

# The Association between Nonalcoholic Fatty Liver Disease and Insulin Resistance within Normal Glucose Level Population

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## INTRODUCTION

The study of nonalcoholic fatty liver disease (NAFLD) with association of type 2 diabetes(T2DM) reveals rapid growth of prevalence and incidence in recent years. The mechanism of NAFLD shows connection between insulin resistance (IR) and T2DM.

## AIM

The aim of this study was to investigate the association between NAFLD and IR in normal glucose level population.

## METHOD

We recruited participants from community and outpatient department in a hospital from central and northern Taiwan.

We screened the items of body max index (BMI), systolic/ diastolic blood pressure (SBP/DBP), body fat ratio (%) and social factors. We performed serum test after 8 hours overnight fasting. NAFLD was diagnosed based on an abdominal ultrasonography measurement.

The calculation of IR used HOMA-IR formula and was shown by tertile (T1, T2, and T3). The method of statics counted through analysis of variance (ANOVA) and multivariate logistic regression.

## RESULTS

A total of 485 subjects (mean age 42.0±11.4 years) were involved.

The prevalence of NAFLD increased significantly among increasing level of IR (34.1%, 40.1%, 47.8%, p <0.001).

Although fasting plasma glucose were within normal range among three groups, higher level of IR presented higher glucose value(81.9±7.4 mg/dL, 85.1±7.6 mg/dL, 87.3±6.5 mg/dL, p<0.0001).

After adjusting for age, sex, BMI, exercise, alcohol consumption and cigarette smoking, the risk of NAFLD was increased with the increment of IR (T3v.s. T1: Odd ratio [OR] 3.87, 95% confidence interval [CI], 2.08 to 7.21; T2 v.s. T1: OR 1.83, 95% CI, 1.11 to 3.00) after adjusting for confounding factors.

Table 1

	Tertile 1 n=167	Tertile 2 n=157	Tertile 3 n=161	P-value	
Age(years)	41.6±11.2	42.8±11.7	41.6±11.0	0.55	I ≠ III, I ≠ II, II ≠ III
Sex(men)	34.1%	40.1%	47.8%	0.04	
Weight(kg)	58.6±11.6	63.0±11.0	74.9±15.5	<0.0001	
Height(cm)	162.7±8.8	163.3±8.6	165.3±8.8	0.02	I ≠ III
Waist(cm)	76.3±7.6	80.9±8.3	90.3±10.5	<0.0001	
Body mass index(kg/m <sup>2</sup> )	22.1±3.5	23.5±3.1	27.2±4.2	<0.0001	
Fat(%)	25.8±7.2	28.2±6.6	32.5±7.5	<0.0001	
Smoking	13.8%	14.7%	16.2%	0.83	
Alcohol	21.0%	19.8%	17.4%	0.71	
Systolic BP(mmHg)	119.3±16.4	122.4±14.7	127.7±17.2	<0.0001	I ≠ III, II ≠ III
Diastolic BP(mmHg)	74.8±11.1	77.5±10.1	80.9±12.9	<0.0001	I ≠ III, II ≠ III
Fasting plasm glucose(mg/dL)	81.9±7.4	85.1±7.6	87.3±6.5	<0.0001	
Total-C(mg/dL)	194.5±36.4	196.8±34.6	197.8±36.3	0.68	
HDL-C(mg/dL)	62.6±14.1	59.2±14.3	49.8±11.5	<0.0001	I ≠ III, II ≠ III
LDL-C(mg/dL)	121.3±34.3	125.2±33.0	128.6±33.8	0.15	
Triglyceride(mg/dL)	88.8±49.6	101.8±57.6	149.2±110.6	<0.0001	I ≠ III, II ≠ III
ALT(IU/L)	18.7±11.0	23.4±15.6	36.4±28.5	<0.0001	I ≠ III, II ≠ III
AST(IU/L)	20.2±5.6	22.3±8.4	25.8±10.8	<0.0001	I ≠ III, II ≠ III
Insulin	3.4±0.8	6.2±0.9	14.1±7.7	<0.0001	
NAFLD(%)	33.5%	55.4%	83.9%	<0.0001	

Table 2

	Model 1	Model 2	Model 3
Homa_IR			
T2 v.s. T1	2.46(1.57-3.86)	1.82(1.11-2.98)	1.83(1.11-3.00)
T3 v.s. T1	10.29(6.07-17.46)	4.02(2.18-7.42)	3.87(2.08-7.21)
Sex(ref=women)		1.75(1.10-7.42)	1.59(0.95-2.66)
Age		1.01(0.99-1.03)	1.01(0.99-1.03)
BMI		1.29(1.19-1.40)	1.30(1.20-1.41)
Exercise(ref=no)			0.80(0.51-1.25)
smoking(ref=no)			2.02(0.95-4.27)
drinking(ref=no)			0.75(0.40-1.39)

## CONCLUSIONS

This study shows that in normal sugar level groups, the significant increasing risk of NAFLD if IR presented even in normal glucose level groups.

The mechanism of NAFLD influenced hepatic enzymes production and further IR involved.

We should take early intervention if abnormal IR present.

## CONTACT INFORMATION

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