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Assessment of Cholelithiasis in Obese Patients on Grayscale Ultrasonography

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Abstract **Original Research Article**

Background*:** Gallstones are concretions that can develop in any section of the biliary system, and cholelithiasis is when they affect the gall bladder. Gallstones are made up of bile that has built up in the gallbladder. Gallstones are one of the most common and costly gastroenterological disorders, posing a significant financial burden. Obesity and gallstone formation have been linked. The gold standard for cholelithiasis diagnosis is ultrasonography. ***Aim: To assess the cholelithiasis in obese patients on grayscale ultrasonography. ***Method*:** A prospective cross-sectional study sample of 151 patients, visited the hospital, during the research data collection period in Aziz Bhatti Shaheed Teaching Hospital, Gujrat. The results were evaluated by Ultrasound. ***Results*:** By performing ultrasound it has been evaluated that 89 patients had gall stones. In total, 25 patients had single G.B stone, 64 patients had multiple G.B stones, and 62 patients showed negative findings of G.B stone. 90 were females and 61 were male patients. The mean value of the age was calculated 49.64 ± 12.24 with a minimum age of 30 years and 80 years as a maximum of age. The mean value of the Height was calculated as 1.66 ± 0.07 in meters with minimum height of 1.55 meters and 1.85 meters as maximum height. The mean value of the weight was calculated as 86.3 ± 8.70 in kg with minimum weight of 73 kg and 110 kg as maximum weight. The mean value of the BMI was calculated as 30.85 ± 0.96 with minimum BMI of 30 and 34 as maximum BMI. In total, 5 patients had positive findings of sludge. ***Conclusion*:** In current study, feminine gender, a high BMI, and advanced age may all be risk factors for gallstone development. Females were spotted in greater numbers. The severity of cholelithiasis was exacerbated by a lack of awareness, information, and dietary education, as well as ignorance of the symptoms. If left untreated, it can lead to a variety of problems, including gallbladder cancer and other serious consequences.

Keyword: Cholelithiasis, G.B stone, Sludge, BMI, Ultrasonography, Cholecystectomy.

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INTRODUCTION

The gallbladder is a pear-shaped organ in the abdomen's right upper region. It ranges between 7 and 10 cm long and 4 cm in wide. Even though the organ is tiny, gallstones are a common source of stomach discomfort, necessitating surgical removal of the organ [1, 2].

The gallbladder lies anatomically anteriorly on the bottom of liver segments IV and V. The architecture of the biliary system has various variations, making precise awareness of these anatomic possibilities critical when undertaking gallbladder and biliary surgery [2].

The peritoneal surface of the gallbladder is inferior, while the liver surface is superior [2]. It is located between the right and quadrate lobes of the liver in a fossa. The gallbladder connects the first and second sections of the duodenum, as well as the hepatic flexure of the colon, inferiorly [1].

The visible surface of the gallbladder's body is covered by the Glisson's capsule. The fundus of the gallbladder is broad at first [3], then narrows as it progresses into the main body. The infundibulum, which links the gallbladder to the neck and cystic duct, tapers into the gallbladder body. Spiral valves of the Heister are found at the distal end of the gallbladder and in the cystic duct. In neurological and hormonal activation, these valves may help with gallbladder emptying. Hartmann's Pouch is an inferior outpouching of the gallbladder infundibulum or neck that affects the majority of people. There is occasionally a scarcity at the apex of the gallbladder fundus. A Phrygian cap is a

benign growth that has no clinical or surgical significance [1, 3].

A typical gallbladder can hold around 50 milliliter of bile. It concentrates hepatic bile by roughly a factor of 10 and secretes mucus into it from the many goblet cells that dot its mucosa [3, 4].

Structure

Involuntary muscle can be found in the gallbladder and the sphincter of Oddi, but there are just a few muscular fibers in the rest of the biliary system. A columnar epithelium with mucus-secreting goblet cells makes up the mucosa [5].

