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Original Research Article

Non-alcoholic fatty liver disease among patients undergoing ultra-sonography abdomen and its associated factors in a tertiary care hospital, Kakinada

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ABSTRACT

Background: Non-alcoholic fatty liver disease (NAFLD) presents a growing global health concern, characterized by the accumulation of hepatic lipids in the absence of significant alcohol consumption. Its prevalence has surged worldwide, including in India, where it has reached alarming levels. Despite its silent progression, NAFLD can lead to severe complications, including liver cirrhosis and hepatocellular carcinoma. Objectives of the study to assess prevalence and its associated factors, which are essential for effective management and prevention strategies.
Methods: An observational, analytical cross-sectional study was conducted in a tertiary care hospital in Kakinada, Andhra Pradesh, from June to July 2022. Among 100 subjects, chosen through the simple random sampling. Ethical approval was granted before conducting study. Data on demographics, lifestyle risk factors, anthropometry, and ultrasound findings were collected using a pretested and validated case record form. Statistical analysis was carried out using SPSS software, employing appropriate tests to explore associations between NAFLD and various variables.
Results: Among 100 participants, the prevalence of NAFLD was found to be 41%. Significant associations were observed between NAFLD and variables such as BMI (p=0.034), waist-hip ratio (p=0.002), and history of diabetes mellitus (p=0.000). Lifestyle factors, including increased cooking oil consumption, were identified as significant risk factors.
Conclusions: The study highlights the high prevalence of NAFLD among subjects undergoing ultrasound abdomen in Kakinada. Significant associations were observed with BMI, waist-hip ratio, and diabetes mellitus history. Promoting healthy behaviours is crucial for NAFLD prevention and management.

Keywords: Non-alcoholic fatty liver, Prevalence, Associated risk factors

INTRODUCTION

Non-alcoholic fatty liver disease (NAFLD) is a condition defined by significant lipid accumulation (5-10%) in hepatic tissue in the absence of significant chronic alcohol consumption.[1] The majority of NAFLD patients have simple steatosis, or increased liver fat content. However, some patients also have non-alcoholic steatohepatitis (NASH), which is characterised by increasing hepatic inflammation. Up to 20% of patients also have progressive hepatic fibrosis, which may lead to cirrhosis or liver failure in the future.[2–4]

Non-alcoholic fatty liver disease (NAFLD is one of the most significant causes of liver disease in the world. The worldwide prevalence of Non-alcoholic fatty liver disease (NAFLD) is about 30% and 33.07% in South-East Asia 29.7% in East Asia 33.83% in South Asia.[5] overall pooled prevalence of NAFLD in India is 38.6% among adults and 35.4% among children.[6] The pathogenesis is

multifactorial, involving insulin resistance, visceral obesity, atherogenic dyslipidaemia, oxidative stress, and inflammation.[7–10] While simple steatosis in NAFLD does not lead to a significant increase in short-term morbidity or mortality, progression to NASH greatly raises the risks of developing cirrhosis, liver failure, and hepatocellular carcinoma.[4] The odds of progression to advanced liver disease, including hepatic decompensation and hepatocellular carcinoma (HCC), are higher in patients with NASH than those with NAFLD.[11] Gender also plays a role, with NAFLD being more common in men, while women have a higher risk of advanced fibrosis.[12] NAFLD is more prevalent in older individuals, with the risk increasing as age advances. Metabolic syndrome is a significant risk factor, with 70-90% of patients with NAFLD having metabolic syndrome.[13] Dietary factors, such as high cholesterol and saturated fats, increase the risk of NAFLD, while high fructose intake and low carbohydrate intake may also play a role. Interestingly, caffeine intake may have a protective effect.[14] Finally, genetic factors, particularly the PNPLA3 gene, are known to contribute to the development of NAFLD.[15] Insulin resistance and obesity are common in NAFLD patients. Many of patients with type 2 DM develops NAFLD.[16] A study reported of NAFLD presence of NAFLD in individuals between the ages of 45 and 54 is a significant and independent predictor of death due to cardiovascular causes.[17] An additional research study revealed that individuals with NAFLD had a 13% increase in carotid intima-media thickness and a higher incidence of plaque formation.[18] A surprisingly large proportion of the general population is not aware of this silent but concerning disease.[19] The MOHFW has identified the significance of NAFLD and included in the NPCDCS programme which is now renamed as NPNCD.[20] This study is taken up with the aim of drawing attention of NCP to this problem by assessing the magnitude of ultrasound-diagnosed NAFLD and identifying the associated factors to assess the prevalence of ultra-sonography-diagnosed NAFLD and its associated risk factors.

