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Original Research Article

Assessment of Incidence of Nephrolithiasis in the Patients of Non Alcoholic Fatty Liver Disease by Using Trans Abdominal Ultrasound

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Abstract: NAFLD affects extrahepatic organs, including the cardiovascular and renal system. NAFLD was linked to an increased risk of future CVD and CKD events and a renal stone disease, which involves the deposition of crystals in the medulla and urinary tract, affects up to a third of the population in Asia. Nephrolithiasis is related to hypertension, asthma, chronic kidney failure, vitamin D deficiency, insulin resistance, fatal conditions, and coronary morbidity. Liver ultrasound is largely available and noninvasive for investigation of nonalcoholic fatty liver disease. In this study we hypothesized presence of kidney stones in the patients of nonalcoholic fatty liver independently from the Cardio vascular disease patients. ***Objective:*** To evaluate incidence of nephrolithiasis in the patients of nonalcoholic fatty liver disease. As a particular underlying risk factor, the relation between fatty liver and renal calculi has received little publicity. So we find out connection between fatty liver and renal calculi and explored in this study. ***Approach:*** 381 reports of Patients of nonalcoholic fatty liver disease who had undergone a transabdominal ultrasound scan were studied to rule out the presence of renal stones. ***Setting:*** Data was collected from private sector hospital Gujrat, Pakistan ***Results:*** 381 ultrasonography reports 167 (43.8%)of females and 214(56.2%) of males. Analysis shows incidence of 13.2% nephrolithiasis in females and 7.9% in males. Totally 10.2% in all 381 subjects. ***Conclusion:*** The study demonstrates that there is a 10.2% incidence of nephrolithiasis in the patients suffering from nonalcoholic fatty liver disease. There is high ratio in females than in males. All the data was analyzed by using Microsoft excel 365. Tables and graphs are used to demonstrate the results.

Keywords: Nephrolithiasis, CKD, Fatty liver, Nonalcoholic fatty liver, NAFLD, Incidence, Ultrasonography.

INTRODUCTION

Nonalcoholic fatty liver becomes common and increasing day by day. It is present in 20-30% population in Asia and USA, Europe [1, 2]. Nonalcoholic fatty liver associated with burgeoning epidemics of obesity and metabolic syndrome [2]. Hepatocytes of nonalcoholic fatty liver have a 5% triglyceride accumulation [3, 4]. NAFLD progresses to nonalcoholic steatohepatitis with different degrees of fibrosis and cirrhosis [5]. NAFLD is now the most frequent cause of chronic liver disease and chronic kidney disease And from CKD end stage renal disease affects 1.1 million people around the world [6]. NAFLD affects extrahepatic organs, including the cardiovascular and renal system [8, 9]. NAFLD was linked to an increased risk of future CVD and CKD events and a Renal stone disease, which involves the deposition of crystals in the medulla and urinary tract, affects up to a third of the population in Asia [11, 12]. Nephrolithiasis is related to hypertension, asthma, chronic kidney failure, vitamin D deficiency, insulin resistance, fatal conditions, and coronary morbidity [3, 13]. A liver biopsy is the gold standard for fatty liver disease, mild steatosis (5-33%) triglycerides, moderate steatosis (34-66%) triglycerides, and extreme steatosis (above66%) triglycerides, but since biopsy is an invasive technique, we use alternatives such as liver ultrasound and CT scans [3, 15]. Hepatic insulin resistance refers to impaired suppression of glucose production by insulin in hepatocytes. Insulin mediates its inhibitory effects on glucose production by inhibiting two key gluconeogenic

