



# “A Cross-Sectional Study On Anthropometric Measurements And Physical Activity Of Individuals With Non-Alcoholic Fatty Liver Disease In Selected Hospitals, Hoshiarpur, Punjab.”

Ms. Deepika Kumari<sup>1</sup>, Dr. Dimple Madaan<sup>2</sup>, Mrs. Sawroop Dhillon<sup>3</sup>

1. M.Sc.(N) Dept. of Medical Surgical Nursing, Shri Guru Ram Dass College Of Nursing  
Hoshiarpur-146001, Punjab, (India)

2. Professor and Principal Shri Guru Ram Dass College of Nursing Hoshiarpur-146001, Punjab(India)

3. Mrs. Sawroop Dhillon, Assistant Professor Shri Guru Ram Dass College of Nursing Hoshiarpur-  
146001, Punjab. (India)

**ABSTRACT-** Aim of the study was to assess the anthropometric profile and physical activity of individuals with non-alcoholic fatty liver disease in the selected hospitals Hoshiarpur, Punjab.

**Material And Methods:** A cross-sectional quantitative research approach and descriptive design was adopted for the study. Purposive sampling technique was used to select 60 subjects. Before data collection, permission was taken from SMO Incharge, Civil Hospital and Narad Hospital Hoshiarpur. Then data were collected on anthropometric measurement and physical activity of individuals with non-alcoholic fatty liver disease. Analysis and interpretation of data was done in accordance with the objectives of the study by using descriptive and inferential statistics like mean, standard deviation, chi-square test, t-test, F-test.

**Findings:** Results of study showed that majority of subjects 61.7% were overweight and had BMI 25-26kg/m<sup>2</sup>, 25% were obese had BMI more than 30kg/m<sup>2</sup> and 13% of subjects having normal weight had BMI between 18.5-24.9kg/m<sup>2</sup>. 51.7% subjects were having very high waist circumference more than 90cm, 41% were having high waist circumference, 6.6% having normal waist circumference. 50% of subjects had high

risk category according to waist to hip ratio, 41.7 were in moderate risk and 8.3% of subjects were in low risk waist to hip ratio. According to waist to height ratio 46.7% of subjects were in the category of increased risk of central obesity, 40% of subjects were in very high risk category and 13.3% were in no risk category of central obesity. 65% of subjects perform moderate physical activity during work and recreational activity, 21.7% of subjects had high physical activity and 13.3% of subjects perform low level of physical activity during work and recreational activity. Present study findings shows that there was statistically non significant association of anthropometric measures and physical activity with socio demographic variables.

**Conclusion:** Thus study concludes that majority of subjects with NAFLD were overweight. Majority of males and females had central obesity. Majority of subjects had moderate level of physical activity.

## Introduction

Non-alcoholic fatty liver disease (NAFLD) is one of the most common liver disorders worldwide. NAFLD has a variable presentation, ranging from being a silent metabolic disorder to as symptomatic nonalcoholic steatohepatitis. It eventually progresses to cirrhosis and, in serious cases, hepatocellular carcinoma. Nonalcoholic fatty liver disease (NAFLD) is liver damage caused by the accumulation of triglycerides (hepatic steatosis) in liver cells, similar to that caused by alcohol, but it occurs in people who do not abuse alcohol.

Nonalcoholic fatty liver disease (NAFLD) is probably the most common liver disorder in the world, affecting 2.8-24% of the general population. It is also currently the most common cause of abnormal liver function tests and is recognized as a major cause of cryptogenic cirrhosis of liver. It is principally a disease of middle age and old age but at present, there is no general consensus on whether there is any predilection for a specific gender.

NAFLD develops due to the deposition of lipids and fats in the liver hepatocytes. Many risk factors play a vital role in the accumulation of this fat, namely the type and contents of the diet, obesity, metabolic syndrome (MS), and lack of physical activity (PA). Diet plays a significant role in the development of NAFLD. Increased intake of carbohydrates, animal proteins, and sugar are linked to the onset of NAFLD. Excess carbohydrate use can lead to insulin resistance (IR), which itself is also a contributing factor for NAFLD. MS is a cluster of metabolic derangements characterized by obesity, raised blood pressure (BP), raised blood glucose levels, IR, and dyslipidemia [9]. Obesity, another major risk factor for NAFLD, disturbs the oxidative pathways in adipose tissues and promotes IR. This oxidative stress creates unfavorable conditions for the liver and worsens NAFLD. An increase in the body mass index (BMI) and waist circumference (WC) are positively associated with the progression of hepatic steatosis.

