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Original Research Paper

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INDIAN DIABETIC RISK SCORE(IDRS) AS A SCREENING TOOL FOR DIAGNOSING NON ALCOHOLIC FATTY LIVER DISEASE (NAFLD) IN RURAL NON DIABETIC POPULATION

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ABSTRACT

Objective : To determine whether IDRS can be used as a screening tool to identify NAFLD in rural non diabetic individuals.

Methods : Non diabetic, outpatients and inpatients of PES Institute of Medical Sciences & Research, Kuppam were enrolled in this cross sectional study. Biochemical values and anthropometric measurements were obtained using standardized procedures. NAFLD was diagnosed by ultrasonography. Collected data was analyzed by using SPSS version 16. Differences between the risk groups of IDRS were studied using ANOVA test. Then, stepwise logistic regression analysis was performed by introducing these factors one by one into this model and P value <0.05 was taken as statistically significant.

Results : The prevalence of NAFLD was 33.81% (47/139 participants) and it was significantly higher among those with high IDRS (54.93%) group. The analysis revealed that Albumin, AST & IDRS remained significantly associated with NAFLD in this study.

Conclusions : IDRS can be used as a screening tool among nondiabetic individuals at high risk for NAFLD.

KEYWORDS :

Introduction

Non-alcoholic Fatty Liver Disease (NAFLD) refers to the presence of hepatic steatosis when no other causes for secondary hepatic fat accumulation are present. NAFLD may progress to cirrhosis and is likely to be an important cause of cryptogenic cirrhosis [1-4]. The term NAFLD includes wide range of liver disorders from steatosis to NASH and cirrhosis. In hepatic steatosis, fatty infiltration is present without evidence of significant inflammation, whereas in NASH, hepatic steatosis is associated with hepatic inflammation that may be histologically indistinguishable from alcoholic steatohepatitis [5,6]. Patients are generally asymptomatic, with mild elevations in liver enzymes [1].

In developing countries, doing imaging tests or liver enzyme tests on a population basis is expensive. Hence, there is a need to develop a simple and inexpensive screening tool to identify individuals who may be at high risk of having NAFLD[7].

IDRS[8] was developed using 4 simple parameters namely age, abdominal obesity, family history of diabetes and physical activity. A maximum score of 100 is given for all these categories combined [8-9].

Subjects with an IDRS of <30 was categorized as low risk, 30-50 as medium risk and those with ≥60 as high risk for developing diabetes mellitus. Higher IDRS is also associated with higher risk of metabolic syndrome and cardiovascular disease risk even among people without prediabetes or diabetes[10].

The present study was undertaken to see whether IDRS can predict development of NAFLD in non diabetic individuals.

Methods

This cross sectional study was done on outpatients and inpatients of PES Institute of Medical sciences and Research, Kuppam,Andhra Pradesh,located in rural area. It was conducted from September 2015 to August 2017. The Study sample included 139 participants.

Patients aged <18 years, diabetics and those with history of alcohol consumption were excluded from the study. Patients showing features of Acute Liver Disease such as jaundice with fever, arthralgia, anorexia and fatigue were also excluded.

Anthropometric measurements were obtained using standardized techniques. BMI was calculated as weight in kilograms divided by the square of body height in meters. Blood pressure was recorded in sitting position in the right arm with a sphygmomanometer. Two readings were taken and the average was recorded.

All the Biochemical tests were done in NABL(National Accreditation Board for Testing and Calibration Laboratories) accredited laboratory affiliated to PES institute of Medical Sciences and Research, Kuppam. Fasting and 2hours Post prandial plasma glucose was estimated using glucose oxidase-peroxidase method, serum total cholesterol using cholesterol oxidase-peroxidase amidopyrine method, serum triglycerides using glycerol phosphate oxidase-peroxidase amidopyrine method, high density lipoprotein cholesterol (HDL-C) using polyethylene glycol pre-treated enzymes. Low density lipoprotein cholesterol (LDL-C) was calculated using the Friedewald equation. Aspartate aminotransferase was estimated using colometric enzymatic method, Alanine aminotransferase using UV with P5P and Alkaline phosphatase using PNPP AMP Buffer method.