Function

When the gallbladder isn't being utilized for digestion, it acts as a reservoir for bile.[1] The absorbent lining of the gallbladder concentrates the bile that has been stored. A hormone called cholecystokinin is produced when food reaches the small intestine, causing the gallbladder to contract and secrete bile into the small intestine via the common bile duct [4].

Bile aids digestion by breaking up fat molecules. It also drains waste products from the liver into the small intestine's duodenum [6].

Cholelithiasis

Gallstones are concretions that can develop in any section of the biliary system, and cholelithiasis is when they affect the gall bladder. Gallstones are made up of bile that has built up in the gallbladder [7]. When the components of bile are out of balance, one or more of them precipitates into a solid compound, resulting in these stones. Gallstones are one of the most common and costly gastroenterological disorders, posing a significant financial burden [2, 8].

Yearly, 600,000 cholecystectomies are performed in 10-15 percent of the adult population in America. Although data from Pakistan is still lacking, a prior study revealed a surgical incidence of 9.03 percent in the southern Sindh region of the country [9, 10].

Gallbladder disease affects up to 15% of the population in the United States, posing a substantial health care burden. Gallstones afflict around 10% to 20% of the US population at some point throughout their lives, and women are more likely than males to be impacted. According to ultrasonography, this area has the highest rate of gallstone development [7, 10].

Age, feminine gender, obesity, high cholesterol consumption, low fiber intake, smoking, high parity, a family history of gallstones, and a lack of physical exercise are all risk factors. Gallstone disease is considered a surgical condition because the only treatment is a cholecystectomy, however, identifying probable risk factors might aid in the development of therapeutic and preventative methods [11].

Gallstones are caused by non-modifiable risk factors such as female gender and increasing age. However, bearing in mind the disease's significant socioeconomic impact and the fact that the majority of Pakistanis live in rural regions with little or non-existent healthcare, an increase in cholelithiasis diagnoses has been attributed to rising obesity and metabolic syndrome trends [11].

The typical symptom of cholelithiasis, especially when gallstones clog the common bile duct, is right upper quadrant abdominal discomfort, which is frequently elicited during a physical examination and documented as a positive Murphy's sign [12, 13]. Cholelithiasis patients commonly experience referred discomfort to the right supraclavicular area and/or shoulder, nausea, and vomiting. Anorexia, a sense of fullness, an inability to eat fatty foods, and persistent diarrhea are all possible symptoms [13].

Gallbladder disease is characterized by a rapid onset of discomfort in the epigastric area or the right upper quadrant of the abdomen. The pain is reported as moderate to severe, continuous, and peaks within one hour after the start. Biliary colic subsides with time and can persist up to 6 hours. Collins' sign, referred pain in the right subscapular area and/or shoulder, back discomfort, nausea, and vomiting are all possible symptoms [12].

Cholelithiasis can lead to problems such as cholecystitis (gallbladder inflammation) and cholangitis (inflammation of the bile duct) [14]. The absence of physical examination evidence does not rule out cholelithiasis as a diagnosis [13].

White blood cell count, liver enzymes, amylase, and lipase are some of the laboratory tests that might help a clinician diagnose cholelithiasis; nevertheless, ultrasonography remains the gold standard for diagnosis [15]. The intensity and frequency of symptoms determine the course of treatment. For those who have a single symptomatic episode, lifestyle and dietary changes, as well as pharmaceutical treatment, such as the use of gallstone dissolving agents, may be advised [16]. Laparoscopic cholecystectomy is suggested if symptoms become severe and/or repeat. Regardless of the severity or frequency of symptoms, people with a confirmed diagnosis of cholelithiasis should be referred to a surgeon and/or gastroenterologist within two weeks after initial presentation [16, 17].

RISK FACTORS

Cholelithiasis is caused by a combination of controllable and nonmodifiable risk factors. Cholelithiasis is more common in women than it is in

males. Pregnancy, increased parity, and obesity during pregnancy all raise the risk of cholelithiasis in women [18, 19].