Obesity is a common clinical phenotype associated with NAFLD, which is linked to metabolic syndrome and related co-morbidities including type II diabetes, hypertension. Clearly not all obese subjects develop NAFLD and NAFLD also can be found in non-obese subjects. These patients are usually asymptomatic clinically, but may also present with hepatosplenomegaly, fatigue, dyspepsia, and discomfort in the right upper quadrant where the liver is located. Cirrhosis may develop, and patients may present with jaundice, ascites, or variceal bleed. Patients may also present with a clinical picture of MS and IR as seen in diabetes mellitus (DM).

The global increase in the prevalence of obesity, type II diabetes and metabolic syndrome has led to an increase in incidence of NAFLD. NAFLD is emerging as an important cause of liver disease in India. Epidemiological studies suggest prevalence of NAFLD in around 9% to 32% of general population in India with higher prevalence in those with overweight or obesity and those with diabetes and prediabetes.

## NEED OF THE STUDY

Non-alcoholic fatty liver disease (NAFLD) is a common liver disorder caused by the deposition of lipids and fats in the hepatocytes, in individuals who consume little or no alcohol, which eventually progresses to cirrhosis and carcinoma. Apart from the known risk factors like obesity, metabolic syndrome (MS), and lack of physical activity (PA), diet also plays a major role in the development of NAFLD. A high body mass index (BMI) and waist circumference (WC) have positive associations with NAFLD. The aim of this study was to find the prevalence of risk factors of hepatic steatosis in NAFLD population and to raise public awareness about the condition.

Non-alcoholic fatty liver disease (NAFLD) is an obesity-associated health problem that causes other liver diseases for the patient. Four anthropometric indices: body mass index (BMI), waist circumference (WC), waist-to-hip ratio (WHR) and waist-to-height ratio (WHtR) as NAFLD predictors. Physical inactivity and unsuitable lifestyle leads to fatty liver.

NAFLD is a significant health concern and also the most common form of liver disease worldwide. NAFLD is a condition defined by significant lipid accumulation (5–10%), especially triglycerides in the hepatocytes in the absence of significant chronic alcohol consumption (less than 20 g/day in men and 10 g/day in women) that may cause other liver diseases for the patient such as non-alcoholic steatohepatitis (NASH), liver tissue fibrosis, cirrhosis, and even hepatocellular carcinoma (HCC). [16]

Systematic review studies show that the prevalence of NAFLD is estimated to be 20-30% in the eastern countries. NAFLD is usually associated with diabetes, insulin resistance, increased blood lipids, increased blood pressure, age, metabolic syndrome, obesity and BMI. NAFLD is present in about 10%, 50% and 70% of subjects with prediabetes with BMI in the normal weight, overweight and obese range,

respectively and in about 20%, 40% and 70% of subjects with a metabolically unhealthy phenotype with BMI in the normal weight, overweight and obese range, and respectively.

NAFLD is usually associated with diabetes, insulin resistance, increased blood lipids, increased blood pressure, age, metabolic syndrome, obesity and BMI. NAFLD is present in about 10%, 50% and 70% of subjects with prediabetes with BMI in the normal weight, overweight and obese range, respectively and in about 20%, 40% and 70% of subjects with a metabolically unhealthy phenotype with BMI in the normal weight, overweight and obese range, and respectively.

However, WC does have limits, e.g., the amount of the abdominal fat is estimated to be lower in short people compared to the tall ones. WC, WHR and WHtR have been considered as alternative indices for abdominal obesity in previous studies. Since NAFLD can lead to the development of liver diseases and impose huge costs, it is very important to identify people at risk and the need of the present research study is to assess the anthropometric measurements and level of physical activity of individuals with NAFLD.

Since there is high prevalence obesity in Punjab so researcher felt need to study the anthropometric profile and physical activity of patients with NAFLD.

### **Statement of problem**

A cross-sectional study on anthropometric measurements and physical activity of individuals with non-alcoholic fatty liver disease in selected hospitals, Hoshiarpur, Punjab.