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enzymes, phosphoenolpyruvate carboxy-kinase (PEPCK) and the glucose-6 phosphatase (G6Pase). Insulin resistance results in impaired excretion of urinary ammonia leading to lower urinary pH ultimately, these conditions induce UA precipitation out of the urine, leading to the formation of kidney stones [17]. We examined the association of NAFLD with the development of nephrolithiasis. The presence of pathophysiological inter-relationships between the liver and kidney is established by the presence of hepatorenal syndrome [18]. Two large prospective studies explain elevated serum liver enzyme levels are surrogate markers for NAFLD and independently associated with an increased incidence of kidney disease [18]. Literature review also show relationship between liver and renal stones. Recent findings indicate that NAFLD is negatively associated with kidney function and NAFLD and mild kidney function damage may share similar risk factors and/or pathological processes [19]. NAFLD and nephrolithiasis share several risk factors such as obesity, hypertension, and diabetes. Insulin resistance, a key factor in the pathogenesis of NAFLD, contributes to the formation of kidney stones by affecting urinary pH [11].The lower the number, the more acidic urine is. The average urine sample tests at about 6.0. If urine sample is lower, this could indicate an environment conducive to kidney stones [11]. Second one reason may be liver doesn't create enough of a certain protein (enzyme) that prevents overproduction of oxalate, or the enzyme doesn't work properly. Excess oxalate is eliminated through your kidneys, in your urine and may be form kidney stones [20].

Liver ultrasound is largely available and noninvasive for investigation of nonalcoholic fatty liver disease. In this study we hypothesized presence of kidney stones in the patients of nonalcoholic fatty liver independently from the Cardio vascular disease patients. We have ruled out significant relationship between Nonalcoholic fatty liver and nephrolithiasis by the help of abdominal ultrasound in same patient.

MATERIAL AND METHODS

It was a retrospective cross-sectional analysis in which 381 ultrasonography reports 214 of males and 167 of females obtained from a private sector hospital Gujrat in duration of 6 months from August 2020-January2021.

Inclusion Criteria
Nonalcoholic fatty liver patients
All age groups

Exclusion Criteria
Alcoholic fatty liver
NASH
Patients with NAFLD but also with any other pathology
Chronic liver disease

STATISTICAL ANALYSIS

According to 14 percent Incidence of NAFLD in Pakistan and population of 3, 90,533 people. And by keeping confidence interval=5 and confidence level=95% we calculated sample size of 381.

RESULTS

As we obtained a 381 ultrasonography reports of patients suffering from nonalcoholic fatty liver disease 167 (43.8%) were of females and 214(56.2%) of male patients. Analysis show incidence of 13.2% nephrolithiasis in females and 7.9% in males. In all 381 subjects, the total incidence came out to be 10.2% because of the absence of nephrolithiasis in 342 subjects.

Table-01: Gender distribution

		Frequency	Percent
Valid	F	167	43.8
	M	214	56.2
	Total	381	100.0

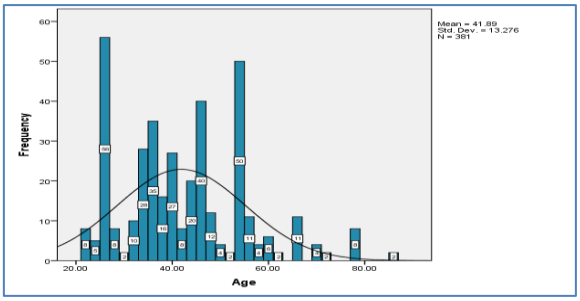


Table-02: Age distribution showing highest frequency among group 31-39

		Frequency	Percent
Valid	22-30	79	20.7
	31-39	112	29.4
	40-49	86	22.6
	50-59	69	18.1
	60-69	21	5.5
	70-79	12	3.1
	80-89	2	.5
	Total	381	100.0

