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WisdomGale

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NAFLD and liver diseases: Prevalence and associated risks

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ABSTRACT

Aim: Liver diseases are increasingly common in humans, with non-alcoholic fatty liver disease (NAFLD) being one of the most prevalent conditions. This study aimed to assess the frequency of various liver diseases and identify the associated risk factors of NAFLD among patients at Chattogram Medical College Hospital (CMCH).

Methods: This research was conducted over a 6-month period at CMCH. Patients presenting with abdominal symptoms suggestive of liver disease and advised to undergo an ultrasound examination [ultrasonography (USG)] of the upper abdomen were initially screened. Those diagnosed with liver diseases via USG were subsequently interviewed using a structured questionnaire. A total of 253 patients with liver diseases were enrolled in the study, and their demographic, socioeconomic, lifestyle, clinical, and treatment-related data were recorded.

Results: Among the liver disease cases identified, NAFLD was the most prevalent, accounting for 81.05% of cases. The study found that females were more commonly affected, and individuals aged 30–60 years had the highest prevalence of NAFLD. Significant risk factors for NAFLD ($p \leq 0.05$) included diabetes and frequent fast-food consumption. Regarding fatty liver severity, Grade 1 NAFLD was most common in females and the 30–60 years age group. Clinically, most NAFLD patients did not exhibit symptoms such as nausea, jaundice, abdominal swelling, or weakness, as reported in previous studies. The primary treatment approach included medication for diabetes, cholesterol, and triglycerides, alongside lifestyle modifications.

Conclusion: This study highlights NAFLD as the most common liver disease among patients at CMCH, underscoring the growing burden of this condition. The identification of significant risk factors emphasizes the importance of early detection and preventive strategies. Targeted interventions focusing on lifestyle changes and metabolic control could help reduce the incidence of NAFLD and its complications, ultimately improving liver health and patient outcomes in the studied population.

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Introduction

Liver disease is a major global health issue, imposing a significant burden on individuals and healthcare systems. It includes a spectrum of conditions such as viral hepatitis, alcoholic liver disease, non-alcoholic fatty liver disease (NAFLD), cirrhosis, and liver cancer. Understanding the epidemiology and risk factors is essential for effective public health strategies. Chronic liver disease (CLD) is a leading cause of global morbidity and mortality [1], with a 46% increase in mortality between 1980 and 2010 [2], particularly in low- and middle-income countries in Asia and Africa [3]. Around 240 million people worldwide are chronically infected with hepatitis B, a major contributor to both acute and CLD [4], causing approximately 800,000 deaths annually, mainly from cirrhosis and liver cancer [5].

Liver diseases result from various risk factors, including lifestyle choices, metabolic disorders,

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genetic predispositions, and environmental exposures. Key contributors include viral hepatitis, NAFLD, autoimmune liver diseases, and toxins. NAFLD, in particular, is rapidly rising worldwide due to obesity, sedentary lifestyles, and insulin resistance. It is more prevalent in Western countries (15%–40%) but also affects Asian populations (9%–40%) [6].

In Bangladesh, NAFLD has become a leading liver disease, with a prevalence of 20%–33% [7], and Bangladeshi ethnicity itself is a significant risk factor [8]. Although hepatic steatosis is often benign, it affects 60%–70% of diabetics and obese individuals [9]. Up to 25% of NAFLD patients may develop nonalcoholic steatohepatitis (NASH), and a similar percentage of NASH patients may progress to cirrhosis [10,11]. NAFLD can ultimately lead to hepatocellular carcinoma [12,13].

According to the WHO, liver diseases account for 2.82% of all deaths in Bangladesh, ranking as the eighth leading cause of death, with an age-adjusted death rate of 19.26 per 100,000 population [14]. Chronic liver disorders represent 37%–69% of liver diseases, with NAFLD contributing significantly to this burden [15,16]. NAFLD is closely linked to metabolic syndrome, which includes obesity, dyslipidemia, hypertension, and insulin resistance. Additional risk factors include type 2 diabetes, PCOS, certain medications (e.g., corticosteroids), and conditions such as sleep apnea. Age, ethnicity, and genetic variants also influence susceptibility [17].

Given this context, this study aims to assess the frequency of liver diseases and identify NAFLD risk factors at Chattogram Medical College Hospital (CMCH).

Materials and Methods

Ethical considerations

This research was conducted as per ethical guidelines of Animal Experimentation Ethics Committee of CVASU, and approval from the ethics committee of CVASU was taken. Informed written consent was obtained from all participants before their inclusion in the study. Confidentiality of participants' data was maintained throughout the research process.

