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Pattern of Cholelithiasis and Cholecystitis among Obese Patients

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Abstract

Introduction: Obesity is a major health problem in western society with rapidly increasing prevalence in most countries. The healthcare burden of obesity is far reaching but many of the consequences are yet to be fully understood. While there is a perception that obesity negatively impacts on health and stone formation in gall bladder there is conflicting evidence for this. ***Aims & Objectives:*** To assess whether obesity impacts on the blood cholesterol level which leads to dislipidaemia and gall stone formation. To identify whether dislipidaemia causes cholelithiasis and cholecystitis among obese patient. ***Methods:*** Between 1st December, 2018 and 31thMay, 2019, patients admitted in dept of surgery at Shaheed Ziaur Rahman Medical College Hospital in Bogura, Bangladesh were enrolled. Following informed consent, BMI was assessed. High risk patients and complications were identified according to established criteria. Patients were grouped according to BMI categories as Normal, overweight, Obese grade-I and Obese grade-II. Various disease of gall bladder including stone formation and its complications were analysed on all obese patients treated at Shaheed Ziaur Rahman Medical College Hospital using a SQL database. ***Results:*** Total 59 people were available and consented for this study. 09 patients were excluded; 4 patient were obese but no cholelithiasis or cholecystitis, 3 patients were not agree to investigations and 2 patients declined study). The remaining 50 patients, 29 females and 21 males, included for analysis. The median age was 48 with a range from 18-55. A literature review found evidence of increased risk of dyslipidemia which induce stone formation in GB and inflammation of gall bladder associated with obesity. ***Conclusion:*** It is an important issue that obesity is increasing in our new generations. This study should take into account for the future health care researcher. This study has summarized the current body of literature and added to it by demonstrating in our cohort that obese patients were at increased risk of formation of gallstones. I have also provided the evidence that patients with increased BMI with cholelithiasis or cholecystitis or other comorbidities are associated with significantly greater cost to the healthcare system.

Keywords: Cholelithiasis, Cholecystitis, gallstones, obese patient.

INTRODUCTION

Obesity is the abnormal accumulation of body fat to the extent that it may have an adverse effect on health. Obesity is now the most common nutritional disorder in the developed world and the incidence has trebled over the past three decades. The developing world is not far away from that. The prevalence of obesity and overweight was found 13.5% and 14% for Nepal and 15.3% and 24.2% for Bangladesh respectively.

In the China obesity has increase from 3.6% to 7.1% over 10 years. Many have described obesity as an epidemic and suggest the long-term consequences of our rising rate of obesity may reverse the life expectancy of our population for the first time in history [1].

Overweight and obesity are risk factors for a number of chronic and life limiting diseases including diabetes, heart disease and cancer. It has been estimated to be directly responsible for 3 million deaths annually [2]. While there is some evidence that the prevalence of obesity is beginning to plateau the rate of secondary diseases is expected to continue to rise [3].

The management of obese patients on a day-to-day basis is a challenge for all health care professionals however we need to prepare for the greater health needs of an increasingly obese population. It is therefore important that we better understand the impact of obesity on health outcomes both outside and within our health care system [4].

OBJECTIVE

General Objective

To assess whether obesity impacts on the blood cholesterol level which leads to dislipidaemia and gall stone formation.

Specific Objective

To identify whether dislipidaemia causes cholelithiasis and cholecystitis among obese patient.

METHODOLOGY

Study Design: Prospective type of observational study.

Place of Study: Department of Surgery, Shaheed Ziaur Rahman Medical College Hospital, Bogura, Bangladesh.

Period of Study: December 2018 to May 2019

Study Population: This study is conducted among the obese patients in the Department of Surgery at Saheed Ziaur Rahman Medical College Hospital, Bogra.

Sample: The patients admitted in the Department of Surgery, Shaheed Ziaur Rahman Medical College Hospital, Bogura and fulfilling the inclusion and exclusion criteria were considered as sample.

Sample Size: 50

Sampling technique: Purposive sample methods will be followed as per inclusion and exclusion criteria.

Inclusion Criteria:

1. All obese patients admitted in surgery department with cholelithiasis.
2. All obese patients with cholelithiasis seen in outdoor.
3. Age between 18 years to 55 years.

Exclusion Criteria:

1. Patient with no Gall bladder pathology.
2. Patient below 18 years and above 55 years.
3. Non cooperative patient.
4. Non-Obese patient.