Indian Diabetes Risk Score[8] :

Particulars	Score
Age (years)	
< 35	0
35-49	20
>50	30
Abdominal obesity	
Waist <80 cm (female) , <90 (male)	0
Waist a 80-89 cm (female), 90 - 99 cm (male)	10
Waist >90 cm (female), >100 cm (male)	20
Physical activity	

Exercise [regular] + strenuous work	0
Exercise [regular] or strenuous work	20
No exercise and sedentary work	30

Family history

No family history	0
Either parent	10
Both parents	20

Minimum score	**0**
Maximum score	**100**

Non-Alcoholic Fatty Liver Disease

Patients with NAFLD have hepatic steatosis with or without inflammation and fibrosis. It was diagnosed by using high resolution B mode Ultrasonogram. Ultrasound reveals a hyperechoic texture or a bright liver because of diffuse fatty infiltration [11].

A meta-analysis of 49 studies with 4720 patients found that sensitivity was 85% and specificity was 94% for Ultrasound [12].

Although Liver biopsy is the gold standard for diagnosis of NAFLD, it is neither feasible nor ethical in large scale studies.

Results

Study population constituted 139 subjects, out of which 80(57.55%) were males & 59(42.45%) were females. The mean age of study subjects was 48.66 $\pm$ 12.59 years. The mean BMI was 26.51 $\pm$ 5.36 kg/m^2. This study demonstrated that NAFLD was significantly higher in patients with high IDRS group (54.93%) with p value <0.001.

Table 1 presents descriptive statistics of the study.

Table No -1 Descriptive statistics Of The Study

	N	Minimum	Maximum	Mean	Std. Deviation
Age(in years)	139	22	81	48.66	12.59
Waist Circumference (in cm)	139	46	132	86.54	15.69
IDRS Score	139	20	100	55.39	18.10
HT	139	139	189	162.06	9.61
WT	139	35	119	69.92	15.15
BMI	139	15	46.8	26.51	5.36
SBP	139	90	176	130.54	16.65
DBP	139	58	110	85.71	12.18
FBS	139	68	123	97.74	10.45
PPBS	139	80	195	126.36	29.06
TB	139	0.20	1.45	0.65	0.26
DB	139	0.10	0.82	0.22	0.09
Albumin	139	2.1	4.7	5.50	6.457
AST	139	13	381	33.15	39.12
ALT	139	10	321	41.95	36.42
ALP	139	21	139	74.69	21.52
TC	139	17	275	177.97	44.70
Triglycerides	139	48	642	148.33	82.08
HDL	139	18	83.6	43.22	11.79
LDL	139	19	220	119.26	40.91

HT-Height in cm;WT-Weight in kg;BMI-Body mass index in kg/m2;SBP-Systolic Blood Pressure in mm of Hg;DBP – Diastolic Blood Pressure in mm of Hg; FBS-Fasting Blood Sugar in mg/dl; PPBS-Post Prandial Blood Sugar in mg/dl; TB-Total Bilirubin- in mg/dl; DB-Direct Bilirubin- in mg/dl; AST-Aspatate transaminase – in International Units/litre; ALP-Alkaline phosphatase – in Interna tional units/ litre;TC-Total cholesterol –in mg/dl; Triglyce rides-in mg/dl;HDL-high density lipoproteins-in mg/dl;LDL-Low density lipoprotein –in mg/dl

The present study showed that, 47/139 subjects (33.18%) had NAFLD of which 56.2% were male and 43.48% were female.

Table 2 presents clinical and Biochemical profile of subjects with & without NAFLD.

Table No-2 Clinical and Biochemical Parameters of subjects with NAFLD compared to NORMAL subjects.