Gallbladder disease is caused by a variety of factors. Gallstones can be caused by a variety of factors that impact cholesterol synthesis in the liver, gallbladder function (stasis or inflammation), bile acid generation, and cholesterol and bile acid absorption in the intestine [20]. Modifiable and nonmodifiable risk factors are also present.

Nonmodifiable Risk Factors

Ethnicity, female gender, family history, pregnancy, and being over 40 years old are all non-modifiable risk factors for gallstones [15]. Gallbladder disease is four to ten times more likely in those over the age of 40. If you have a family history of gallbladder illness, you're at a 5 times higher chance of having the condition. Gallstones are twice as common in women of reproductive age as they are in males [21]. After menopause, the incidence of menopause in women is similar to that of males [15, 21].

Modifiable Risk Factors

Obesity, fast weight loss, rapid weight loss cycling, a high-calorie diet, medicines, type 2 diabetes, metabolic syndrome, dyslipidemia, smoking, and a sedentary lifestyle are all modifiable risk factors [18]. Weight loss cycling refers to times of fast weight reduction followed by periods of weight gain that typically equal or surpasses the previous weight loss. Obesity, particularly abdominal obesity, has been linked to gallstone formation [22].

Around 25% of those who are very obese have gallbladder disease [23]. Obesity is also a major contributor to metabolic syndrome and nonalcoholic fatty liver disease, both of which are linked to a higher risk of gallstone development. Obesity and gallstone formation have been linked in several studies [22, 23].

Researchers examined the link between body mass index (BMI) and gallbladder disease risk in a systematic evaluation of 17 prospective studies (N = 55,670 people with gallbladder illness). The results showed that a 5-unit rise in BMI increased the relative risk of gallbladder illness by 1.63. (95 percent CI, 1.49-1.78). Gallstone development is linked to low-calorie diets and bariatric surgery [24].

After bariatric surgery, weight reduction of more than 1.5 kg per week increases the risk of gallstone development [25]. Rapid weight loss may increase the likelihood of gallstone development due to an increase in the cholesterol-to-bile-salt ratio or the incidence of bile stasis due to reduced gallbladder movement [21].

Ultrasonography

The gold standard for cholelithiasis diagnosis is ultrasonography [15, 26]. This is particularly essential for pregnant women, as ultrasonography does not expose them to radiation. When there is discomfort in the right upper quadrant, restricted abdominal ultrasonography should be done. Ultrasonography has a 98 percent specificity, a 95 percent sensitivity, and a 1 percent to 4% false-negative rate [27].

Obesity, on the other hand, has a substantial negative association with the quality of ultrasound images [28]. According to recent research, the accuracy of ultrasonography in detecting gallstones falls considerably in obese people - Both obesity and the greater distance to the gallbladder are possible barriers to gallstone identification in obese patients. Refraction and reverberation artifacts may be caused by subcutaneous fat layers [29].

Fasting for at least 8 hours before an ultrasound examination is recommended for anybody suspected of having cholelithiasis, as the gallbladder may be restricted as a result of a recent meal. However, in the case of acute right upper quadrant discomfort, a precise diagnosis may be critical, and an ultrasound is recommended regardless of whether or not the patient is fasting [30].

Ultrasound may reveal biliary sludge [31], which is a precursor to gallstone development. If an ultrasound reveals a normal gallbladder wall and common bile duct, an acute cholecystitis diagnosis can be ruled out. Gallbladder wall thickness (4 mm), an enlarged gallbladder, or fluid surrounding the gallbladder are all ultrasound indications of acute cholecystitis (referred to as pericholecystic fluid) [31, 32].

The purpose of this study is to assess cholelithiasis in obese patients from Gujrat to reduce the economic burden of this preventable disease.

MATERIAL AND METHODS

The study was prospective cross-sectional analytical being Completed in 5 months. 151 patients were recruited in the study by using convenient sampling technique. Obese patients having abdomen pain BMI equal to 30 and greater than 30 were included.

Patients excluded from the Study Were Those Who

- Had abdomen pain but not obese
- BMI less than 30
- Uncooperative patients
- Any other anatomical abnormality

TOSHIBA TA machine 311 was used.