Study design

This study utilized a cross-sectional study design to assess the frequency of liver diseases, with a specific focus on NAFLD, and identify associated risk factors. The study was conducted at CMCH, a tertiary care hospital in Bangladesh. The study included patients who visited the Radiography Department of Chittagong Medical College Hospital with abdominal symptoms suspected with liver diseases and advised for ultrasonography (USG) of upper abdomen.

Data collection

Data for this study were collected through a combination of structured interviews, physical examinations, laboratory investigations, and USG assessments of the upper abdomen. The goal was to obtain comprehensive information on potential risk factors and clinical features associated with liver diseases, particularly NAFLD.

A face-to-face interview was conducted with each participant using a pre-tested, structured questionnaire. The questionnaire was designed to gather detailed information on the following areas:

- Sociodemographic characteristics: age, sex, education level, occupation, income, and residence (urban/rural).
- Medical history: personal and family history of liver disease, diabetes mellitus (DM), hypertension, dyslipidemia, and other relevant chronic conditions.
- Lifestyle factors: dietary habits, frequency of consumption of fatty or sugary foods, physical activity level (based on self-reported frequency and type of exercise), smoking status, and alcohol consumption (including quantity and frequency).
- Medication history: current or past use of hepatotoxic drugs, steroids, or other medications known to influence liver function.

Following the interview, a physical examination was conducted for each participant to obtain anthropometric and vital measurements. These included:

- Height and weight: measured using standardized equipment, with participants wearing light clothing and no shoes. Body mass index was calculated as weight in kilograms divided by height in meters squared (kg/m^2).
- Waist circumference: measured at the midpoint between the lower margin of the last palpable rib and the top of the iliac crest, using a non-stretchable measuring tape.
- Blood pressure: measured using a calibrated sphygmomanometer with the participant in a

seated position after at least 5 minutes of rest. Two readings were taken, and the average was recorded.

Additionally, laboratory investigations such as liver function tests, fasting blood glucose, and lipid profiles were reviewed when available to complement clinical data.

USG findings of the upper abdomen were used to assess the structural condition of the liver and to identify the presence or absence of fatty liver changes, as described in the USG examination.

USG examination

USG of the hepatobiliary system was used to diagnose the condition of the liver and any diseases of the liver and the presence or absence of NAFLD. This technique is considered an easily available, cost-effective, and essentially noninvasive method for the detection of NAFLD. USG of the hepatobiliary system for each subject was performed where the liver and biliary tract were scanned using a digital color Doppler ultrasound system (P12EXP, USA). Fatty liver was diagnosed by the sonographic findings of the echogenicity of the liver.

Data analysis

The collected data were first stored in MS Excel 2019 (Microsoft Corporation, USA), coded, and entered into a STATA-13 (Stata Corporation, USA) for analysis. Descriptive statistics, such as frequencies, proportions, means, and SEM, was calculated to describe the demographic characteristics, prevalence of liver diseases, and risk factors. The chi-square test was used to analyze associations between categorical variables. p value less than 0.05 was considered significant.

Results

Prevalence of liver diseases and distribution of fatty liver cases

The study included a total of 800 patients who visited the Department of Radiology and Imaging at CMCH over a 6-month period. Of these, 253 patients (31.63%) were diagnosed with liver diseases, while the remaining 547 patients (68.37%) presented with other abdominal conditions (Table 1). Among the 253 patients with liver diseases, 205 (81.02%) were diagnosed with fatty liver disease. Other liver conditions included liver abscess (5.53%), acute hepatitis (3.55%), CLD (3.55%), hepatic space-occupying lesions (SOL) (3.55%), liver cirrhosis (2.77%), and hepatic cysts (1.58%) (Table 2).

Table 1. Frequency of liver diseases and other diseases with abdominal clinical signs.

Types of diseases	No (Percentage)
Liver diseases	253 (31.63)
Others	547 (68.37)
Total	800 (100)

Table 2. Frequency of different liver diseases in CMCH (N = 253).