METHODS

Study design

This was an observational, analytical, cross-sectional study conducted at a tertiary care hospital in Kakinada, Andhra Pradesh, from June to July 2022.

Study population and setting

The study population were adult patients, either inpatient or outpatient, who were referred for ultrasound abdomen to Radiology department, Government General Hospital, Kakinada, Andhra Pradesh. The inclusion criteria were patients about 18 years of age and below 60 years. Exclusion criteria included patients with hepatobiliary diseases, malignancies, ascites, chronic drug abuse, and alcohol abuse (more than 20 g/day).

Sample size and sampling technique

The sample size was calculated to be 97, including a 10% attrition rate. The sample size was determined using the formula $n=4pq/l^2$, where the prevalence of NAFLD in hospital settings was taken as 32% based on pilot study. Total of 100 subjects were selected by using simple random sampling from the list of daily registered patients for ultrasound in the radiology department.

Study instrument and variables

A pretested validated case record form was used to collect data on age, gender, lifestyle risk factors, body mass index, waist circumference, and waist/hip ratio and ultrasound. Additionally, detailed information on cooking oil consumption, lifestyle habits, and dietary habits were obtained.

Ethical considerations

Institutional Ethics Committee approval was obtained prior to conducting the study.

Data collection

After obtaining informed consent, a pretested validated case record form was used to collect data from eligible subjects regarding their demographics, co-morbidities, diet, and anthropometry. Anthropometry measurements were BMI and waist-hip ratio. All individuals underwent an ultrasound examination by Radiologist.[21] Additionally, detained information on cooking oil consumption, lifestyle habits, and dietary habits was obtained. The data was collected using Google Forms.

Statistical analysis

After collection, the obtained data analysed by using Microsoft Excel and SPSS software (version 21.0). Prior to performing statistical tests, the normality of continuous variables was assessed. An independent sample t-test was used for the comparison of continuous variables and Chi-square test for qualitative variables. Non-parametric tests, such as the Mann-Whitney U test, were employed when data violated the assumptions of normality. P value below 0.05 was considered as statistically significant. Ninety-five per cent confidence intervals (95% Confidence interval (CI) for the measures of association were calculated and reported.

RESULTS

The present study, conducted on 100 sample populations, found that there was a prevalence of 41% of NAFLD among the study population, with a mean age of 35.46 ±10.8 years and a mean weight of 65.5 kg. The mean BMI of the sample population was 25.79±4.89. The mean waist-hip ratio was 0.93±0.11 cm. The mean oil consumption per person was 1.1±0.49 kg per month.

Table 1 shows the socio-demographic profile of the subjects. Out of 100 subjects, 50 were male and 50 were female, the majority were Hindu (81%), followed by Christians (16%) and Muslims (3%). In terms of age distribution, 40 subjects were between 18 and 30 years old, 35 were >30 years and 25 were above 45 years old. The highest proportion of subjects had primary education (34%), followed by secondary education (31%), illiterate (23%), and degree holders (12%). Many were engaged in daily wage and agriculture (49%), followed by housewives (27%), unemployed (12%), technicians (8%), clerks (2%), and professionals (2%).

Table 1: Distribution of study subjects regarding socio-demography (n=100).

Variables	Classification	NAFLD (Yes)	NAFLD (No)	Total
Age (years)	18-29	10	25	35
	30-45	19	21	40
	>45	12	13	25
	Total	41	59	100
Gender	Male	13	37	50
	Female	28	22	50
Religion	Hindu	33	48	81
	Christian	7	9	16
	Muslim	1	2	3
Education	Illiterate	10	13	23
	Primary	16	18	34
	Secondary	13	18	31
	Degree	2	10	12
Occupation	Daily wage and agricultural	18	31	49
	House wife	18	9	27
	Professional	1	1	2
	Technicians	1	7	8
	Unemployed	3	9	12
	Clerks	0	2	2

Table 2 shows the anthropometric measurements. Out of 100 subjects 17 were obese, 35 were pre-obese, 6 were underweight, BMI was normal among 42%. High waist-hip ratio seen in 65%. Only 20% reported exercising. There was significant association between high BMI with NAFLD in the study population. There was also a significant association between waist-hip ratio and NAFLD (χ^2=12.66, p<0.000). In terms of health factors, 11% had a history of diabetes and 20% had a history of hypertension.