RESULTS

By performing ultrasound it has been evaluated that 89 patients had gall stone. In total, 25 patients had single G.B stone, 64 patients had multiple G.B stones, and 62 patients showed negative findings of G.B stone. 90 were females and 61 were male patients. The mean value of the age was calculated 49.64 ± 12.24 with minimum age of 30 years and 80 years as maximum age. The mean value of the Height was calculated as 1.66 ± 0.07 in meters with minimum height of 1.55 meters and 1.85 meters as maximum height. The mean value of the weight was calculated as 86.3 ± 8.70 in kg with minimum weight of 73 kg and 110 kg as maximum weight.The mean value of the BMI was calculated as 30.85 ± 0.96 with minimum BMI of 30 and 34 as maximum BMI. In total, 5 patients had positive findings of sludge.

Table 1

Gender of participants					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	Male	61	40.4	40.4	40.4
	Female	90	59.6	59.6	100.0
	Total	151	100.0	100.0	

A total of 151 cases of different age groups were involved in this study. In which 61 were males and 90 were females.

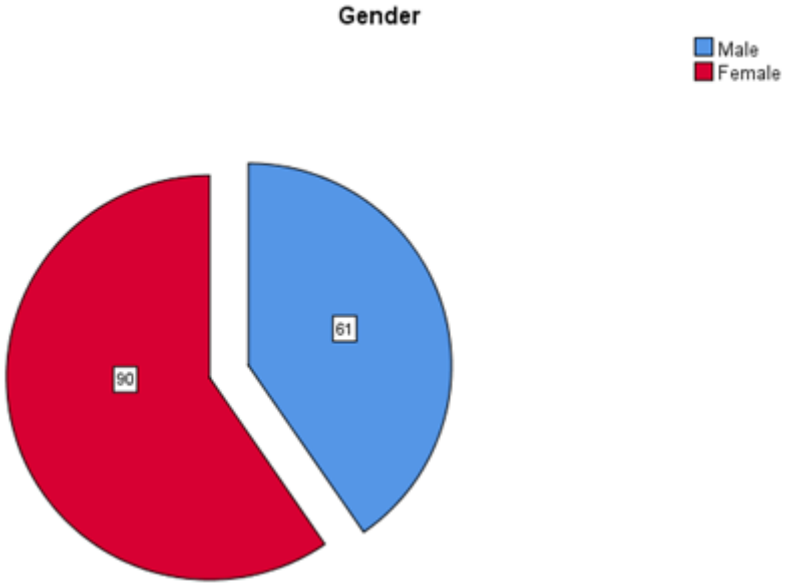

Figure 1

Table 2

Age (Years) of participants					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	30-40 years old	52	34.4	34.4	34.4
	41-50 years old	32	21.2	21.2	55.6
	51-60 years old	35	23.2	23.2	78.8
	61-70 years old	27	17.9	17.9	96.7
	71-80 years old	5	3.3	3.3	100.0
	Total	151	100.0	100.0	

A total of 151 cases of different age groups were involved in this study which was divided into 5 different groups. Group 1 included 30-40 years old patients which were 52 in total, Group 2 included 41-50 years old patients which were 32, group 3 included 51-60 years old patients which were 35, group 4 included 61-70 years old patients who were 27, and group 5 included 71-80 years old which were 5 in total.

