

Article

# Clinical profile of non-alcoholic fatty liver disease: A cross-sectional study

Dr. Sarita Jalodiya<sup>1</sup>, Dr. Pankaj Kumar Jain<sup>2</sup>, Dr. Mohit Garg<sup>3</sup> and Dr. Arun Kumar Pargi<sup>4,\*</sup>

<sup>1</sup> Consulting Physician Khandwa, M.P. India.

<sup>2</sup> Assistant Professor, Department of Medicine, N.S.C. Government Medical College, Khandwa, M.P. India.

<sup>3</sup> Assistant Professor, Department of Medicine, N.S.C. Government Medical College, Khandwa, M.P. India.

<sup>4</sup> Assistant Professor, Department of Surgery, N.S.C. Government Medical College, Khandwa, M.P.

\* Correspondence: dr.pargi4grmc@gmail.com

Received: 1 February 2023; Accepted: 5 May 2023; Published: 26 May 2023.

**Abstract: Introduction:** In many Western countries, non-alcoholic fatty liver disease (NAFLD) is now surpassing viral hepatitis as the primary cause of chronic liver disease and hepatocellular carcinoma (HCC). In India, the current high burden of NAFLD is likely to rise further in the future. Given the significant prevalence of NAFLD in the community, identifying those at risk of developing liver disease is critical in order to simplify referral and advice effective management. Thus, the present study was carried out with the aim to diagnose Non-alcoholic fatty liver disease based on ultrasound and study its clinical profile in patients attending outpatient clinic and inpatients in a tertiary care hospital in Central India.

**Material and Methods:** This observational study was carried out in the Department of Medicine, Netaji Subhash Chandra Bose Medical College and Hospital, Jabalpur, after approval by Institutional Ethics Committee. 100 consented patients, >18 years of age presenting to the OPD and IPD of the hospital and suspected and later diagnosed as NAFLD were included in the study using a proforma, ultrasonography and investigations. Data was collected, compiled and analysed using SPSS 22.0 (trial version).

**Results:** 68%, 27%, 5% cases were diagnosed as grade I, grade II and grade III fatty liver respectively. The mean age was  $47.07 \pm 11.95$  years. Female preponderance was observed (55%). Abdominal pain (55%), fatigue (73%) and dyspepsia (48%) were the dominant symptoms. 51% patients had increased waist circumference (mean =  $87.06 \pm 10.46$  cm). Mean BMI was  $26.77 \pm 4.01$  kg/m<sup>2</sup>. 46% were pre-obese and 15% were obese (BMI >30). Majority of Grade III fatty liver (60%) were diabetics. Mean values of impaired fasting blood sugar in grade I, II, III were  $109.6 \pm 45.02$ ,  $117.52 \pm 56.93$ ,  $138.20 \pm 53.31$  mg/dl and when compared was statistically significant ( $p < 0.05$ ). 29% patients had hypertension ( $\geq 130/85$  mmHg). 18% patients had high bilirubin levels. Deranged AST ( $46.48 \pm 27.30$ ) and ALT ( $57.51 \pm 52.10$ ) were found in greater percentage of patients ( $p$  value  $< 0.001$ ,  $< 0.001$  respectively) and had positive co-relation ( $r + 0.36$  and  $r + 0.43$ ). Hypercholesterolemia ( $> 200$  mg/dl) was found in 46% patients. Mean cholesterol level in grade I, II and III was  $192.71 \pm 43.43$ ,  $210.37 \pm 44.11$  and  $277.34 \pm 34.06$ ; when compared it was found to be statistically significant ( $p < 0.01$ ) with positive co-relation ( $r + 0.39$ ). Hypertriglyceridemia ( $> 150$  mg/dl) was present in 60% cases. The mean triglyceride level in grade I, II and III was  $160.46 \pm 51.28$ ,  $211.00 \pm 111.432$  and  $240.14 \pm 174.111$  mg/dl respectively and when compared was statistically significant ( $p < 0.05$ ) with positive co-relation ( $r + 0.29$ ). Low HDL was present in 71% of patients. HDL cholesterol had a negative co-relation ( $r - 0.17$ ). In the present study mean LDL was  $119.66 \pm 31.11$  mg/dl and elevated LDL ( $> 130$  mg/dl) was found in 29% of patients. Elevated VLDL was seen in 36% of patients with mean of  $30.496 \pm 10.33$  mg/dl.