Data Collection:

After taking informed written consent from the patient, he/she was interviewed by the researcher himself. As the questions were related to obesity and obesity associated complications, exclusion of other pathology and relevant physical examinations, privacy of the respondent's during interview was given due attention. Before starting the interview, rapport was built.

Study Procedure:

Patients were divided into groups according to BMI. A BMI of 18.5-24.9 was defined as normal weight, 25-29.9 as overweight, 30-34.9 as obese grade-I, and a BMI of 35-39.9 as obese grade-II. Obese patients are selected from all admitted patient in dept of surgery. Necessary investigations were done like ultrasonogram of whole abdomen, Fasting lipid profile, blood sugar, serum creatinineetc. Then patients are catagorised as different pattern of disease like cholelithiasis, acute cholecystitis, chronic cholecystitis, mucocele of gall bladder, empyema gall bladder, perforation of gall bladder. Patients were also catagorised as BMI and different age group. Comorbidities also studied here. All end points were well defined according to established criteria.

Statistical Analysis:

After collecting data it is processed and analyzed using computer software program SPSS V17.0 (Statistical Package for Social Science). The test statistics used to analyze the data were descriptive statistics, Chi-square (χ^2) Test and Student's t-Test. Data presented on categorical scale were compared between groups using Chi-square (χ^2) Test, while the data presented on continuous scale were compared between groups using Student's t-Test. For all analytical tests, a probability value of 5% or less ($p=0.05$ or $p<0.05$) was considered as significant.

RESULTS

Table 1: Classification of Obesity according to BMI

BMI (kg/m^2)	Classification
<18.5	Underweight
18.5 – 24.9	Normal range
25.0 – 29.9	Pre-obese/Overweight
30.0 – 34.9	Obese Grade I
35.0 – 39.9	Obese Grade II
≥40.0	Obese Grade III

BMI –Body mass index, here normal range of BMI-18.5-24.9 kg/m^2, if BMI 25 – 29.9 kg/m^2 it falls within the overweight rage. If BMI 30 kg/m^2 or higher, it falls within the obese range. If BMI 40 kg/m^2 or more it fallse within the range of morbid obesity.

Table: 2 Distribution of cases according to BMI

	Normal	Over weight	Grade-I	Grade-II	Total
Cholelithiasis	4	6	4	2	16
Acute cholecystitis	2	2	1	1	06
Chronic cholecystitis	4	4	6	4	18
Mucocele	2	1	2	1	06
Empyema	1	0	2	1	04
Perforation of GB	0	0	0	0	0
Total	13	13	15	09	50

13 people within BMI-(18.5 – 24.9 kg/m^2), 13 people within BMI-(25-29.9 kg/m^2), 15 people within BMI- (30-34.9 kg/m^2) and 09 people within BMI- (35-39.9 kg/m^2). Another distribution among 50 patients 16 patients were diagnosed as cholelithiasis, 06 patients wewdiagonosed as Acute cholecystitis, 18 patients were diagnosed as Chronic cholecystitis, 06 patients were diagnosed as Mucocele and 04 patients were diagnosed as Empyema Gall bladder.

Table 3: Baseline Characteristics

	Normal Weight	Overweight	Grade-I	Grade-II	P value
N	13	13	15	09	
Age range (median)	39(28-48)	44(19-52)	41(31-54)	46(37-55)	0.952
% Female	45 %	45 %	52 %	31%	0.623
Median ASA	1	1	1	2	0.973
P-POSSUM Morbidity	47%	52%	43%	50%	0.903
P-POSSUM Mortality	0	0	0	0	

The baseline characteristics revealed some expected differences between the groups with male female percentage and less females in the obese group consistent with the distribution in the overall population. Among 50 patients 13 patients were within BMI 18.5-24.9 median age 39 years, 45% female and 55% male. 13 patients were within BMI 25-29.9, median age 44 years, 45% female and 55% male. 15 patients were within BMI 30-34.9, median age 41 years, 52% female and 48% male. 09 patients were within BMI 35-39.9 kg/m^2, median age 46 years, 31% female and 69% male.