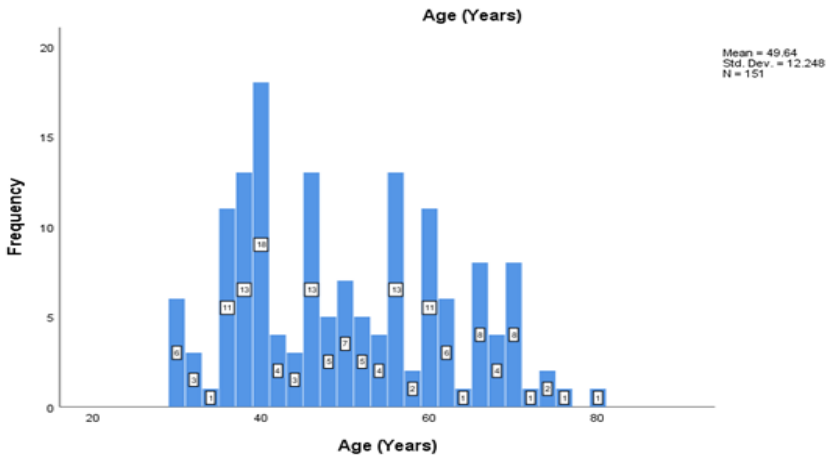

Figure 2

The mean value of the age was calculated 49.64 ± 12.24 with minimum age of 30 years and 80 years as maximum age.

Table 3

Height (Meters) of the participants					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	1.55	8	5.3	5.3	5.3
	1.58	20	13.2	13.2	18.5
	1.61	29	19.2	19.2	37.7
	1.64	29	19.2	19.2	57.0
	1.67	9	6.0	6.0	62.9
	1.70	16	10.6	10.6	73.5
	1.73	10	6.6	6.6	80.1
	1.74	13	8.6	8.6	88.7
	1.76	8	5.3	5.3	94.0
	1.79	7	4.6	4.6	98.7
	1.85	2	1.3	1.3	100.0
	Total	151	100.0	100.0	

151 patients with no height restriction were presented in the study. The mean value of the Height was calculated as 1.66 ± 0.07 in meters with minimum height of 1.55 meters and 1.85 meters as maximum height.

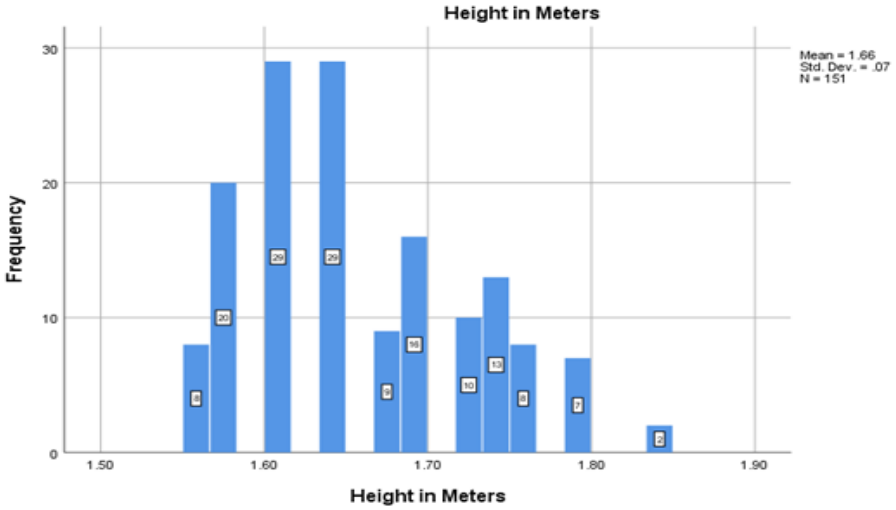

Figure 3

Table 4

Weight(Kg) of participants					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	70-80 kg	50	33.1	33.1	33.1
	81-90 kg	55	36.4	36.4	69.5
	91-100 kg	35	23.2	23.2	92.7
	101-110 kg	11	7.3	7.3	100.0
	Total	151	100.0	100.0	

151 patients with different weights were presented in the study. These were divided into 4 different groups. Group 1 included 70-80 kg patients which were 50 in total, Group 2 included 81-90 kg patients which were 55, group 3 included 91-100 kg patients which were 35, and group 4 included 101-110 kg patients which were 11. The mean value of the weight was calculated as 86.3 ± 8.70 in kg with minimum weight of 73 kg and 110 kg as maximum weight.