**Conclusion:** Non-alcoholic fatty liver disease (NAFLD) is a leading cause of chronic liver disease in both the developed and developing worlds. It is emerging as a major public health problem. The present study throws light on the clinical spectrum of the disease. Early detection and treatment is of utmost importance in preventing this disease from emerging as a new epidemic globally.

**Keywords:** NAFLD; fatty liver; ultrasonography; clinical profile; spectrum.

## 1. Introduction

**N**on-alcoholic fatty liver disease (NAFLD) is a disease spectrum that includes simple steatosis, non-alcoholic steatohepatitis (NASH), severe fibrosis, and cirrhosis [1]. In many Western countries, nonalcoholic fatty liver disease (NAFLD) is now surpassing viral hepatitis as the primary cause of chronic liver disease and hepatocellular carcinoma (HCC). NAFLD-associated HCC typically affects older individuals who have various comorbidities, frequently develops in the absence of cirrhosis, and is usually detected later, with a poor prognosis. The poor prognosis is also owing to inadequate surveillance systems and the ineffectiveness of standard treatments [2]. In India, the current high burden of NAFLD is likely to rise further in the future, in tandem with the growing epidemics of obesity and type 2 diabetes mellitus. Given the significant prevalence of NAFLD in the community, identifying those at risk of developing liver disease is critical in order to simplify referral and advice effective management [3]. Thus, the present study was carried out with the aim to diagnose Non-alcoholic fatty liver disease based on ultrasound and study its clinical profile in patients attending outpatient clinic and inpatients in a tertiary care hospital in Central India.

## 2. Material and methods

This observational study was carried out in the Department of Medicine, NetajiSubhash Chandra Bose Medical College and Hospital, Jabalpur, after approval by Institutional Ethics Committee. 100 consented patients, >18 years of age presenting to the OPD and IPD of the hospital and suspected and later diagnosed as NAFLD were included in the study.

All those with history of alcohol intake (>30 gm/day in males and >20 gm/day in females); jaundice; HBsAg/ anti HCV positive serum; ceruloplasmin; KF ring (to rule out Wilson's disease; history of drug intake such as steroids, synthetic estrogens, calcium channel blockers, heparin, amiodarone, valproic acid and anti-viral agents were excluded from the study.

The standard criteria which is accepted by the American Gastroenterology Association was used to include subjects in the study [4]. As per the USG findings, the three grades of fatty liver are as follows:

**Grade I-** Slight diffuse increase in the fine echoes; liver appears bright as compared to the cortex of kidney. Normal visualization of diaphragm and intrahepatic vessel borders.

**Grade II-** Moderate diffuse increase in the fine echoes; slightly impaired visualization of intrahepatic vessels and diaphragm.

**Grade III-** Marked increase in the fine echoes; poor or no visualization of intrahepatic vessel borders, diaphragm and the vessel.

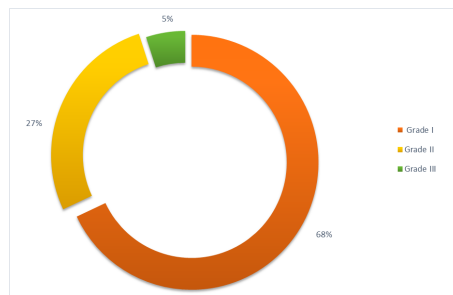
During the study, detailed history, anthropometry and clinical examination was done and recorded accordingly, after taking informed consent of the patient.

