

ASSOCIATION OF PREDIABETES WITH NON-ALCOHOLIC FATTY LIVER DISEASE (NAFLD) - A CASE CONTROL STUDY

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Abstract

Background: Non-Alcoholic Fatty Liver Disease (NAFLD) encompasses a spectrum of diseases with hepatic steatosis at the benign end to hepatocellular carcinoma at the terminal end. It forms one of the leading causes for cirrhosis and liver transplantation in western countries. Due to its close association with insulin resistance, NAFLD is fast reaching epidemic proportions world wide with a prevalence of 30- 40% among the general Indian population. **Materials and Methods:** Retrospective case control study was done in Pushpagiri Institute of Medical Sciences and Research Centre. Cases were defined as individuals between 20-60 years of age with daily alcohol intake <20g/day, diagnosed with NAFLD by abdominal ultrasonography in the radiology department of the hospital as a part of routine health check-up. 31 age and sex matched healthy individuals who have no NAFLD on USG formed the control group. Association of prediabetes was compared between the cases and controls. **Result:** There were 33 Cases and 31 controls after considering inclusion and exclusion criteria. NAFLD was more common among males (66.6%) and in the 30 - 40 age group. Mean fasting blood sugar value of the cases was 118.09±24.8 and the controls were and 76.39±26.04 for the controls. 80.6% of the NAFLD cases were in the pre diabetic stage while the prevalence of pre-diabetes was 45% among the controls. The difference remained statistically significant (p =0.0001). **Conclusion:** Prediabetes is strongly associated with Non Alcoholic Fatty Liver Disease among individuals in south Kerala.

INTRODUCTION

Non -Alcoholic Fatty Liver Disease (NAFLD) is characterized by an excess hepatic lipid accumulation in the absence of a significant amount of alcohol intake (>20g per day) or any other medical conditions that are known to produce steatosis is known as Non-alcoholic fatty liver disease (NAFLD).^[1] It includes a spectrum of liver diseases that includes hepatic steatosis at the benign end and hepatocellular carcinoma (HCC) at the terminal end. Simple steatosis progresses to Non-Alcoholic Steatohepatitis (NASH) in 20-30% of cases with the development of histologic changes including necroinflammation and fibrosis of hepatocytes leading to cirrhosis and hepatocellular carcinoma at the end.^[2] Age, activity of steatohepatitis, and established fibrosis predispose to cirrhosis, with a 7- to 10-year liver-related mortality of 12% to 25%.^[3] A higher prevalence of NAFLD is observed among Type II Diabetes Mellitus (Type II DM) with a global prevalence ranging from 34-94% and 57% among the Eastern Indian population.^[4] Prediabetes is a state of hyperglycemia where the glycemic parameters are above normal but

below the diabetic threshold. Besides being asymptomatic in nature prediabetes is associated with complications including Type II DM, chronic kidney disease, cardiac autonomic dysfunction leading to reduced heart rate variability, and coronary artery disease.^[5] However, data regarding the association between NAFLD and prediabetes is less abundant in literature since the high risk of metabolic complications in prediabetes has only recently been recognized. Our study aimed to find out the association of prediabetes with NAFLD among individuals in South Kerala, which is known as the diabetic capital of India.

MATERIALS AND METHODS

A case-control study was done in the Department of Physiology in association with the Department of Radiodiagnosis of Pushpagiri Institute of Medical Sciences and Research Centre. Ethical committee clearance was obtained from the institutional review board with ref.no: PIMSRC/E1/388A/56/2013. Individuals between 20 -60 years of age, had alcohol consumption less than twenty grams per day, who

underwent abdominal ultrasonogram (USG) as part of routine health check-up in the radiology outpatient department of the hospital were included in the study. Those who reported a previous history of hepatitis, any other liver disease, or drug intake known to cause hepatic steatosis were excluded. Individuals who had NAFLD on abdominal ultrasonogram (USG) formed the cases and age and sex-matched individuals who had no NAFLD on USG formed the controls. Informed consent was taken from the participants. The final sample size attained was 63 (33 cases and 30 controls).

Blood glucose was analyzed in fasting state by using the hexokinase method for cases and controls, and was recorded in mg/dl. Fasting Blood Sugar (FBS) was compared between the cases and controls. FBS value between 110mg/dl -125mg/dl was considered prediabetic.

Statistical analysis: Statistical analysis was done with SPSS 17.0 software. All values are expressed as mean \pm SD and compared by Pearson Chi-square test.

Odds ratios were calculated for the categorical variables comparing the cases and controls.

RESULTS

There were 33 Cases and 31 controls after considering inclusion and exclusion criteria. The two groups were comparable concerning age and sex ($p=0.45$). The mean age of the cases was 42.42 ± 8.99 and that of the controls was 44.09 ± 10.93 ($p=0.67$). A maximum number of cases were seen among males (63.6%) and in the 30 - 40 age group which formed 45.5% of the total cases. Mean FBS was 118 ± 24.8 (mean \pm SD) for the cases and 76.39 ± 26.04 (mean \pm SD) for the controls. 80.6% of the NAFLD cases had pre-diabetes while the prevalence of pre-diabetes was 45% among the controls and the difference remained statistically significant ($p=0.0001$). (Table 1)

Table 1: Pre -diabetic profile of the population.