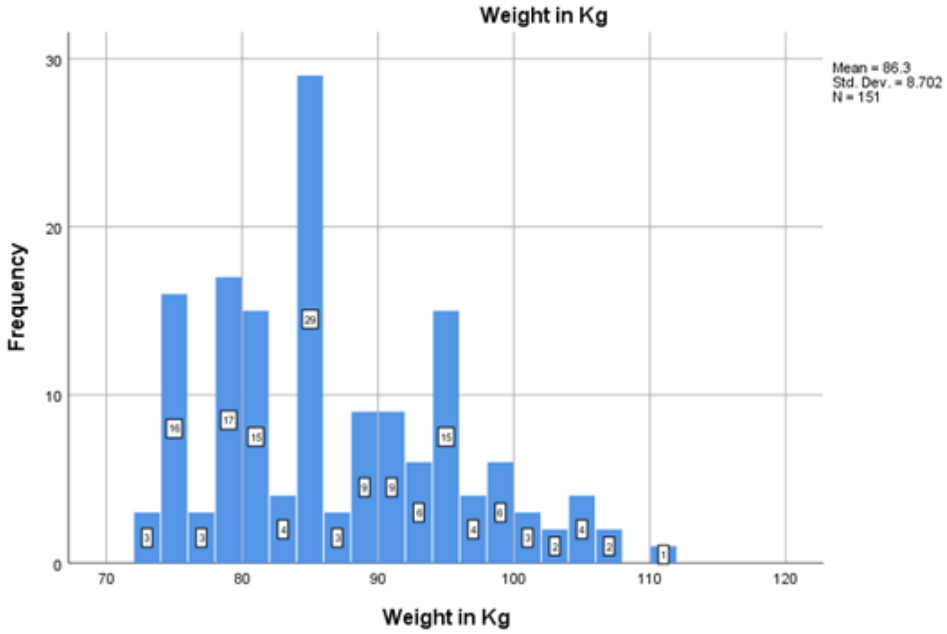

Figure 4

Table 5

BMI of the participants					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	30	69	45.7	45.7	45.7
	31	48	31.8	31.8	77.5
	32	24	15.9	15.9	93.4
	33	8	5.3	5.3	98.7
	34	2	1.3	1.3	100.0
	Total	151	100.0	100.0	

151 obese patients were included in the study. BMI was calculated by the height and weight of the patients. The mean value of the BMI was calculated as 30.85 ± 0.96 with minimum BMI of 30 and 34 as maximum BMI.

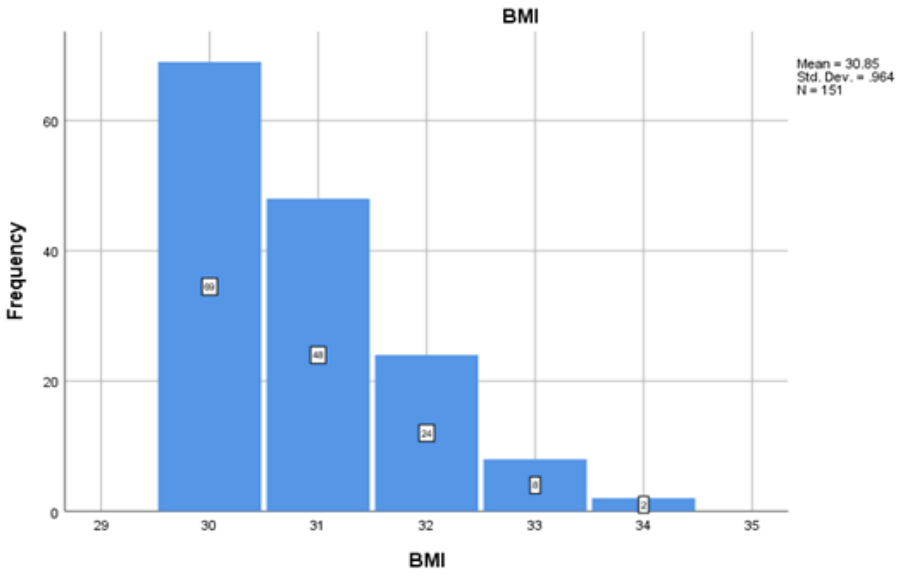

Figure 5

Table 6

G.B Stones in participants					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	yes	89	58.9	58.9	58.9
	no	62	41.1	41.1	100.0
	Total	151	100.0	100.0	

A total of 151 cases of different age groups were involved in this study. In total, 89 patients had positive findings of G.B stone and 62 patients showed negative findings of G.B stone.