### 2.1. Statistical analysis

Data was collected, compiled and analysed using SPSS 22.0 (trial version). Results were expressed as the means and standard deviation or as numbers and percentages. Statistical analysis was done by applying appropriate statistical tests. The level of significance was fixed at 95%. P-value < 0.05 was considered statistically significant.

## 3. Results

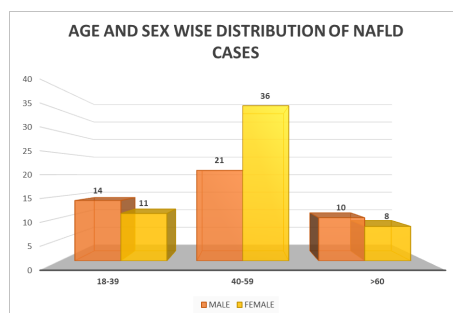
(The mean age of male patients was  $46.24 \pm 12.91$  years (range 21-66 years) and that of female patient was  $47.63 \pm 10.90$  years (range 22-80 years). Maximum number of both male and female patients is in fourth and fifth decade.)



**Figure 1.** Distribution of severity of NAFLD cases based on ultrasonography

**Table 1.** Distribution of study participants on the basis of socio-demographic characteristics

Socio-demography	USG Grade			Total
	I (n=68)	II (n=27)	III (n=5)	
Age (in years)				
18-39	19 (27.94%)	6 (22.22%)	0 (0.00%)	25 (25%)
40-59	37 (54.41%)	15 (55.56%)	5 (100%)	57 (57%)
>60	12 (17.65%)	6 (22.22%)	0 (0.00%)	18 (18%)
Mean age (in years)	47.07±11.95			
Gender				
Male	28 (41.18%)	14 (51.85%)	3 (60%)	45 (45%)
Female	40 (58.82%)	13 (48.15%)	2 (40%)	55 (55%)
Locality				
Urban	26 (38.24%)	11 (40.74%)	1 (20%)	38 (38%)
Rural	42 (61.76%)	16 (59.26%)	4 (80%)	62 (62%)