Type of liver diseases	No (Percentage)
Fatty liver	205 (81.02)
Acute hepatitis	9 (3.55)
CLDs	9 (3.55)
Liver abscess	14 (5.53)
Hepatic SOL	9 (3.55)
Liver cirrhosis	7 (2.77)
Hepatic cyst	4 (1.58)
Total	253 (100)

Risk factors and demographic associations with fatty liver prevalence

Table 3 demonstrates that the age group 30–60 years had a significantly higher prevalence of fatty liver, with 138 patients (86.79%) out of 159, compared to 13.21% in other age groups (p = 0.001). Similarly, the fast-food consumption group exhibited a higher prevalence of fatty liver, with 151 patients (84.36%) out of 179, compared to 15.64% in those not consuming fast food (p = 0.003). The analysis also identified sex as a significant risk factor, with females being predominantly affected, accounting for 84.36% of the cases in the fast-food consumption group (179 patients). Further results showed that among patients aged 30–60 years, the prevalence of Grade 1 fatty liver (G1) was significantly higher, with 128 patients (92.09%) out of 139 (p = 0.03). Additionally, female patients exhibited a higher prevalence of Grade 1 fatty liver, with 92.59% (108 patients) affected (Table 4).

Clinical symptoms, severity, and treatment approaches in fatty liver patients

Ultrasound examination revealed that among patients presenting with abdominal pain, 177 patients (78.32%) were diagnosed with fatty liver, compared to 21.68% in those without abdominal

Table 3. Risk factors of fatty liver diseases and other types of liver diseases.

Risk factors	Fatty liver	Other liver diseases	*p*
Age			
Below 30 years	26 (66.67)	13 (33.33)	0.001
30–60 years	138 (86.79)	21 (13.21)	
Above 60 years	37 (67.27)	18 (32.73)	
Diabetes			
Diabetic	81 (95.29)	4 (4.71)	0.000
Non-diabetic	120 (71.43)	48 (28.57)	
Hypertension			
Yes	67 (82.72)	14 (17.28)	0.377
No	134 (77.91)	38 (22.09)	
Sex			
Male	94 (75.2)	31 (24.80)	0.09
Female	107 (83.59)	21 (16.41)	
Fast food consumption			
Yes	151 (84.36)	28 (15.64)	0.003
No	50 (67.57)	24 (32.43)	

Table 4. Risk factors according to different grades of fatty liver.

Risk factors	Fatty liver G1	Fatty liver G2	*p*
Age			
Below 30 years	27 (100)	0 (0)	0.03
30-60 years	128 (92.09)	11 (7.91)	
Above 60 years	32 (82.05)	7 (17.95)	
Diabetes			
Diabetic	71 (86.59)	11 (13.41)	0.06
Non-diabetic	116 (94.31)	7 (5.69)	
Hypertension			
Yes	59 (85.51)	10 (14.49)	0.04
No	128 (94.12)	8 (5.88)	
Sex			
Male	87 (89.69)	10 (10.31)	0.464
Female	100 (92.59)	8 (7.41)	
Fast food consumption			0.15
Yes	143 (92.86)	11 (7.14)	
No	44 (86.27)	7 (13.73)	
Physical activity			
Yes	170 (91.40)	16 (8.6)	0.778
No	17 (89.47)	2 (10.53)	

pain ($p = 0.002$). Additionally, a significant risk factor was identified in patients experiencing weakness,

Table 5. Clinical signs observed in fatty liver and other liver diseases.

Clinical signs	Fatty liver	Other liver diseases	*p*
Presence of abdominal pain			
Yes	177 (78.32)	49 (21.68)	0.002
No	24 (96)	1 (4)	
Presence of nausea			
Yes	70 (64.22)	39 (35.78)	0.000
No	131 (90.97)	13 (9.03)	
Yellowish skin			
Yes	6 (17.65)	28 (82.35)	0.000
No	195 (89.04)	24 (10.96)	
Extreme tiredness			
Yes	26 (50.98)	25 (49.02)	0.000
No	175 (86.63)	27 (13.37)	
Swollen abdomen			
Yes	15 (35.71)	27 (64.29)	0.000
No	186 (88.15)	25 (11.85)	
Weakness			
Yes	116 (70.3)	49 (29.7)	0.000
No	85 (96.59)	3 (3.41)	

with 116 patients (70.30%) diagnosed with fatty liver out of 165, compared to 29.7% in those without weakness ($p = 0.000$) (Table 5). Regarding fatty liver severity, 164 patients (90.61%) out of 181 with abdominal pain were diagnosed with Grade 1 fatty liver (G1), compared to 9.39% in other cases. Furthermore, patients suffering from weakness exhibited a significantly higher prevalence of Grade 1 fatty liver, with 105 patients (91.22%) out of 120, compared to 12.5% in those not experiencing weakness ($p = 0.025$) (Table 6). According to the study results, 66 patients (35.29%) with Grade 1 fatty liver (G1) are receiving medication to manage DM, cholesterol, and triglyceride levels. In comparison, 10 patients (55.56%) with Grade 2 fatty liver (G2) are undergoing similar treatment (Table 7).