Table 2: Anthropometry and it's association with NAFLD among subjects (n=100).

Variables	Classification	NAFLD (Yes)	NAFLD (No)	Total	P value
BMI	Under weight	1**	5	6	
	Normal	14	28	42	0.034*
	Pre-obese	14	21	35	
	Obese	12	5	17	
Waist /Hip ratio	High	35	30	65	0.000*
	Normal	6	29	35	
	Total	41	59	100	

*Statistically significant

Table 3 shows association of NAFLD with co-morbidities. The results show that there was a significant association between a history of diabetes mellitus (DM) and NAFLD (χ^2=12.72, p<0.000), with a higher prevalence of NAFLD among individuals with a history of DM. There was no significant association between a history of hypertension (HTN) and NAFLD (χ^2=0.837, p=0.36). The most commonly used cooking oil was sunflower oil (67%), followed by palm oil at 28%, 1% of subjects used groundnut oil while 4% used rice bran oil. In terms of consumption of non-vegetarian food, 44% reported consuming once in a week, 24% reported consuming twice a week and 21% reported consuming thrice a week. Only 3% reported not consuming any non-vegetarian food.

Table 3 shows the association between dietary habits and NAFLD in the study population. The results show that there was no significant association between the type of cooking oil and NAFLD (χ^2=4.6, p=0.201). However, there was a significant association between the amount of

cooking oil consumption and NAFLD (χ^2=19.25, p<0.01), with a higher prevalence of NAFLD among individuals who consumed >1.24 kg/month of cooking oil. There was no significant association between non-vegetarian consumption and NAFLD (χ^2=8.6, p=0.19). There was a significant association between exercise and NAFLD ($\chi^{\wedge 2}$=13.39, p=0.000), with a higher prevalence of NAFLD among individuals who did not exercise. Table 4 variables, including BMI, waist circumference, waist-hip ratio, and oil consumption, are associated with NAFLD.

Table 3: Association of NAFLD with Co-morbidities and lifestyle factors of subjects (n=100)

	Classification	NAFLD (Yes)	NAFLD (No)	Total	P value
Variables					
H/0 DM	Yes	10	1**	11	0.000*
	No	31	58	89	
H/0 HTN	Yes	10	10	20	0.360
	No	31	49	80	
	Total	41	59	100	
Type of cooking oil	Groundnut	1**	0**	1	0.201
	Palm	15	13	28	
	Rice bran	2	2	4	
	Sunflower	23	44	67	
	Total	41	59	100	
Non-veg consumption/week	Once	24	20		0.193
	Twice	7	17		
	Thrice	6	19		
	More than thrice	4	3		
	Total	41	59		
Exercise	Yes	1**	19	20	**0.000***
	No	40	40	80	
	Total	41	59	100	

**When the expected count in some cells of a contingency Table is less than 5, continuity correction (also known as Yates' correction), which adjusts the chi-square value to account for the discrepancy between the discrete and continuous distributions.

Table 4: Comparison of demographic and clinical characteristics by NAFLD status.

		NAFLD		Asymp. Sig. (2-tailed) t,u
		Yes	No	
Age (years)	Mean	37.3	34.2	0.114
	Standard deviation	10.8	11.5	
Weight (kg)	Mean	67.7	64.0	0.10*
	Standard deviation	11.4	10.7	
Height (cm)	Mean	157.6	161.2	0.025[u]
	Standard deviation	7.5	8.2	
BMI	Mean	27.39	24.69	0.004*
	Standard deviation	4.89	4.19	
Waist (cm)	Mean	91.2	80.6	0.001
	Standard deviation	17.6	18.8	
Hip (cm)	Mean	94.0	88.5	0.091
	Standard deviation	16.7	20.3	
Waist hip ratio	Mean	0.97	0.918	0.002
	Standard deviation	0.11	0.10	
Oil consumption kg per person	Mean	1.24	1.03	0.005
	Standard deviation	0.49	0.34	
Total family income	Mean	17756.1	20644.1	0.178
	Standard deviation	8668.3	19348.7	

*Unpaired t test; Mann-Whitney U test.