**Figure 2.** Distribution of NAFLD cases on the basis of age and sex

**Table 2.** Distribution of study participants on the basis of various parameters

Parameters	USG Grade			Total	p-value
	I (n=68)	II (n=27)	III (n=5)		
<b>Signs and Symptoms</b>					
Abdominal Pain	33 (48.53%)	18 (66.67%)	4 (80%)	55 (55%)	-
Fatigue	49 (72.06%)	20 (74.07%)	4 (80%)	73 (73%)	
Dyspepsia	33 (48.53%)	12 (44.44%)	3 (60%)	48 (48%)	
Malaise	13 (19.12%)	7 (25.93%)	1 (20%)	21 (21%)	
Hepatomegaly	9 (13.24%)	6 (22.22%)	1 (20%)	16 (16%)	
<b>Waist Circumference (Indian Asian Criteria125)</b>					
Abnormal (Male>90/Female>80)	36 (52.94%)	13 (48.15%)	2 (40%)	51 (51%)	0.97
Normal	32 (47.06%)	14 (51.85%)	3 (60%)	49 (49%)	
Mean±SD	87.19±10.88	86.63±9.03	86.80±13.97	87.02±10.46	
<b>BMI</b>					
<18.5	0 (0%)	1 (3.70%)	0 (0%)	1 (1%)	0.18
18.5-22.9	6 (8.82%)	6 (22.22%)	1 (20%)	13 (13%)	
23-24.99	18 (26.47%)	6 (22.22%)	1 (20%)	25 (25%)	
25-29.99	31 (45.59%)	12 (44.44%)	3 (60%)	46 (46%)	
>30	13 (19.12%)	2 (7.41%)	0 (0%)	12 (12%)	
<b>Impaired Fasting Blood Sugar level (≥100mg/dl)</b>					
Yes	28 (41.18%)	13 (48.15%)	3 (60%)	44 (44%)	0.028*
No	40 (58.82%)	14 (51.85%)	2 (40%)	56 (56%)	
Mean±SD	109.62±45.02	117.52±56.93	138.20±53.31	113.18±48.82	
<b>Hypertension(NCEP ATP III Guideline)</b>					
Hypertensive	18 (26.47%)	7 (25.93%)	4 (80%)	29 (29%)	-
Non-hypertensive	50 (73.53%)	20 (74.07%)	1 (20%)	71 (71%)	
SBP(>130mmHg)	126.22±19.05	127.56±14.74	134.40±10.43	126.99±17.62	0.59
Mean±SD					
DBP(>85mmHg)	79.47±8.54	81.19±8.25	88.00±4.47	80.36±8.47	0.078
Mean±SD					
<b>Liver function Tests</b>					
Total Serum Bilirubin (Mean±SD)	.90±.38	.99±.25	1.07±.17	.94±.34	
ALT (Mean±SD)	44.07±23.67	77.48±75.31	132.40±90.35	57.51±52.10	<0.001*
	Positive correlation (r+0.43)				
AST (Mean±SD)	41.01±22.97	53.04±28.73	85.40±39.35	46.48±27.30	<0.001*
	Positive correlation (r+0.361)				
<b>Total Serum Cholestrol (mg/dl)</b>					
Hypercholestroemia (>200mg/dl)	27 (39.71%)	14 (51.85%)	5 (100%)	46 (46%)	<0.001*
Normal (<200mg/dl)	41 (60.29%)	13 (48.15%)	0 (0%)	54 (54%)	
Mean±SD	192.71±43.43	210.37±44.11	277.34±34.06	201.69±46.87	
	Positive correlation (r+0.367)				
<b>Triglycerides (mg/dl)</b>					
Hypertriglyceridemia (>150mg/dl)	35 (51.47%)	21 (77.78%)	4 (80%)	60 (60%)	0.001*
Normal (<150 mg/dl)	33 (48.53%)	6 (22.22%)	1 (20%)	40 (40%)	
Mean±SD	160.46±51.28	211.00±111.432	240.14±174.111	178.09±83.48	
	Positive correlation (r+0.315)				
<b>HDL (mg/dl)</b>					
Low (M<40 mg/dl) (F<50 mg/dl)	47 (69.12%)	20 (74.07%)	4 (80%)	71 (71%)	0.049*
Normal	21 (30.88%)	7 (25.93%)	1 (20%)	29 (29%)	
Mean±SD	42.12±8.11	41.61±5.19	33.60±3.65	41.56±7.45	

Negative correlation (r-0.183)					
LDL (mg/dl)					
Abnormal (>130 mg/dl)	19 (27.94%)	8 (29.63%)	2 (40%)	29 (29%)	0.51
Normal	49 (72.06%)	19 (70.37%)	3 (60%)	71 (71%)	
Mean±SD	118.08±29.40	117.52±29.45	152.60±49.11	119.66±31.11	
Positive correlation (r+0.152)					
VLDL (mg/dl)					
Abnormal	25 (36.76%)	8 (29.63%)	3 (60%)	36 (36%)	0.25
Normal	43 (63.24%)	19 (70.37%)	2 (40%)	64 (64%)	
Mean±SD	30.053±9.66	30.222±9.98	38.000±18.83	30.496±10.33	
Positive correlation (r+0.114)					
Total	68 (100%)	27 (100%)	5 (100%)	100 (100%)	-

#### 4. Discussion

Total 174 patients were screened for NAFLD. Among these, 140 patients were diagnosed as NAFLD in ultrasonography of abdomen, of which 13 patients refused to give consent, 7 patients were found to be HBsAg positive and 5 patients were found to be HCV positive. 9 patients were found to be alcoholic and 6 patients had a history of drug intake. Thus, a total of 100 patients were enrolled in our study.