PARAMETER	GROUP	N	MEAN	STD.DEVIATION	t
AGE	NORMAL	92	47.16	13.41	1.984 P=0.05
	NAFLD	47	51.59	10.32	
WEIGHT	NORMAL	92	65.35	12.96	5.47 P<0.001
	NAFLD	47	78.87	15.25	
HEIGHT	NORMAL	92	162.13	10.04	3.21 P=0.90
	NAFLD	47	161.92	8.8	
BMI	NORMAL	92	24.66	4.33	6.496 P<0.001
	NAFLD	47	30.14	5.36	
SBP	NORMAL	92	129.11	15.83	1.41 P=0.158
	NAFLD	47	133.34	18.01	
DBP	NORMAL	92	84.88	11.98	1.137 P=0.25
	NAFLD	47	87.36	12.53	
FBS	NORMAL	92	95.38	9.5	3.92 P<0.001
	NAFLD	47	102.38	10.76	
PPBS	NORMAL	92	117.73	25.29	5.36 P<0.001
	NAFLD	47	143.25	28.78	
TB	NORMAL	92	0.641	0.27	0.66 P=0.506
	NAFLD	47	0.673	0.26	
DB	NORMAL	92	0.225	0.103	0.41 P=0.67
	NAFLD	47	0.232	0.08	
AST	NORMAL	92	23.82	10.76	4.15 P<0.001
	NAFLD	47	51.4	62.04	
ALT	NORMAL	92	31.71	17.09	5.02 P<0.001
	NAFLD	47	62	52.73	
ALP	NORMAL	92	72.79	18.57	1.46 P=0.14
	NAFLD	47	78.4	26.18	
ALBUMIN	NORMAL	92	4.4	0.32	-10.41 P<0.001
	NAFLD	47	3.6	0.6	
TC	NORMAL	92	175.42	46.03	0.94 P=0.34
	NAFLD	47	182.97	42.01	
TG	NORMAL	92	134.13	84.56	2.93 P<0.01
	NAFLD	47	176.12	69.8	
LDL	NORMAL	92	114.57	37.64	1.9 P=0.05
	NAFLD	47	128.43	45.7	
HDL	NORMAL	92	46.17	11.62	-4.3 P<0.001
	NAFLD	47	37.45	9.93	

HT-Height in cm;WT-Weight in kg;BMI-Body mass index in kg/m2;SBP-Systolic Blood Pressure in mm of Hg;DBP – Diastolic Blood Pressure in mm of Hg; FBS-Fasting Blood Sugar in mg/dl; PPBS-Post Prandial Blood Sugar in mg/dl; TB-Total Bilirubin- in mg/dl; DB-Direct Bilirubin- in mg/dl; AST-Aspatate transaminase – in International Units/litre; ALP-Alkaline phosphatase – in Intern ational units/ litre;TC-Total cholesterol –in mg/dl; Triglycerides-in mg/dl;HDL-high density lipoproteins-in mg/dl;LDL-Low density lipoprotein –in mg/dl

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	NAFLD	47	87.36	12.53	
FBS	NORMAL	92	95.38	9.5	3.92 P<0.001
	NAFLD	47	102.38	10.76	
PPBS	NORMAL	92	117.73	25.29	5.36 P<0.001
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	NAFLD	47	0.673	0.26	
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	NAFLD	47	0.232	0.08	
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	NAFLD	47	51.4	62.04	
ALT	NORMAL	92	31.71	17.09	5.02 P<0.001
	NAFLD	47	62	52.73	
ALP	NORMAL	92	72.79	18.57	1.46 P=0.14
	NAFLD	47	78.4	26.18	
ALBUMIN	NORMAL	92	4.4	0.32	-10.41 P<0.001
	NAFLD	47	3.6	0.6	
TC	NORMAL	92	175.42	46.03	0.94 P=0.34
	NAFLD	47	182.97	42.01	
TG	NORMAL	92	134.13	84.56	2.93 P<0.01
	NAFLD	47	176.12	69.8	
LDL	NORMAL	92	114.57	37.64	1.9 P=0.05
	NAFLD	47	128.43	45.7	
HDL	NORMAL	92	46.17	11.62	-4.3 P<0.001
	NAFLD	47	37.45	9.93	

significantly higher in patients with NAFLD compared to normal individuals as shown in Table 2. HDL & Albumin were significantly lower in them.