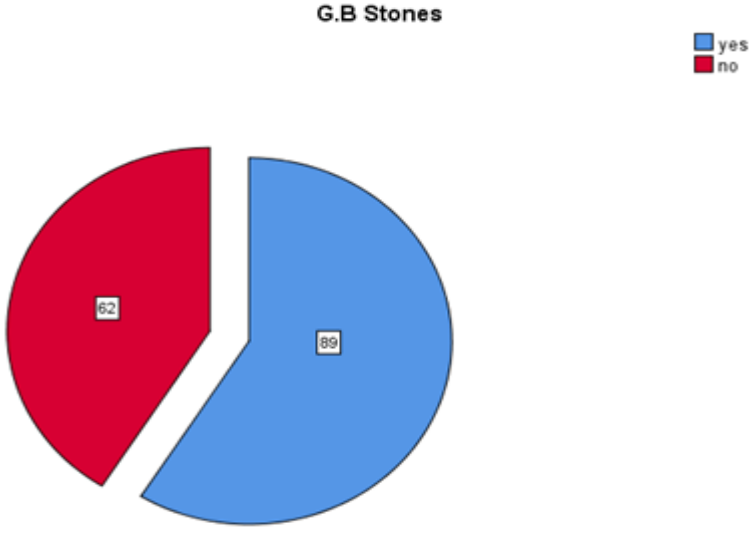

Figure 6

Table 7

Number of stones in participants					
		Frequency	**Percent**	**Valid Percent**	**Cumulative Percent**
Valid	single stone	25	16.6	16.6	16.6
	multiple stones	64	42.4	42.4	58.9
	nil	62	41.1	41.1	100.0
	Total	151	100.0	100.0	

A total of 151 cases of different age groups were involved in this study. In total, 25 patients had single G.B stone, 64 patients had multiple G.B stones, and 62 patients showed negative findings of G.B stone.

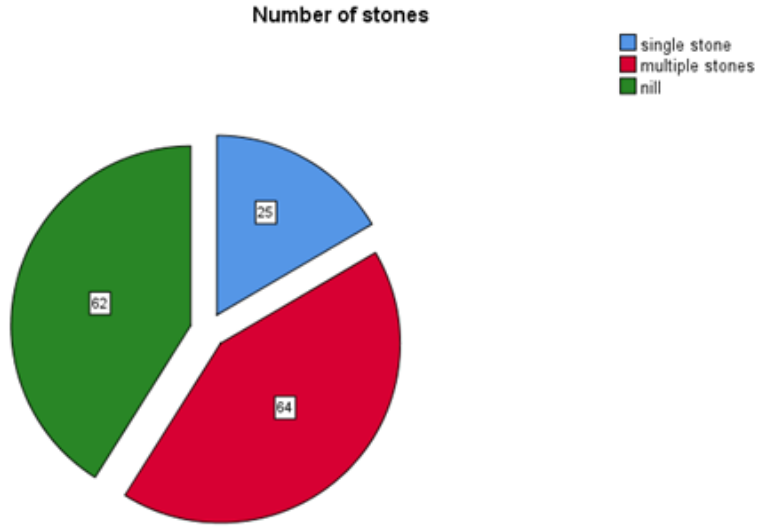

Figure 7

Table 8

BMI * G.B Stones Crosstabulation					
			G.B Stones		Total
			yes	no	
BMI	30	Count	45	24	69
		% within BMI	65.2%	34.8%	100.0%
	31	Count	28	20	48
		% within BMI	58.3%	41.7%	100.0%
	32	Count	11	13	24
		% within BMI	45.8%	54.2%	100.0%
	33	Count	4	4	8
		% within BMI	50.0%	50.0%	100.0%
	34	Count	1	1	2
		% within BMI	50.0%	50.0%	100.0%
Total		Count	89	62	151
		% within BMI	58.9%	41.1%	100.0%