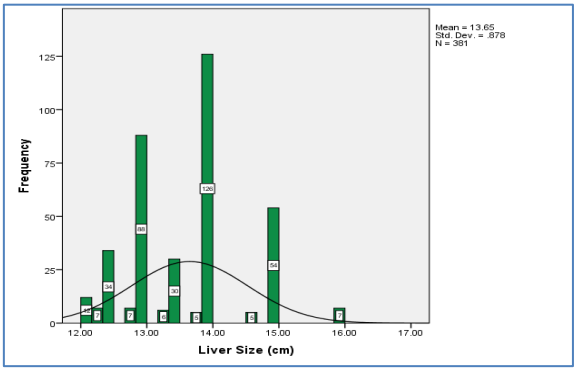


Table-03: Liver status * Nephrolithiasis Cross tabulation

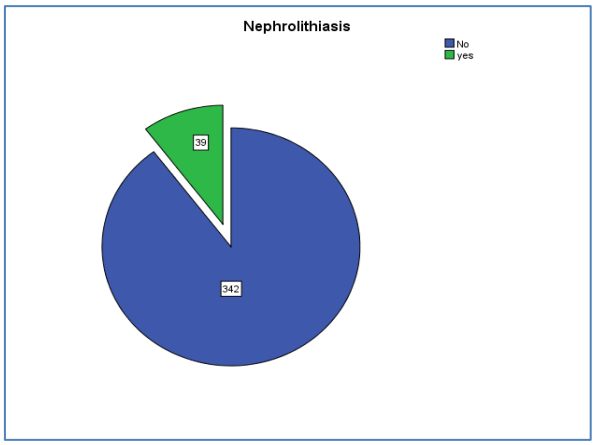
			Nephrolithiasis		Total
			No	yes	
Liver status	Fatty	Count	342	39	381
		% within Liver status	89.8%	10.2%	100.0%
Total		Count	342	39	381
		% within Liver status	89.8%	10.2%	100.0%

Table-04: Gender * Nephrolithiasis Cross-tabulation

			Nephrolithiasis		Total
			No	yes	
Gender	F	Count	145	22	167
		% within Gender	86.8%	13.2%	100.0%
	M	Count	197	17	214
		% within Gender	92.1%	7.9%	100.0%
Total		Count	342	39	381
		% within Gender	89.8%	10.2%	100.0%

Table-05: Age Group * Nephrolithiasis Cross-tabulation

			Nephrolithiasis		Total
			No	yes	
Age Group	22-30	Count	74	5	79
		% within AGE	93.7%	6.3%	100.0%
	31-39	Count	102	10	112
		% within AGE	91.1%	8.9%	100.0%
	40-49	Count	76	10	86
		% within AGE	88.4%	11.6%	100.0%
	50-59	Count	59	10	69
		% within AGE	85.5%	14.5%	100.0%
	60-69	Count	19	2	21
		% within AGE	90.5%	9.5%	100.0%
	70-79	Count	10	2	12
		% within AGE	83.3%	16.7%	100.0%
	80-89	Count	2	0	2
		% within AGE	100.0%	0.0%	100.0%
Total		Count	342	39	381
		% within AGE	89.8%	10.2%	100.0%



Simple Pie- Chart showing final concluded results of nephrolithiasis incidence in patients of nonalcoholic fatty liver disease.

DISCUSSION

In 2014 L. Orlic performed a study to conclude a relationship between presences of CKD in the NAFLD patients. The prevalence of NAFLD is growing internationally, increasing the risk of an increase in the level of CKD. Insulin resistance, liver inflammation, and steatotic liver cytokine secretion abnormalities are all common NAFLD causes. Then there are further studies that point to a correlation between NAFLD and CKD. Patients with NAFLD need a multifaceted approach to treatment. Doctors that treat NAFLD are also conscious of extra-hepatic effects of NAFLD. Doctors that treat CKD patients are aware of their patients' liver function. It is possible to classify high-risk patients and reduce their severity [1]. In 2007 Yoosoo Changa performed a prospective analysis to see whether there is a correlation between CKD and NAFLD. It was a cohort sample in which 8329