In the present study, out of 100 cases 68%, 27%, 5% cases were diagnosed as grade I, grade II and grade III fatty liver respectively. Roli Agarwal et al. [4](2008) reported that 48.1%, 40.3% and 11.3% had grade I, II and III fatty liver respectively. The mean age, in the present study, was 47.07±11.95 years. Mean age for male patients was 46.24±12.91 years (range 21-66 years) and mean age for females was 47.63±10.90 years (range 22-80 years). Maximum number of patients were in the 4th & 5th decade of life. Similar finding was observed by Adam et al. [5] (2005) who reported mean age to be 45.0±11.0 years. Roli Agarwal et al. [4](2008) reported mean age as 42.90±10.54 years. In the present study, majority participants were females i.e. 55% while males constituted 45% of the total population. Female preponderance could be because major risk factors for the presence and severity of NAFLD such as obesity, central obesity, and diabetes are more common in females. Roli Agrawal et al. [4](2008) reported 64.51% males and 35.48% females. Bajaj et al [6] (2009) reported an equal incidence in males and females. In the present study, 55% patients had abdominal pain, 73% patients had fatigue and 48% patients had dyspepsia. These were the dominant symptoms. 21% patients of NAFLD had malaise and 16% patients had hepatomegaly on examination. Amarapurkar et al. [7](2007) reported 69.23% symptomatic patients having right hypochondrial pain as the presenting complaint. In another study by Agarwal et al. [8](2001) 64% patients were symptomatic and right upper quadrant pain, fatigue and malaise were the main symptoms.

In the present study 51% of patients of NAFLD had increased waist circumference as defined by criteria established for Asian Indians. The mean waist circumference was 87.06±10.46 cm. A study by Bajaj et al. [6](2009) reported 47.1% cases with increased waist circumference and mean waist circumference of 89.2±13.9 cm. Another study by Deepa Uchil et al. [9](2009) showed higher values (99.96±10.01 cm). A study by Amarapurkar et al. [7](2007) reported that 53.6% with increased waist circumference had grade II fatty liver. The mean BMI, in the present study, was 26.77±4.01 kg/m<sup>2</sup>, which was similar to the study by Bajaj et al. [6](2009) who reported it to be 26.7±4.4 kg/m<sup>2</sup>, Amarapurkar et al. [7](2007) reported it as 26.6 ±5.1 kg/m<sup>2</sup>, and 26.7 kg/m<sup>2</sup> was reported by Kaushal et al. [10](2006). According to BMI 25% of the patients were overweight, (BMI 23-24.99), 46% were pre obese and 15% were obese (BMI >30) according to Indian Asian criteria of BMI. In the present study, mean fasting blood sugar was 113.18±48.82 mg/dl which is similar to a study conducted by Roli Agrawal et al. [4] (2008) who reported it to be 116.06±20.38 mg/dl. A study by Deepa Uchil et al. [9](2009) revealed higher mean sugar (126.6±45.83 mg/dl). Other studies show prevalence of 23.1% by Bajaj et al. [6](2009) and 72.4% by Deepa uchil et al. [9](2009). Majority of Grade III fatty liver were diabetics i.e. 3 (60%) while 11 (40%) of Grade II fatty liver and 20 (33.33%) of Grade I patients were diabetics. 44% had impaired fasting glucose (≥100mg/dl). 60% of grade III fatty liver had impaired fasting glucose. Mean values of impaired fasting blood sugar in grade I, II, III were 109.6±45.02, 117.52±56.93, 138.20