Multivariate analysis of various clinical & biochemical parameters associated with NAFLD revealed that BMI had highest odds ratio (1.27) for NAFLD than other factors.

Using various risk factors of NAFLD as independent variables and NAFLD as the dependent variable, stepwise multiple logistic regression analysis revealed that Albumin, AST & IDRS remained significantly associated with NAFLD .

Table 3-Univariate and Multivariate analysis of various clinical and biochemical parameters associated with NAFLD

VARIABLES	UNADJUSTED		ADJUSTED	
	ODDS RATIO (95% CI)	P VALUE	ODDS RATIO (95% CI)	P VALUE
Age	1.02(0.99-1.05)	0.05	.983(0.91-1.06)	0.67
Weight	1.07(1.04-1.10)	<0.001	.916(0.82-1.01)	0.09
Waist circumference	1.09(1.05-1.13)	<0.001	1.01(0.94-1.10)	0.64
BMI	1.27(1.16-1.41)	<0.001	1.29(0.94-1.76)	0.10
IDRS	1.09(1.05-1.13)	<0.001	1.08(0.99-1.18)	0.05
FBS	1.07(1.03-1.11)	<0.001	0.99(0.91-1.08)	0.93
PPBS	1.03(1.01-1.04)	<0.001	1.00(0.97-1.03)	0.59
AST	1.05(1.02-1.09)	<0.001	1.00(0.97-1.03)	0.81
ALT	1.04(1.02-1.06)	<0.001	1.07(1.02-1.11)	0.001
TG	1.006(1.001-1.01)	0.01	1.00(0.99-1.00)	0.72
HDL	0.91(0.88-0.95)	<0.001	0.94(0.87-1.01)	0.14
LDL	1.008(0.99-1.01)	0.06	1.01(0.99-1.04)	0.06
ALBUMIN	0.02(0.008-0.09)	<0.001	0.02(0.003-0.141)	<0.001

Table 4. Multiple Logistic Regression Analysis of NAFLD using step wise model

Independent variables	Odds ratio	95% C.I	P Value
IDRS	1.08	0.99-1.18	<0.05
ALT	1.07	1.02-1.11	0.001
ALBUMIN	0.02	0.003-0.141	<0.001

Discussion

This study demonstrated that NAFLD was significantly higher in patients with high IDRS group (54.93%) with p value <0.001. In multiple logistic regression analysis Odds Ratio for IDRS is 1.08 with a p value of <0.05 which is statistically significant. Since Diabetes itself is a major cause of Fatty liver subjects with diabetes has been excluded in the study to prevent confounding bias.

CURES-117[7] study was done based on Chennai urban population whereas the present study is based entirely on rural population .Female subjects were 54.8% and males were only 45.2% in their study whereas in our study males were 57.55% ,which may be due to 'male first attitude' of the rural people. In their final model after multiple logistic regression, association of NAFLD with AST/ALT and HbA1c were statistically significant where as in our study low albumin levels and high ALT levels were associated with NAFLD as shown in Table 4. HbA1c was not done due to cost factor among rural people.

NAFLD is significantly associated with increased risk of diabetes [13]. NAFLD is associated with increased risk of fatal and non-fatal cardiovascular disease events [14]. NAFLD is commonly associated with metabolic comorbidities, including obesity, dyslipidemia & metabolic syndrome [15]. Nowadays, there is a general consensus that fatty liver is the hepatic manifestation of metabolic syndrome [16]. NAFLD has the potential to progress into advanced fibrosis, end stage liver disease and hepatocellular carcinoma [15].

There has been a general increase in the prevalence of NAFLD, with Asia leading the rise, yet the United States is following closely behind with a rising prevalence from 15% in 2005 to 25% within 5 years [15].

This study shows that a simple clinical risk score may help to identify individuals at high risk of NAFLD. This score costs nothing and it requires only 3 questions and a waist measurement. Therefore, it is highly effective in a rural setup.

This study shows IDRS can be used as an initial, cost-effective screening tool to identify individuals at high risk of NAFLD. Patients with high IDRS scores can then be referred for biochemical tests or for imaging for definitive assessment of NAFLD.

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