Discussion

In our study results findings, one patient was suffering from fatty liver disease out of every four of the total 800 patients in this study, and four patients were suffering from fatty liver diseases out of every five who were suffering from liver diseases. The finding underlines the country's severe NAFLD epidemic and raises the prospect of increased liver-related morbidity and mortality. The prevalence

Table 6. Clinical signs observed in according to different grades of fatty liver.

Clinical signs	Fatty liver G1	Fatty liver G2	*p*
Presence of abdominal pain			
Yes	164 (90.61)	17 (9.39)	0.395
No	23 (95.83)	1 (4.17)	
Presence of nausea			
Yes	65 (89.04)	8 (10.96)	0.412
No	122 (92.42)	10 (7.58)	
Yellowish skin			
Yes	8 (88.89)	1 (11.11)	0.801
No	179 (91.33)	17 (8.67)	
Extreme tiredness			
Yes	20 (68.97)	9 (31.03)	0.000
No	167 (94.89)	9 (5.11)	
Swollen abdomen			
Yes	15 (78.95)	4 (21.05)	0.047
No	172 (92.47)	14 (7.53)	
Weakness			
Yes	105 (91.22)	15 (12.5)	0.025
No	82 (96.47)	3 (3.53)	

Table 7. Treatment given to patients according to different grading of fatty liver.

Treatment strategy	Fatty liver G1	Fatty liver G2
Losing weight	1 (0.53)	0 (0)
Losing weight + taking medication to control DM, cholesterol, and triglyceride	7 (3.74)	0 (0)
Losing weight + taking medication to control DM, cholesterol, and triglyceride + specific drugs for NAFLD	10 (5.35)	5 (27.78)
Losing weight + specific drugs for NAFLD	3 (1.6)	0 (0)
Taking medication to control DM, cholesterol, and triglyceride	66 (35.29)	10 (55.56)
Taking medication to control DM, cholesterol, and triglyceride + vitamins	1 (0.53)	0 (0)
Taking medication to control DM, cholesterol, and triglyceride + specific drugs for NAFLD	8 (4.28)	1 (5.56)
Vitamins	1 (0.53)	0 (0)
Specific drugs for NAFLD	7 (3.74)	0 (0)

estimated in this study is higher than in surrounding countries and prior reports from Bangladesh [18–20]. This supports the already present evidence of rising NAFLD prevalence in this area and is inconsistent with the global trend of fatty liver disease [21].

In this study, risk factors including sex and female sex, were predominant: 84.36% fatty liver patients out of 179 and 92.59% fatty liver G1 patients out of 108, respectively. In rural areas, women were almost 10% more (1.27 times more) prone to developing NAFLD than men. According to several hospital-based studies from Bangladesh, fatty liver disease predominates in women there [15,16,22,23]. Women who live in rural areas are more likely to get NAFLD. Data from numerous studies suggested that men are more likely than women to develop NAFLD [24].

However, while sharing a similar sociocultural background, a prior study on the nearby Indian state of West Bengal found a prevalence to be between 8% and 9% [19]. The higher prevalence of NAFLD examined potential explanations, including the rising awareness of sonographic NAFLD diagnosis, recent economic growth with lifestyle changes, and the religious conservatism of rural Bangladeshi women. Due to social conservatism, women typically have sedentary lives in rural areas since they

stay at home. This could be the reason why NAFLD is more common in women in rural regions [22].

In my study, age ranges between 30 and 60 years obtained significantly higher 138 (86.79%) fatty liver patients out of 159 (86.79% vs. 13.21%, p = 0.001) and 128 (92.09%) fatty liver G1 patients out of 139 (92.09% *vs*. 7.91%, p = 0.03). Therefore, age is a significant and independent risk factor for NAFLD. NAFLD is thought to primarily affect people in their middle and later years [25]. A life expectancy of more than 24 years was an independent predictor of having a fatty liver. The prevalence was 30.91% in the 25–34 age range, and it rises with age. According to research, fatty alterations in the liver worsen with age [26]. Young persons under 24 years old were significantly less affected, and the danger rises from 25 to 54 years of age. The highest prevalence (55.38%) was seen in midlife adults between the ages of 45 and 54 years, and the risk declined as people aged over 55 years. According to earlier research, people with NASH are generally between 40 and 50 years [22]. In India, NAFLD is most common in people 40–60 years old [25], and in the United States, liver disease is the fourth most common cause of death for people 45–54 years [26].