We split the 150 obese individuals into 5 groups based on their BMI. A cross tab of BMI and Gallstones is created. Patients in group 1 with a BMI of 30 had a total of 69 patients, however, only 45 of them developed gall stones. Only 28 individuals in group 2 of 31 BMI were diagnosed with gall stones. In group 3, which included individuals with a BMI of 32, there were a total of 24 patients, 11 of whom had gall stones. Individuals in Group 4 with a BMI of 33 had 8 patients, 4 of whom had gallstones. Only 1 patient with gallstones was discovered in Group 5, which included a total of 2 patients with a BMI of 34.

Table 9

Statistics					
		Age (Years)	Height in Meters	Weight in Kg	BMI
N	Valid	151	151	151	151
	Missing	0	0	0	0
Mean		49.64	1.6603	86.30	30.85
Std. Deviation		12.248	.07015	8.702	.964
Minimum		30	1.55	73	30
Maximum		80	1.85	110	34
a. Multiple modes exist. The smallest value is shown					

The average age was 49.64, the average height was 1.6603, the average weight was 86.30, and the average BMI was 30.85. Std. deviation was the second category. The age Std.deviation was 12.248, the height Std.deviation was 0.07015, the weight Std.deviation was 8.702, and the BMI Std.deviation was.964. The lowest age value was 30 and the highest age value was 80. The lowest and maximum height values were 1.55 and 1.85 respectively. The weight had a minimum value of 73 and a maximum value of 110. BMI had a minimum value of 30 and a maximum value of 34.

DISCUSSION

Gallstones are becoming more prevalent and are seen in people of all ages, with the frequency rising as they become older. Gallstones are usually asymptomatic. Symptoms often occur 5 to 20 years after a diagnosis [43]. In the current study female ratio was greater than males, as males were 61 and females, were 90. Similar findings were documented in another study [44]. Cholelithiasis were more common in women than in men, according to most studies, however, the ratio was 3:1.3. There is a common perception that cholelithiasis is more frequent among obese women over the age of forty. Female patients have a higher incidence due to sex hormones [45]. In the current study 89 patients had cholelithiasis, 69 females out of a total of 90 females developed cholelithiasis, whereas only 20 males had cholelithiasis.

In women, BMI has a well-known link to cholelithiasis, however, this link was not seen in males [46, 47]. One study found a link between BMI and waist-to-hip ratio in men, indicating an obesity link [38]. Because the current study exclusively included obese individuals, the mean BMI was 30.85.

Females have a lower mean BMI than males, and one possible explanation is that female sex hormone play a role in gallstone formation. Another research with a sample size of over 11000 people found similar results [38]. The majority of cholelithiasis patients fell into the underweight and obese categories, according to WHO standards (61 percent). All of the obese patients (n=12) were girls, with just six men among them. In the current study, the majority of females (n=69) had a BMI of 30, with 52 having cholelithiasis and just 17 men having cholelithiasis.

The majority of prior studies established a link between increasing BMI and the development of gallstones, however, there has been little research on the cause of gallstones in individuals with normal BMI. Community-based research in India found no evidence of a link between BMI and cholelithiasis [48].

Gallstones can be caused by a variety of factors, including a change in lifestyle and dietary habits. Future study in this area is critical.

CONCLUSION

Cholelithiasis was shown to be more common in female individuals with a BMI of 30. Male patients with the same BMI had positive cholelithiasis results, but the male-to-female ratio was lower. According to the findings of the current study, the feminine gender, a high BMI, and advanced age may all be risk factors for gallstone development. Females were spotted in greater numbers. The severity of cholelithiasis was exacerbated by a lack of awareness, information, and dietary education, as well as ignorance of the symptoms. If left untreated, it can lead to a variety of problems, including gallbladder cancer and other serious consequences.

Conflict of Interest: Nil

Funding Resources: Nil

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