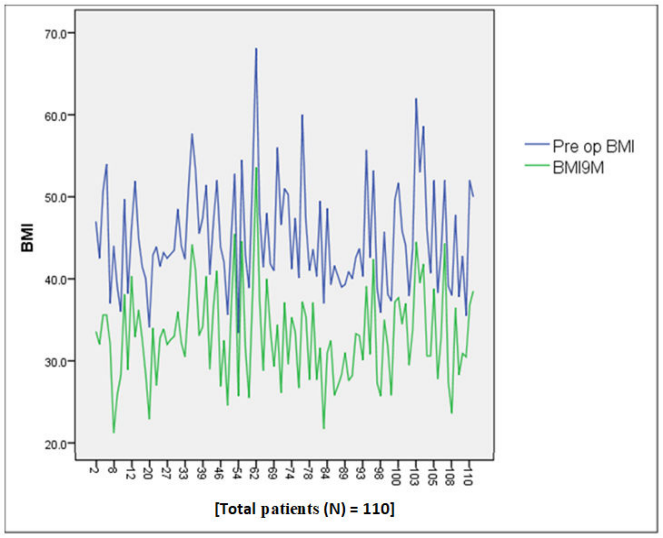

Figure 3: Distribution of BMI in kilograms per square meter kgm^{-2} of patients before (Pre op BMI) and after 9 months of the bariatric surgery (BMI9M).

Discussion

Obesity has now become a critical public health concern among adults as well as children which has escalated to an epidemy regardless of world demography. The disease directly affects the quality of life of an individual and exerts an economic burden globally as well as low income countries like Sri Lanka. It has been shown that young obese adolescents were more likely to cause severe obese complications than adult obese patients and they have 80% more risk of being obese in their later ages. In the present study, we have demonstrated that the bariatric surgery is an excellent option for weight reduction in both early and adult onset patients with obesity in Sri Lanka and the study is a proof of principle for effects of bariatric surgery.

The assigned patient data shows there are more early onset patients with obesity in the cohort while the majority is female patients which represent more than 48.18% of the total patients. Previous data shows that despite the bariatric surgery, most female bariatric patients retain obese after 18-30 months after the surgery. Obesity associates with the risk of early onset colorectal cancer among female patients. Therefore, further studies will be required to investigate more into the gender relationship with obesity and the bariatric surgery.

The early onset obese patients associates with many heritable factors and molecular pathway mechanisms which regulates gene expression relates to development of obese conditions. Our study shows that the bariatric surgery effectively reduces both the weight and the BMI value of early onset patients than the adult onset patients. The mean BMI reduction after 9 months of the bariatric surgery of early onset obese patients is greater than adult onset obese patients. From an average BMI of 45.27 kgm^{-2}, early onset obese patients were able to reduce the BMI to a 32.39 kgm^{-2} which is a lesser value compared to the final BMI of adult onset obese patients. It's noteworthy, that the mean weight prior to the bariatric surgery of early onset obese patients is higher than the adult onset obese patients too. Since early onset obesity relates to heritable traits with a series of genetic factors, it is evident that the effect of bariatric surgery relates to the genetic composition of the patient.

Nevertheless, the mean weight and the BMI value of all the patients recruited have reduced is from extreme obese, early onset: 45.277 kgm^{-2} and adult onset: 44.925 kgm^{-2} regardless the gender and the age at onset of obesity. However, the reduced mean BMI values for all the patients remained in WHO defined obese category of both early onset and adult onset obese patients which is similar to previous publication. Therefore, more investigations and further follow-up studies with post-bariatric patients will be required as well.

Given the fact that the health facilities are free for the public in Sri Lanka, all the patients recruited in this study privileged to undergo the bariatric surgery for free. A significant weight reduction for all the patients post 9 months operation is a support for their quality of life and welfare being able to carry out regular work independently. Nonetheless, low risk of obesity related complications eases the burden on health care system as well. For example, obesity related risk on cardiovascular diseases and diabetes will be minimal.

Conclusion

In conclusion, our study shows the bariatric surgery is a better solution for morbidly obese patients in Sri Lanka and the significance of considering the age at onset of obesity as a factor of evaluation for the bariatric surgery. Collectively, this study will enhance the outcomes of bariatric surgery and the quality of life of morbidly obese patients.

Ethics Statement

The study was carried out in accordance with the 1964 principles of the declaration of Helsinki. All research methods used in this study, involving human subjects followed the organizational and national research committee's ethical guidelines. Written informed consent was obtained from each participant after a full explanation of the study. The whole study protocol and the consent procedure were approved by the ethical review committee of Colombo South teaching hospital (CSTH/1023).

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Conflict of Interest

The authors declare no conflict of interest.

Funding Declaration

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Author's Contribution

Conceptualization G.A.; investigation, G.A.; writing-original draft preparation, G.A.; writing-review and editing, T.W., U.W., D.A. and M.K.; visualization, G.A.; Statistical analysis, G.A. and L.W.;

supervision, T.W. All authors have read and agreed to the published version of the manuscript.

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