In this study, out of 139 individuals with fatty liver grade 2 disease, 92.09% were between the ages of 30 and 60 years. In Bangladesh, Grade 1 was more prevalent (26.10%). Even though this illness is benign, if Grade 1I advances to later stages, the liver may experience major alterations that lead to NASH or cirrhosis [27,28].

The enormous sample size used in this study, which included both urban and rural residents around the Chattogram district, is one of its strong points. However, since USG is noninvasive, it is unquestionably the most popular way to diagnose NAFLD in clinical settings. For identifying hepatic steatosis, it has extremely high sensitivity and specificity, which can range from 60% to 94% and 88% to 95%, respectively [29]. According to several studies, diagnosing NAFLD almost never requires a liver biopsy because of the evident sensitivity and specificity of a straightforward ultrasound [30,31].

In conclusion, the results of this study demonstrate that about 81.02% of patients were suffering from fatty liver diseases of whom 253 were suffering from liver diseases. The frequency is higher than in neighboring countries, putting this population at an increased risk of liver-related morbidity and mortality. Early to midlife adults; diabetic, overweight, and obese individuals; rural women; and married individuals are at a greater risk of developing NAFLD than others. Young and non-obese individuals are also not spared by NAFLD. Modifiable risk factors identified in this study might help to develop feasible interventions for the early detection and management of NAFLD. In addition, it will lead to the development and implementation of national programs to prevent NAFLD and control its associated risk factors.

Conclusion

The results of the present study clearly demonstrate that the frequency of liver disease and associated risk factors of NAFLD in Chattogram have some definite risk factors such as advanced age, sex difference, and fast-food consumption which leads to increasing burdens to fatty liver disease in Chattogram as well as the country.

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Conflict of Interest

The authors declare no competing interests.

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References

1. Marcellin P, Kutala BK. Liver diseases: a major, neglected global public health problem requiring urgent actions and large-scale screening. Liver Int 2018; 38(Suppl 1):2–6.
2. Mokdad AA, Lopez AD, Shahraz S, Lozano R, Mokdad AH, Stanaway J, et al. Liver cirrhosis mortality in 187 countries between 1980 and 2010: a systematic analysis. BMC Med 2014; 12:145.
3. Stepanova M, De Avila L, Afendy M, Younossi I, Pham H, Cable R, et al. Direct and indirect economic burden of chronic liver disease in the United States. Clin Gastroenterol Hepatol 2017; 15(5):759–66.
4. Alavian SM, Fallahian F, Lankarani KB. The changing epidemiology of viral hepatitis B in Iran. J Gastrointestin Liver Dis 2007; 16(4):403–6.
5. Lavanchy D, Kane M. Global epidemiology of hepatitis B virus infection. In: Liaw YF, Zoulim F (eds.). Hepatitis B virus in human diseases, Springer, Cham, pp 187–203, 2016.
6. Farrell GC, Larter CZ. Nonalcoholic fatty liver disease: from steatosis to cirrhosis. Hepatology 2006; 43(1 Suppl 1):S99–112.