DISCUSSION

Based on the results of the study and the other studies mentioned, it is clear that various factors play a role in the development of non-alcoholic fatty liver disease (NAFLD). In particular, BMI, gender, waist-hip ratio, and lifestyle factors such as diet and exercise have been identified as significant risk factors for NAFLD.[12,13,22,23] The present analytical cross-sectional study found that there was a prevalence of 41% of NAFLD among the study population using ultrasound. A meta-analysis assessment showed a worldwide prevalence is about 30% and 33.07% in South-East Asia 29.7% in East Asia 33.83% in South Asia.[5] Overall pooled prevalence of NAFLD in India is 38.6% among adults and 35.4% among children A prevalence rate of 49.8% was reported in coastal south India in a population-based study and Type 2 diabetes is a common condition and it regularly coexists with NAFLD and 24.3% of those with NAFLD also had diabetes.[16,24]

The mean BMI of the sample population was 25.79 BMI which is considered to be in the overweight category was found to be a significant factor in this study, with a p value of 0.03. This is consistent with the findings of Anand et al, who reported a p value of <0.001 for BMI as a risk factor.[25] Gender, age and BMI were also found to be significant risk factors.[22,26,27]

The mean waist-hip ratio was 0.93 cm. Waist-hip ratio was found to be a significant factor with a p value of 0.002 in the current study. This is consistent with the results of the study, where an increase in waist and hip ratio was identified as a risk factor for NAFLD. with a p value of 0.000.[28]

In terms of prevalence, the study found a prevalence of 41% of NLFD among the study population, which is consistent with the prevalence reported by Georgi Kirovski and Doris Schacherer.[21] Their study also identified lifestyle factors such as increased oil intake and sedentary lifestyle as risk factors for NAFLD, which reinforces the importance of promoting healthy behaviours to prevent and control NAFLD.[21] Our study shows an increase in cooking oil consumption, which turns to be a significant risk factor as the mean consumption is 1.24 kg per month in the NAFLD population.

Overall, the study adds to the body of literature on the risk factors for NAFLD, with BMI, Waist hip ratio, lack of exercise, overconsumption of oil and coexisting diabetes mellitus identified as a significant factor. The findings of the study are consistent with previous studies, and underscore the importance of lifestyle factors in the prevention and management of NAFLD.[29]

CONCLUSION

Promoting healthy behaviours to effect life style behaviour change, is critical for prevention and specific control of NAFLD. Future studies could further investigate the role of dietary and exercise interventions in the prevention and treatment of NAFLD

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REFERENCES

1. Neuschwander-Tetri BA, Caldwell SH. Nonalcoholic steatohepatitis: Summary of an AASLD Single Topic Conference. Hepatology. 2003;37:1202–19.
2. Dam-Larsen S, Franzmann M, Andersen IB, Christoffersen P, Jensen LB, Sørensen TIA, et al. Long term prognosis of fatty liver: risk of chronic liver disease and death. Gut. 2004;53:750–5.
3. Clark JM. The epidemiology of nonalcoholic fatty liver disease in adults. J Clin Gastroenterol. 2006;40(Suppl 1):S5-10.
4. Allen AA, Wang Z, Prokop LJ, Murad MH, Loomba R. Fibrosis Progression in Nonalcoholic Fatty Liver versus Nonalcoholic Steatohepatitis: A Systematic Review and Meta-analysis of Paired-Biopsy Studies. Clin Gastroenterol Hepatol Off Clin Pract J Am Gastroenterol Assoc. 2015;13:643-654.e9.
5. Younossi ZM, Golabi P, Paik JM, Henry A, Dongen CA, Henry L. The global epidemiology of nonalcoholic fatty liver disease (NAFLD) and nonalcoholic steatohepatitis (NASH): a systematic review. Hepatol Baltim Md. 2023;77:1335–47.
6. Shalimar, Elhence A, Bansal B, Gupta H, Anand A, Singh TP, et al. Prevalence of Non-alcoholic Fatty Liver Disease in India: A Systematic Review and Meta-analysis. J Clin Exp Hepatol. 2022;12:818–29.
7. Hepatology. Neuschwander-Tetri-Non-alcoholic steatohepatitis Summary of an AASLD Single Topic Conference.pdf; 2004.
8. Liver International. Ara Jo-Global epidemiology of non-alcoholic fatty liver disease non-alcoholic.pdf; 2018.
9. Medina J, Fernández-Salazar LI, García-Buey L, Moreno-Otero R. Approach to the Pathogenesis and Treatment of Nonalcoholic Steatohepatitis. Diabetes Care. 2004;27:2057–2066.
10. Wanless IR, Lentz JS. Fatty liver hepatitis (steatohepatitis) and obesity: an autopsy study with analysis of risk factors. Hepatol Baltim Md. 1990;12:1106–10.
11. M, E. et al. Long-term follow-up of patients with NAFLD and elevated liver enzymes. Hepatol. Baltim Md. 2006;44:1-10.