Table 4: Percentages of cases according to BMI

BMI	18.5-24.9	25-29.9	30-34.9	35-39.9
Cholelithiasis	4 (30.76%)	6 (46.15%)	4 (26.66%)	2 (22.22)
Acute Cholecystitis	2 (15.38%)	2(15.38%)	1(6.66%)	1 (11.11%)
Chronic Cholecystitis	4 (30.76%)	4(30.76%)	6(40.00%)	4(44.44%)
Mucocele	2 (15.38%)	1(7.69%)	2(13.33%)	1 (11.11%)
Empyema	1 (7.69%)	0(00%)	2 (13.33%)	1(11.11%)
Perforation of GB	0 (00%)	0(00%)	0 (00%)	0(00%)

Among 50 patients within BMI 18.5-24.9, cholelithiasis 30.76%, Acute cholecystitis 15.38%, Chronic cholecystitis 30.76%, Mucocele 15.38%, Empyema 7.69%. Within BMI 25-29.9, cholelithiasis 46.15%, Acute cholecystitis 15.38%, Chronic cholecystitis 30.76%, Mucocele 07.69%, Empyema 00%. Within BMI 30-34.9, cholelithiasis 26.66%, Acute cholecystitis 6.66%, Chronic cholecystitis 40.0%, Mucocele 11.11%, Empyema 11.11%. Within BMI 35-39.9, cholelithiasis 22.22%, Acute cholecystitis 11.11% , Chronic cholecystitis 44.44% , Mucocele 11.11% , Empyema 11.11%.

Table 5: Percentage of serum triglyceride, total cholesterol, HDL, LDL in patients of cholelithiasis.

Lipid Content	Group A		Group B	
	Patients with normal range		Patients with abnormal range	
	No	%	No	%
Triglyceride	21	42.85	29	57.15
Cholesterol	**20**	**40.57**	**30**	**59.43**
HDLc	16	32.57	34	67.42
LDLc	15	29.75	35	70.28

Among 50 patients TG high in 57.15%, abnormal cholesterol level in 59.43% patients, abnormal HDLc in 67.42% and abnormal LDLc level in 70.28% patients.

Table 6: Varoius complications

	Normal	Overweight	Grade-I	Grade-II
N	13	13	15	09
Infectious complication	4 (12.5%)	5 (17.24%)	7 (30.43%)	6 (37.5%)
Wound complication	3 (9.4%)	6 (20.7%)	5 (21.7%)	4 (25%)
Anastomotic leak	0	1(3.45%)	1 (4.35%)	0
Respiratory Failure	1 (3.13%)	2 (6.9%)	1 (4.35%)	1 (6.25%)
Cardiovascular Event	2 (6.25%)	2 (6.9%)	2 (8.7%)	2 (12.5%)
GI Failure	1 (3.13%)	1(3.45%)	2 (8.7%)	1 (6.25%)
Inflammation/Sepsis	3 (9.4%)	2 (6.9%)	1 (4.35%)	1 (6.25%)
Pneumonia	1 (3.13%)	1(3.45%)	1 (4.35%)	1 (6.25%)
DVT	0	0	0	0
PE	0	0	0	0

Rate of infection and wound complication were increases with the increment of BMI, like infectious complication in case of normal 12.5%, overweight 17.24%, grade -I obesity 30.43% and Grade-II obesity it was 37.5%.