$\pm 53.31$  mg/dl and when compared was statistically significant ( $p < 0.05$ ). The mean blood pressure of the patients in our study was  $126.99 \pm 17.62$  mmHg SBP;  $80.36 \pm 8.47$  mmHg DBP. 29% patients had hypertension ( $\geq 130/85$  mmHg) as per the NCEP ATP III criteria. Out of the 5 patients who had grade III fatty liver 4 patients had hypertension. Deepa Uchil et al. [9] (2009) reported that 28% of the patients had hypertension but Kaushalman et al. [10] (2006), Ajay Duseja et al. [11] (2007) reported lower prevalence i.e. 11.8% and 10% respectively. In the present study, 18% patients had high bilirubin levels. Elevated bilirubin levels were reported in 8.0% by Agarwal et al. [8] (2001) and 7.69% by Amarapurkar et al. [7] (2007). Deranged AST ( $46.48 \pm 27.30$ ) and ALT ( $57.51 \pm 52.10$ ) were found in greater percentage of patients ( $p$  value  $< 0.001$ ,  $< 0.001$  respectively) and had positive co-relation ( $r = 0.36$  and  $r = 0.43$ ). With increasing grades of NAFLD incidence of raised AST and ALT level increases meaning NAFLD patients may have more NASH like and severe disease. Roli Agrawal et al. [4] (2008) reported elevated ALT and AST in 97.6% and 98.4% respectively. The mean total cholesterol was  $201.69 \pm 46.87$  mg/dl and hypercholesterolemia ( $> 200$  mg/dl) was found in 46% patients, in the present study. Roli Agarwal et al. [4] (2008) reported 21 (21.8%) patients with hypercholesterolemia. In the present study, mean cholesterol level in grade I, II and III was  $192.71 \pm 43.43$ ,  $210.37 \pm 44.11$  and  $277.34 \pm 34.06$ ; when compared it was found to be statistically significant ( $p < 0.01$ ) with positive co-relation ( $r = 0.39$ ). Hypertriglyceridemia ( $> 150$  mg/dl) was present in 60% cases with a mean of  $178.09 \pm 83.48$  mg/dl. Similar observation was reported by Roli Agarwal et al. [4] (2008) reported hypertriglyceridemia in 63.7% of patients with a mean of  $177.91 \pm 61.12$ . Other studies show lower prevalence of hypertriglyceridemia such as those by Ajay Duseja et al. [11] (2007) who reported prevalence of 53% and Deepa Uchil et al. [9] (2009) who reported it as 43.6%,  $170.02 \pm 88.90$ . The mean triglyceride level in grade I, II and III was  $160.46 \pm 51.28$ ,  $211.00 \pm 111.432$  and  $240.14 \pm 174.111$  mg/dl respectively and when compared was statistically significant ( $p < 0.05$ ) with positive co-relation ( $r = 0.29$ ). In the present study mean HDL cholesterol was  $41.56 \pm 7.45$  mg/dl and low level of HDL Cholesterol ( $< 40$  mg/dl in male,  $< 50$  mg/dl in female) was present in 71% of patients which was similar to study of Bajaj et al. [6] (2009) who reported 66.7% of patients with low HDL cholesterol but higher than that reported by Roli Agarwal et al. [4] (2008) who found 45.16% of patients with low level of HDL Cholesterol. The mean HDL levels in grade I, II and III were  $42.12 \pm 8.11$ ,  $41.61 \pm 5.19$ ,  $33.60 \pm 3.65$  mg/dl and HDL was significantly low in Grade III NAFLD cases. When compared with each grade of NAFLD, HDL cholesterol had a negative co-relation ( $r = 0.17$ ). In the present study mean LDL was  $119.66 \pm 31.11$  mg/dl and elevated LDL ( $> 130$  mg/dl) was found in 29% of patients, while Roli Agarwal et al. [4] (2008) reported elevated LDL in 25% of patients with mean of  $115 \pm 35.49$  mg/dl. Elevated VLDL, in the present study, was seen in 36% of patients with mean of  $30.496 \pm 10.33$  mg/dl which is lower than that reported by Roli Agarwal et al. [4] (2008) who observed elevated VLDL in 56.5% of patients with mean of  $34.38 \pm 11.39$  mg/dl.

## 5. Conclusion

Non-alcoholic fatty liver disease (NAFLD) is a leading cause of chronic liver disease in both the developed and developing worlds. It is emerging as a major public health problem. The present study throws light on the clinical spectrum of the disease. Not only would early discovery aid in changing the disease's course but it will also help in delaying its effects. Thus, early detection and treatment is of outmost importance in preventing this disease from emerging as a new epidemic globally.