participants with normal kidney function and no proteinuria were recruited. NAFLD affects 2516 people out of 8329. 324 patients developed CKD after being checked up with [2]. In 2005, D. Paz1, L performed study in which researchers analyzed 100 non-contrast CT scans of 100 patients and found that the group with positive urinary stone disorder had 37.5 percent of them. NAFLD accounted for 11% of the number, compared to 11% in the non-stone disease community. We discovered a slightly higher proportion of fatty liver disease in the population of patients with renal stones for the first time. This study backs up the connection between renal stones and fatty liver disease, especially in females. More research is required into the consumption of the stones, as well as common risk and pathogenic factors [3]. In 2007, Seolhye Kim, performed a study which describes There were 112,324 males (53.9%) and 96,254 females among the 208,578 people (46.1 percent). NAFLD was more common in men than it was in women. Age, BMI, glucose, uric acid, total cholesterol, LDL-C, triglyceride, AST, ALT, and GGT were all related to NAFLD. The partnership between and. During the 1,054,887.6 person-years of follow-up, 16,442 individuals developed nephrolithiasis (with a cumulative incidence of 1.6 per 100 people). 1.3 per 100 person-years in men, and 1.3 per 100 person-years in women. As a result, NAFLD was related to an increased risk of contracting nephrolithiasis in men but not in women in a cohort sample of Korean adults. Women may not have nephrolithiasis because oestrogen prevents the production of nephrolithiasis in women. This connection remains after adjusting for possible confounders and other metabolic parameters, suggesting that NAFLD plays a negative role in the production of nephrolithiasis [4]. In 2017, Abdel-Rauf Zeina performed a study. The aim of this study was to learn more about the connection between nephrolithiasis and NAFLD. A total of 508 patients were tested for renal calculi. In adition Hepatosteatosis was found in 80 (15.7 percent) cases and nephrolithiasis in 421 (83.9%). The findings of the vector quantity study showed a statistically significant correlation between nephrolithiasis and hepatosteatosis (OR=3.24 (95% CI 1.36-7.68), p=0.008. As a result, an important correlation between nephrolithiasis and hepatosteatosis had been discovered [5]. Hepatic insulin resistance refers to impaired suppression of glucose production by insulin in hepatocytes. Insulin mediates its inhibitory effects on glucose production by inhibiting two key gluconeogenic enzymes, phosphoenolpyruvate carboxykinase (PEPCK) and the glucose-6 phosphatase (G6Pase). Insulin resistance results in impaired excretion of urinary ammonia leading to lower urinary pH. Ultimately, these conditions induce UA precipitation out of the urine, leading to the formation of kidney stones [17]. We examined the association of NAFLD with the development of nephrolithiasis. The presence of pathophysiological inter-relationships between the liver and kidney is established by the presence of hepatorenal syndrome [18]. Two large prospective studies explain elevated serum liver enzyme levels are surrogate markers for NAFLD and independently associated with an increased incidence of kidney disease [18]. Literature review also show relationship between liver and renal stones. Recent findings indicate that NAFLD is negatively associated with kidney function and NAFLD and mild kidney function damage may share similar risk factors and/or pathological processes [19].

NAFLD is attributed to metabolic complications and has a detrimental effect on kidney function. Nephrolithiasis is an increasingly prevalent cause of a common renal disease that is a multifactorial disorder caused by both intrinsic and extrinsic, predominantly environmental causes. As a particular underlying risk factor, the relation between fatty liver and renal calculi has received little publicity. So we have find out incidence between fatty liver and renal calculi and explored in this study.

CONCLUSION

Nonalcoholic fatty liver disease is most common pathology and in this study we basically find out intermittent relationship between nephrolithiasis and NAFLD.

We studied 381 patients of NAFLD and find out incidence of 10.2% nephrolithiasis in it. Given the moderate prevalence of nephrolithiasis, the current result indicates that performing regular kidney and urinary system examinations during ultrasonography for fatty liver identification may be warranted. Small number of urolithiasis patients can go unreported for a long time in fatty liver patients; alternatively, a small number of urolithiasis patients may go undiagnosed for a long time. The information and assumptions discussed here should be regarded as preliminary and we're just pointing out a connection that needs to be looked at further.

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