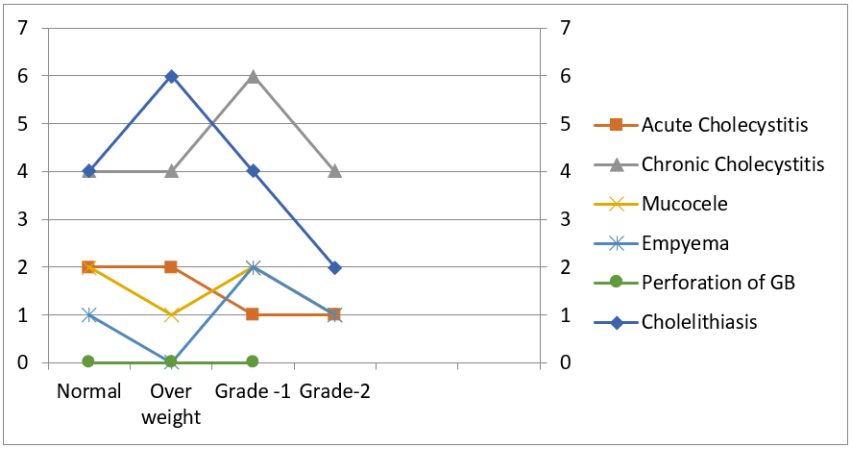

Fig 1: Pattern of Cholelithiasis and Cholecystitis

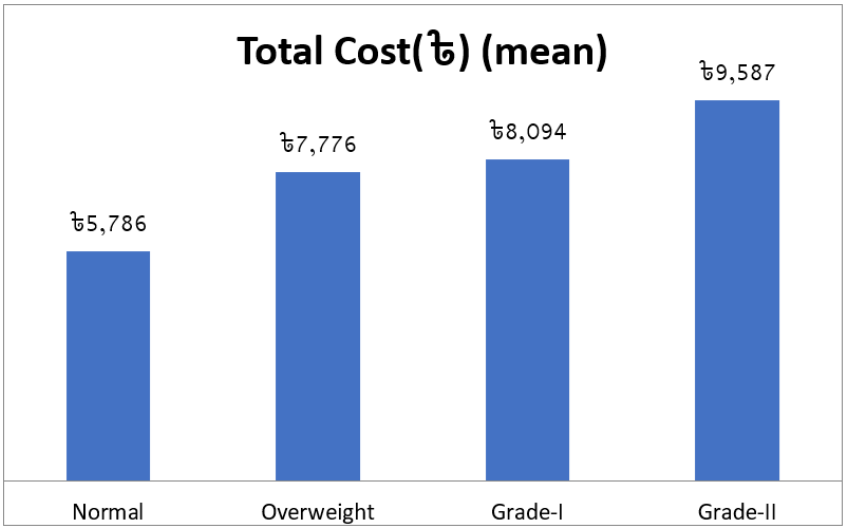

Fig 2: Cost of different sub groups

DISCUSSION

Despite different pattern of cholelithiasis and cholecystitis not being statistically significant, when using BMI as a measure of obesity most of the endpoints had a reproducible J shaped distribution with greater numbers with increasing weight [5].

In this study we observed healthy dietary pattern high in fruits, vegetables, whole grain and vegetable oil was associated with decreased risk of gall stone disease through there high anti-oxidants, fiber, magnesium and vitamin C content. Previous studious on the role of vegetarian diet on gall stone disease suggest a protective role for vegetarian dietary pattern and other studies show evidence for a protective effect of fruits and vegetables, vegetables fat, vegetables protein and crude fiber from vegetables in the risk of gall stone disease. In addition, vit C, folate and magnesium have been linked to a lower risk of gall stone disease, all of which are found profoundly in fruits and vegetables [6].

Consumption of sugar, refined grains and soft drinks in the present study was higher in the unhealthy dietary pattern and was positively associated with increased risk of dyslipidemia which associated with gall stone disease and its complications [7].

The other interesting finding was that for most data points the overweight group tended to have the lowest rates of cholelithiasis and its complication [8]. This suggests that, as has been shown in other series, there may be some protective effect from dyslipidemia of being moderately overweight.

Any future research should take care to use some method of assessing severity of Gall stone disease and its complications. There is evidence from our study and others that Gall stone disease and its complications increase at both extremes of BMI and therefore future studies should categories patients appropriately to determine exactly who is at increased risk of complications [9].

Obesity is an increasing problem in our society and the various health related consequences of obesity pose a significant burden to health care provision in developing countries. A number of studies have previously failed to show an increase rate of stone formation due to obesity however there is still a belief among many surgeons that this is not the case.

This study evaluated the association of various obesity indices with occurrence of GSD in both genders. Our data demonstrated that several obesity measures including WHR (waist-hip ratio), WHtR (waist-to-height ratio) also called waist-to-stature ratio (WSR), BMI and VAT (viaceral adipose tissue) are associated with GSD in women, while only WHR was powerful enough for reflecting the presence of GSD in men.

Meanwhile, increased subcutaneous fat was not associated with GSD in both genders. GSD remains a common health concern with a prevalence of 3-10% in Asia which is lower than North America and Europe [12]. Women were affected with GSD almost two-fold more frequently than men, which was in agreement with previously published reports. Obesity is a well-known risk factor for development of gallstone, which is attributed to the increased hepatic secretion of cholesterol.

The association between central obesity indices and clinical manifestations of metabolic syndrome has been a subject of growing interest. Gallstone formation has also been closely correlated with abdominal (central) obesity, insulin resistance and diabetes mellitus. BMI is the most common method for assessment of adiposity, however it is an indicator of lean body mass and does not concern about anatomical distribution of fat. Therefore, BMI cannot discriminate between visceral and subcutaneous fat. Individuals with high visceral fat may have normal or high BMI. Waist circumference, waist-to-hip ratio and waist-to-height ratio are more accurately associated with central adiposity.