Variable	NAFLD (n=33)	Non NAFLD (n=31)	p =
FBS	118.09 \pm 24.8	76.39 \pm 26.04	
Pre-diabetes*			
Yes	22(70.96%)	12(38.71%)	<0.0001*
No	9 (27.27%)	19 (61.29%)	

DISCUSSION

Our study is the first of its kind to find out the association between prediabetes and Non-Alcoholic Fatty Liver Disease in South Kerala. The mean age of the study population was similar to studies conducted elsewhere. NAFLD was more prevalent among men than women in the reproductive age group. Our results are similar to those obtained by Kojima et al among the adult Japanese population where the average prevalence of NAFLD was double among men compared to that of women in the reproductive age group.^[6,7] Taharboucht, S. et al observed a significantly higher prevalence ($p<0.001$) of prediabetes among the NAFLD population compared to the general population which is consenting with our results.^[8] The common link contributing to the basic pathophysiology in both clinical conditions was pointed out to be insulin resistance in their study. Insulin resistance resulting in increased de novo lipogenesis and abnormal lipolysis resulting in excess fatty acid influx into the hepatocytes contributes to fat accumulation in the liver could be the possible mechanism.^[9-11]

CONCLUSION

Pre-diabetes is a risk factor for several metabolic and systemic complications including Type II Diabetes Mellitus and coronary artery disease. The presence of prediabetes is strongly associated with Non-Alcoholic Fatty Liver Disease in adults.

Limitations of the study: A smaller sample size is a limitation of the study.

REFERENCES

- Carr, R. M., Oranu, A., & Khungar, V. (2016). Non-alcoholic fatty liver disease: Pathophysiology and management. *Gastroenterology Clinics of North America*, 45(4), 639. <https://doi.org/10.1016/j.gtc.2016.07.003>.
- Shalimar, Elhence A, Bansal B, Gupta H, Anand A, Singh TP, Goel A. Prevalence of Non-alcoholic Fatty Liver Disease in India: A Systematic Review and Meta-analysis. *J Clin Exp Hepatol*. 2022 May-Jun;12(3):818-829. doi: 10.1016/j.jceh.2021.11.010. Epub 2021 Nov 25. PMID: 35677499; PMCID: PMC9168741.
- Fernando DH, Forbes JM, Angus PW, Herath CB. Development and Progression of Non-Alcoholic Fatty Liver Disease: The Role of Advanced Glycation End Products. *Int J Mol Sci*. 2019 Oct 11;20(20):5037. doi: 10.3390/ijms20205037. PMID: 31614491; PMCID: PMC6834322.
- Sinha, A., & Bankura, B. (2023). Prevalence of nonalcoholic fatty liver disease in type 2 diabetes mellitus patients from the Eastern region of India. *Diabetes Epidemiology and Management*, 12, 100161. <https://doi.org/10.1016/j.deman.2023.100161>.
- Vesa CM, Behl T, Nemeth S, Bratu OG, Diaconu CC, Moleriu RD, Negrut N, Zaha DC, Bustea C, Radu FI, Bungau S. Prediction of NAFLD occurrence in prediabetes patients. *Exp Ther Med*. 2020 Dec;20(6):190. doi: 10.3892/etm.2020.9320. Epub 2020 Oct 13. PMID: 33101480; PMCID: PMC7579780.
- Kojima, Si., Watanabe, N., Numata, M. et al. Increase in the prevalence of fatty liver in Japan over the past 12 years: analysis of clinical background. *J Gastroenterol* 38, 954–961 (2003). <https://doi.org/10.1007/s00535-003-1178-8>
- Nagral, A., Bangar, M., Menezes, S., Bhatia, S., Butt, N., Ghosh, J., Manchanayake, J. H., Mahtab, M. A., & Singh, S. P. (2022). Gender Differences in Nonalcoholic Fatty Liver Disease. *Euroasian Journal of Hepato-Gastroenterology*,

- 12(Suppl 1), S19. <https://doi.org/10.5005/jp-journals-10018-1370>
8. TAHARBOUCHT, S., GUERMAZ, R., BROURI, M., & CHIBANE, A. (2020). Pre-diabetes and NAFLD; A study of an Algerian population sample. *Endocrine and Metabolic Science*, 1(3-4), 100060. <https://doi.org/10.1016/j.endmts.2020.100060>
 9. Marchesini, G., Brizi, M., Morselli-Labate, A. M., Bianchi, G., Bugianesi, E., McCullough, A. J., Forlani, G., & Melchionda, N. (1999). Association of nonalcoholic fatty liver disease with insulin resistance. *The American Journal of Medicine*, 107(5), 450-455. [https://doi.org/10.1016/S0002-9343\(99\)00271-5](https://doi.org/10.1016/S0002-9343(99)00271-5)
 10. Rakesh Gaharwar, Sushma Trikha, Shuba laxmi margekar, Om Prakash jatav, P Deepak Ganga. Study of clinical profile of patients on Non-Alcoholic Fatty Liver Disease and its association with Metabolic syndrome. *Journal of the Associations of Physicians of India*.2015; 63(1):12-16.
 11. Modhumi Khan, R. M., Yu Chua, Z. J., Tan, J. C., Yang, Y., Liao, Z., & Zhao, Y. (2019). From Pre-Diabetes to Diabetes: Diagnosis, Treatments and Translational Research. *Medicina*, 55(9). <https://doi.org/10.3390/medicina55090546>.