7. Hossain N, Kanwar P, Mohanty SR. A comprehensive updated review of pharmaceutical and nonpharmaceutical treatment for NAFLD. Gastroenterol Res Pract 2016; 2016:1–24.
8. Alazawi W, Mathur R, Abeysekera K, Hull S, Boomla K, Robson J, et al. Ethnicity and the diagnosis gap in liver disease: a population-based study. Br J Gen Pract 2014; 64(628):e694–702.
9. Wang J, Wu Z, Li D, Li N, Dindot SV, Satterfield MC, et al. Nutrition, epigenetics, and metabolic syndrome. Antioxid Redox Signal 2012; 17(2):282–301.
10. Clark JM, Brancati FL, Diehl AM. The prevalence and etiology of elevated aminotransferase levels in the United States. Am J Gastroenterol 2003; 98(5):960–7.
11. Michelotti GA, Machado MV, Diehl AM. NAFLD, NASH and liver cancer. Nat Rev Gastroenterol Hepatol 2013; 10(11):656–65.
12. Tian Y, Wong VW, Chan HL, Cheng AS. Epigenetic regulation of hepatocellular carcinoma in non-alcoholic fatty liver disease. Semin Cancer Biol 2013; 23(6):471–82.
13. Bhala N, Angulo P, van der Poorten D, Lee E, Hui JM, Saracco G, et al. The natural history of nonalcoholic fatty liver disease with advanced fibrosis or cirrhosis: an international collaborative study. Hepatology 2011; 54(4):1208–16.
14. Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V, et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet 2012; 380(9859):2095–128.
15. Alam S, Mustafa G, Alam M, Ahmad N. Insulin resistance in development and progression of nonalcoholic fatty liver disease. World J Gastrointest Pathophysiol 2016; 7(2):211–7.
16. Rahman S, Ahmed MF, Alam MJ, Hoque MI, Hussain MM, Kabir AS, et al. Distribution of liver disease in Bangladesh: a cross-country study. Euroasian J Hepatogastroenterol 2014; 4(1):25–9.
17. Randeva HS, Tan BK, Weickert MO, Lois K, Nestler JE, Sattar N, et al. Cardiometabolic aspects of the polycystic ovary syndrome. Endocr Rev 2012; 33(5):812–41.
18. Loomba R, Sanyal AJ. The global NAFLD epidemic. Nat Rev Gastroenterol Hepatol 2013; 10(11):686–90.
19. Das K, Mukherjee PS, Ghosh A, Ghosh S, Mridha AR, Dhibar T, et al. Nonobese population in a developing country has a high prevalence of nonalcoholic fatty liver and significant liver disease. Hepatology 2010; 51(5):1593–601.
20. Dassanayake AS, Kasturiratne A, Rajindrajith S, Kalubowila U, Chakrawarthi S, De Silva AP, et al. Prevalence and risk factors for non-alcoholic fatty liver disease among adults in an urban Sri Lankan population. J Gastroenterol Hepatol 2009; 24(7):1284–8.
21. Ray K. NAFLD—the next global epidemic. Nat Rev Gastroenterol Hepatol 2013; 10(11):621.
22. Alam S, Noor-E-Alam SM, Chowdhury ZR, Alam M, Kabir J. Nonalcoholic steatohepatitis in nonalcoholic fatty liver disease patients of Bangladesh. World J Hepatol 2013; 5(5):281–7.
23. Alam S, Gupta UD, Alam M, Kabir J, Chowdhury ZR, Alam AK. Clinical, anthropometric, biochemical and histological characteristics of nonobese nonalcoholic fatty liver disease patients of Bangladesh. Indian J Gastroenterol 2014; 33(5):452–7.
24. Park SH, Jeon WK, Kim SH, Kim HJ, Park DI, Cho YK, et al. Prevalence and risk factors of non-alcoholic fatty liver disease among Korean adults. J Gastroenterol Hepatol 2006; 21(1):138–43.
25. Amarapurkar D, Kamani P, Patel N, Gupte P, Kumar P, Agal S, et al. Prevalence of non-alcoholic fatty liver disease: population based study. Ann Hepatol 2007; 6(3):161–3.
26. Lazo M, Hernaez R, Eberhardt MS, Bonekamp S, Kamel I, Guallar E, et al. Prevalence of nonalcoholic fatty liver disease in the United States: the Third National Health and Nutrition Examination Survey, 1988–1994. Am J Epidemiol 2013; 178(1):38–45.
27. Agarwal AK, Jain V, Singla S, Baruah BP, Arya V, Yadav R, et al. Prevalence of non-alcoholic fatty liver disease and its correlation with coronary risk factors in patients with type 2 diabetes. J Assoc Physicians India 2011; 59:351–4.
28. Dixon JB, Bhathal PS, O'Brien PE. Nonalcoholic fatty liver disease: predictors of nonalcoholic steatohepatitis and liver fibrosis in the severely obese. Gastroenterology 2001; 121(1):91–100.
29. Joy D, Thava VR, Scott BB. Diagnosis of fatty liver disease: is biopsy necessary?. Eur J Gastroenterol Hepatol 2003; 15(5):539–43.
30. Adams LA, Talwalkar JA. Diagnostic evaluation of nonalcoholic fatty liver disease. J Clin Gastroenterol 2006; 40 Suppl 1:S34–8.
31. Caturelli E, Rapaccini GL, Sabelli C, De Simone F, Anti M, Savini E, et al. Ultrasonography and echo-guided fine-needle biopsy in the diagnosis of focal fatty liver change. Hepatogastroenterology 1987; 34(4):137–40.