Several studies have investigated the association between these indices of central adiposity and GSD with controversial results. Furthermore, they found that BMI was associated with GSD in women and not in men and serum leptin concentration was not a better predictor of GSD than anthropometric measures. Although, they investigated different obesity indices including skin fold thickness, waist circumference was considered the only measure representing visceral fat without specific measurement of this value in abdomen. Therefore, lack of significant association between leptin concentration and GSD in their study could be partly explained by lack of separate measurements of visceral and subcutaneous fat considering this fact that leptin concentration is more strongly associated with subcutaneous fat than visceral fat.

A study on Chinese women showed that both BMI and WHR are associated with GSD. They only evaluated BMI and WHR as indicators of over-all and central adiposity excess, respectively, on 8,485 women with self-reported, physician-diagnosed GSD which could be subject to misclassification.

Researcher used waist circumference and waist-to-hip ratio for quantification of central adiposity and they found significant correlation between these anthropometric measures and GSD in either men or women in two separate studies [10].

Their outcomes were restricted to subjects with cholecystectomy or diagnostically confirmed but unremoved symptomatic gallstones, while asymptomatic gallstones, which are obviously more frequent, were not included in both studies. Our study was consistent with those of demonstrating strong correlation between WHR and GSD in both men and women. The association between BMI and GSD was observed in women and not in men [11].

Fat distribution differs between men and women and men have more lean body mass than women;

therefore, BMI might not be an accurate measure of adiposity in men. Furthermore, we utilized WHR which has been suggested as a reliable marker of visceral adiposity. To the best of our knowledge, no study has evaluated the association between WHR and GSD. WHR was the strongest adiposity index to reflect GSD in women, however no such association was demonstrated in men. Published data have shown that shorter people, even after adjustment for age, may still face higher metabolic risks than taller people with similar waist circumferences [12].

Elderly subjects in our study were more prone to have GSD, meanwhile height was negatively correlated with age. Since elderly women had shorter stature than elderly men, we found higher risk of GSD in women with increasing values of WHR.

Ultrasound has been used as an alternative method for direct estimation of visceral adiposity. A study by Stolk, *et al.*, showed that measuring visceral fat by ultrasound has stronger correlation with cardiovascular risk factors in comparison with anthropometric measurements. The data of this study did not find strong evidence for the possible association between VAT and the risk of GSD in men. In contrast, VAT was associated with GSD in women, although it showed weaker odds ratio compared to WHtR and WHR. Several studies have assessed clinical difference between subcutaneous and visceral adiposity [13].

Higher visceral fat is an independent and strong indicator of cardiovascular disease and metabolic syndrome. Subcutaneous and visceral fat are different in physiologic functions. Several theories have been proposed for association between visceral adiposity and GSD. Visceral fat has direct hepatic access through portal venous system, thus delivers un esterified fatty acids to liver. Moreover, visceral fat releases several vasoactive substances directly into portal venous system. Visceral adipocytes initiate a pro inflammatory response through macrophage activation and subsequent release of inflammatory cytokines such as TNF-α and Il-6. These cytokines have an inhibitory effect on expression of Adiponectin. Adiponectin which is released from adipocytes increases insulin sensitivity and fatty acid oxidation, hence having an anti-diabetic and anti athrogenic effect [14].

Consequently, this process results ininsulin resistance and manifestations of metabolic syndrome. Hyperinsulinemia has been linked with GSD through excessive cholesterol release from liver and an inhibitory effect on gallbladder motility. We noted strengths of this study as followed; first, we used various anthropometric measures to assessrisk of GSD. Second, ultrasound was applied as asimple, safe and inexpensive technique for estimation of visceral and subcutaneous fat. Third, study design was based on individuals from general population toreduce selection bias. Fourth, all subjects with either sonographically confirmed gallstone or history ofcholecystectomy were enrolled in this study giving a more accurate representation of GSD prevalence.

CONCLUSION

It is an important issue that obesity is increasing in our new generations. This study should take into account for the future health care researcher. This study has summarized by demonstrating in our cohort that obese patients were at increased risk of formation of gallstones. I have also provided the evidence that patients with increased BMI with cholelithiasis or cholecystitis or other comorbidities are associated with significantly greater cost to the healthcare system. These results are important for clinicians and healthcare professionals who together will be responsible for provision of care to the increasingly obese patients.

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