**Author Contributions:** "All authors contributed equally to the writing of this paper. All authors read and approved the final manuscript."

**Conflicts of Interest:** The authors declare no conflict of interests.

## References

- [1] Asadullah, M., Shivashankar, R., Shalimar, Kandasamy, D., Kondal, D., Rautela, G., ... & Tandon, N. (2022). Rural-Urban differentials in prevalence, spectrum and determinants of Non-alcoholic Fatty Liver Disease in North Indian population. *Plos one*, 17(2), e0263768. doi: 10.1371/journal.pone.0263768. PMID: 35143562; PMCID: PMC8830644.
- [2] Pugliese, N., Alfarone, L., Arcari, I., Giugliano, S., Parigi, T. L., Rescigno, M., ... & Aghemo, A. (2023). Clinical features and management issues of NAFLD-related HCC: what we know so far. *Expert Review of Gastroenterology & Hepatology*, 17(1), 31-43. doi: 10.1080/17474124.2023.2162503. Epub 2022 Dec 28. PMID: 36576057.



- [3] Duseja, A., Singh, S. P., De, A., Madan, K., Rao, P. N., Shukla, A., ... & Chawla, Y. K. (2022). Indian National Association for Study of the Liver (INASL) Guidance Paper on Nomenclature, Diagnosis and Treatment of Non-alcoholic Fatty Liver Disease (NAFLD). *Journal of clinical and experimental hepatology*, 13(2):273-302. doi: 10.1016/j.jceh.2022.11.014. Epub 2022 Dec 7. PMID: 36950481; PMCID: PMC10025685.
- [4] Roti, A., Sunita, M., Dixit, V. K., & Sweta, R. (2008). Association of nonalcoholic fatty liver disorder with obesity. *Indian J Prev Soc Med*, 39, 13-16.
- [5] Adams, L. A., Lymp, J. F., Sauver, J. S., Sanderson, S. O., Lindor, K. D., Feldstein, A., & Angulo, P. (2005). The natural history of nonalcoholic fatty liver disease: a population-based cohort study. *Gastroenterology*, 129(1), 113-121.
- [6] Bajaj, S., Nigam, P., Luthra, A., Pandey, R. M., Kondal, D., Bhatt, S. P., ... & Misra, A. (2009). A case-control study on insulin resistance, metabolic co-variates & prediction score in non-alcoholic fatty liver disease. *Indian Journal of Medical Research*, 129(3), 285-292.
- [7] Amarapurkar, D., Kamani, P., Patel, N., Gupte, P., Kumar, P., Agal, S., ... & Deshpande, A. (2007). Prevalence of non-alcoholic fatty liver disease: population based study. *Annals of hepatology*, 6(3), 161-163.
- [8] Agarwal, S. R., Malhotra, V., Sakhuja, P., & Sarin, S. K. (2001). Clinical, biochemical and histological profile of nonalcoholic steatohepatitis. *Indian journal of gastroenterology: official journal of the Indian Society of Gastroenterology*, 20(5), 183-186.
- [9] Uchil, D., Pipalia, D., Chawla, M., Patel, R., Maniar, S., & Juneja, A. (2009). Non-alcoholic fatty liver disease (NAFLD)–the hepatic component of metabolic syndrome. *The Journal of the Association of Physicians of India*, 57, 201-204.
- [10] Madan, K., Batra, Y., Datta Gupta, S., Chander, B., Anand Rajan, K. D., Tewatia, M. S., ... & Acharya, S. K. (2006). Non-alcoholic fatty liver disease may not be a severe disease at presentation among Asian Indians. *World journal of gastroenterology*, 12(21), 3400-3405.
- [11] Duseja, A., Das, A., Das, R., Dhiman, R. K., Chawla, Y., Bhansali, A., & Kalra, N. (2007). The clinicopathological profile of Indian patients with nonalcoholic fatty liver disease (NAFLD) is different from that in the West. *Digestive diseases and sciences*, 52, 2368-2374.



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