



ORIGINAL RESEARCH PAPER

Gastroenterology

WAIST CIRCUMFERENCE AND PHYSICAL ACTIVITY AS INDIVIDUAL PREDICTORS OF NAFLD: INSIGHTS FROM A SOUTH INDIAN POPULATION

KEY WORDS: Non Alcoholic Fatty Liver Disease, Waist Circumference, Physical Activity

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ABSTRACT	Background: Non-Alcoholic Fatty Liver Disease (NAFLD) is a growing health concern in India, particularly among non-diabetic individuals. Waist circumference and physical activity may serve as accessible, non-invasive predictors of NAFLD due to their links to metabolic dysfunction. Objective: To evaluate the individual association of waist circumference and physical activity with NAFLD severity in a non-diabetic South Indian population. Methods: A cross-sectional study on 92 ultrasound-confirmed NAFLD patients without diabetes was conducted. Waist circumference was measured, and physical activity levels were assessed via questionnaire. NAFLD was graded using ultrasonography. Associations were analyzed using chi-square tests, ANOVA, and logistic regression. Results: Waist circumference and physical inactivity significantly increased across NAFLD grades ($p < 0.001$). Regression analysis showed waist circumference ≥ 90 cm (females) and ≥ 100 cm (males), and sedentary lifestyle independently predicted moderate to severe NAFLD (OR: 3.2 and 2.6 respectively, $p < 0.05$). Conclusion: Waist circumference and physical inactivity are strong, independent predictors of NAFLD severity. These easily measurable parameters can be used for early risk stratification and preventive intervention in community and clinical settings.
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INTRODUCTION

NAFLD is now recognized as the hepatic manifestation of metabolic syndrome and has become the most common chronic liver disease globally. In India, its prevalence ranges from 9% to 32%, and is influenced by urbanization, diet, and physical inactivity^[1].

Waist circumference (WC) reflects central obesity, which is strongly linked to insulin resistance—a key driver of NAFLD^[2]. Physical inactivity contributes to metabolic dysregulation and hepatic fat accumulation. Although both are part of the IDRS, their individual predictive power for NAFLD in non-diabetic populations remains underexplored.

This study aims to assess the association of waist circumference and physical activity level with NAFLD severity in a non-diabetic South Indian population and to evaluate their utility as independent predictors.

MATERIALS AND METHODS

Study Design and Population

This was a cross-sectional observational study conducted at Sri Siddhartha Medical College, Tumkur, over eighteen months. A total of 92 adults with ultrasound-confirmed NAFLD and no history of diabetes were included.

Inclusion Criteria

Non-diabetic Adults aged ≥ 18 years
 NAFLD confirmed by abdominal ultrasound

Exclusion Criteria

1. Patients with diabetes.
2. Patients with history of alcohol consumption
3. Patients showing features of acute liver disease, critically ill, malignancy, pregnancy and those on hepatotoxic medications.

Data Collection

Participants were interviewed for demographic data, family history, and physical activity levels using a structured questionnaire.

Waist Circumference (WC) - Measured at midpoint between lower rib and iliac crest using standard tape .

Categorized as
Males: <90 cm, $90-99$ cm, ≥ 100 cm
Females: <80 cm, $80-89$ cm, ≥ 90 cm

Physical Activity Categories :
Vigorous: Regular exercise/strenuous work
Moderate: Occasional walking/light work
Sedentary: No regular physical activity

NAFLD Grading (Ultrasound-Based):
Grade 1: Mild increased hepatic echogenicity
Grade 2: Moderate echogenicity with obscured vessels
Grade 3: Severe echogenicity, poor diaphragm visualization

Statistical Analysis
 Data were analyzed using SPSS version 26.
Descriptive Analysis: Mean, SD, proportion
ANOVA and Chi-square: Used to assess differences across NAFLD grades
Logistic Regression: Used to determine independent predictors of NAFLD severity
 p-value <0.05 was considered statistically significant.

RESULTS

Table 1: Distribution of Waist Circumference Across NAFLD Grades

Waist Circumference Category	NAFLD Grade 1 (n=41)	NAFLD Grade 2 (n=32)	NAFLD Grade 3 (n=19)	p-value
Normal ($<80/90$ cm)	24 (58.5%)	7 (21.9%)	1 (5.3%)	
Moderate ($80-89/90-99$ cm)	12 (29.3%)	15 (46.9%)	6 (31.6%)	
High ($\geq 90/100$ cm)	5 (12.2%)	10 (31.2%)	12 (63.1%)	<0.001

Interpretation: Waist circumference significantly increased with increase in NAFLD grade.

Table 2: Physical Activity Level Across NAFLD Grades

Physical Activity	NAFLD Grade 1	NAFLD Grade 2	NAFLD Grade 3	p-value
Vigorous	15 (36.6%)	5 (15.6%)	1 (5.3%)	

Moderate	17 (41.4%)	13 (40.6%)	4 (21.0%)	
Sedentary	9 (22.0%)	14 (43.8%)	14 (73.7%)	0.001

The association between physical activity and NAFLD Grades was statistically significant. These findings suggest that lower physical activity may be linked to disease progression, highlighting the importance of maintaining an active lifestyle.

Table 3: Logistic Regression of Predictors- Waist circumference and physical inactivity with NAFLD Grade

Predictor	β Coefficient	Odds Ratio (95% CI)	p-value
WC ≥90/100 cm	1.18	3.26 (1.40–7.59)	0.006
Sedentary Lifestyle	0.95	2.58 (1.12–5.91)	0.03

Model Accuracy: 74.1 % | Nagelkerke R²: 0.42

DISCUSSION

Our study demonstrated a strong association between increasing waist circumference and physical inactivity with NAFLD severity in non-diabetic South Indian adults. Participants with a WC above threshold had over threefold increased odds of moderate to severe NAFLD. Sedentary individuals had nearly three times the odds compared to physically active individuals.

These findings are consistent with previous studies linking central obesity and physical inactivity to hepatic fat accumulation and insulin resistance^[2-4]. Waist circumference, a simple bedside measure, was more predictive of NAFLD^[5,6].

This study reinforces the need to include lifestyle and anthropometric screening in early NAFLD detection strategies, particularly in community settings lacking access to imaging and lab facilities.

CONCLUSION

Waist circumference and physical inactivity are significant, independent predictors of NAFLD severity among non-diabetic adults. These variables should be integrated into routine screening protocols for early identification of high-risk individuals, enabling timely lifestyle-based interventions to prevent disease progression.

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