12. Yang CC, Yeh YH, Yueh SK, Huang MH, Yang JC, Nien CK. Prevalence and risk factors of nonalcoholic fatty liver disease in an adult population of taiwan: metabolic significance of nonalcoholic fatty liver disease in nonobese adults.
13. Bellentani S, Scaglioni F, Marino M, Bedogni, G. Epidemiology of Non-Alcoholic Fatty Liver Disease. Dig Dis. 2010;28:155–61.
14. Yki-Järvinen H, Luukkonen PK, Hodson L, Moore JB. Dietary carbohydrates and fats in nonalcoholic fatty liver disease. Nat Rev Gastroenterol Hepatol. 2021;18:770–86.
15. Kumar A, Shalimar, Walia GK, Gupta V, Sachdeva MP. Genetics of nonalcoholic fatty liver disease in Asian populations. J Genet. 2019;98:29.
16. Jawaharlal RK, Mootha VK. Non-alcoholic fatty liver disease and type 2 diabetes mellitus a prospective observational study in coastal region of Andhra Pradesh. Int J Adv Med. 2021;8:918.
17. Ioannou GN, Weiss NS, Boyko EJ, Mozaffarian D, Lee SP. Elevated serum alanine aminotransferase activity and calculated risk of coronary heart disease in the United States. Hepatology. 2006;43:1145–51.
18. Sookoian S, Pirola CJ. Non-alcoholic fatty liver disease is strongly associated with carotid atherosclerosis: A systematic review. J Hepatol. 2008;49:600–7.
19. Ghevariya V. Knowing What's Out There: Awareness of Non-Alcoholic Fatty Liver Disease. Front Med. 2014;1:4.
20. Operational guidelines for the integration of Non-Alcoholic Fatty Liver Disease in to NPCDCS by MoH & F.pdf; 2021.
21. Kirovski G. Prevalence of ultrasound-diagnosed non-alcoholic fatty liver disease in a hospital cohort and its association with anthropometric, biochemical and sonographic characteristics. Z. Für Gastroenterol. 2010;48:s-0029-1246560.
22. Khadka B, Shakya R, Bista, Y. Non-alcoholic fatty liver disease assessment in Nepal. Int J Community Med Public Health. 2016;15:1654–9.
23. Weiß J, Rau M, Geier A. Non-Alcoholic Fatty Liver Disease. Dtsch Ärztebl Int. 2014;111:447–52.
24. De A, Duseja A. Nonalcoholic Fatty Liver Disease: Indian Perspective. Clin Liver Dis. 2021;18:158.
25. Anand A. Prevalence and Predictors of Nonalcoholic Fatty Liver Disease in Family Members of Patients With Nonalcoholic Fatty Liver Disease. J Clin Exp Hepatol. 2022;12:362–71.
26. Golabi P. Prevalence and long-term outcomes of non-alcoholic fatty liver disease among elderly individuals from the United States. BMC Gastroenterol. 2019;19:56.
27. Aggarwal R, Pathania M, Raina R, Singh A. A study of correlation between clinical profile of patients with non- alcoholic fatty liver disease and individual components of metabolic syndrome at a tertiary care centre in Uttarakhand region: an observational cross-sectional study. Int J Community Med. Public Health 2023;10:3143–49.
28. Singh SP, Singh A, Misra D, Misra B, Pati GK, Panigrahi MK, et al. Risk factors associated with non-alcoholic fatty liver disease in indians: a case–control study. J Clin Exp Hepatol. 2015;5(4):295-302.
29. Vilar-Gomez E. Weight Loss Through Lifestyle Modification Significantly Reduces Features of Nonalcoholic Steatohepatitis. 2015;149:1-10.

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