### **Aim of the study**

The study aims to assess the anthropometric measurements and physical activity of the individuals with non-alcoholic fatty liver disease.

### **Objective of the study**

1. To assess anthropometric indices i.e. body mass index (BMI), waist circumference (WC), waist hip ratio (WHR) and waist-to-height ratio (WHtR) in patients with non-alcoholic fatty liver disease (NAFLD).
2. To assess physical activity of individuals with non-alcoholic fatty liver disease.
3. To find out the association of anthropometric indices and physical activity with selected socio-demographic variables.

### **Delimitations**

Four anthropometric indices i.e. BMI, WC, WHR, WHtR of individuals with non-alcoholic fatty liver disease were studied in selected hospital Hoshiarpur.

## Assumptions

- People with NAFLD have poor physical activity.
- Regular physical activity reduces overall and abdominal obesity.
- NAFLD leads to many co morbidities.

## MATERIAL AND METHODS

### Research design

A descriptive cross-sectional research design was used to assess the anthropometric profile and physical activity of individuals with non- alcoholic fatty liver disease.

### Research settings

The study was conducted in Narad Hospital and Civil Hospital, Hoshiarpur. The primary reasons for selection of these hospitals are researcher's familiarity with settings and availability of the sample and standard of care being maintained in these hospitals.

### Sample size

The sample size for the study was 60 subjects with non- alcoholic fatty liver disease in selected hospitals, Hoshiarpur, Punjab.

### Sample techniques

Purposive sampling technique was used to select the sample.

### Variables of study

**Independent variable:** Physical activity.

**Dependent variable:** Anthropometric measurements.

## DESCRIPTION OF THE TOOL

### Development of Tool

**Section A: Socio-Demographic Performa:** This section consists of socio- demographic variables. It consists of 9 items includes Age, gender, residence, educational qualification, religion, occupation, monthly income, consumption of fruit and consumption of vegetables.

### Section B:

**Anthropometric Measurements recording Performa:** The anthropometric measures recording performa was developed by the investigator to record the BMI, WC, WHR and WHtR. It consists of 4 items.

- I. **Body mass index (BMI):** - Weight was measured to the nearest 0.1 kg using electronic weight scale with the respondents lightly clothed. Height was measured to the nearest 0.1cm with non-stretchable measuring tape while the respondent stood still without shoes. Height was measured twice and the

average value was taken. BMI was calculated by the formula,  $BMI = \text{weight (kg)} / \text{height (m)}^2$ . Body Mass Index (BMI) is a simple index of weight-for-height that is commonly used to measure body fat as per following criteria:

- Underweight ( $<18.5 \text{kg/m}^2$ )
- Normal weight ( $18.5\text{-}22.9 \text{kg/m}^2$ )
- Overweight ( $23\text{-}27.49 \text{kg/m}^2$ )
- Obesity ( $\geq 27.5 \text{kg/m}^2$ )

**II. Waist circumference (WC):** - WC was measured at the end of several consecutive natural breaths, at the level parallel to the floor, midpoint between the top of the iliac crest and the lower margin of the last palpable rib in midaxillary line. Waist circumference is assessed as per following criteria:

Waist circumference	In male	In female
a) Normal	<90cm	<80
b) High	95-102cm	80-88
c) Very high	102cm	$\geq 88$

**III. Waist to hip ratio (WHR):** - WHR was calculated by dividing WC (in cm) by hip circumference (cm). Hip circumference was measured at a level parallel to floor, at the largest circumference of the buttocks.

According to the World Health Organization (WHO), a healthy WHR is:

- 0.95 or less in men
- 0.80 or less for women

Waist to hip ratio used to following criteria measure:

Health risk	Men	Women
Low risk	0.95 or lower	0.80 or lower
Moderate risk	0.96-1.0	0.81-0.85
High risk	1.0 or higher	0.86 or higher

**IV. Waist-to- height ratio (WHtR):** - A person's waist-to-height ratio (WHtR), also called waist-to- stature ratio (WSR), is defined as their waist circumference divided by their height, both measured in the same units. The WHtR is a measure of the distribution of body fat. Higher values of WHtR indicate higher risk of obesity-related diseases; it is correlated with abdominal obesity.

Waist- to- height ratio commonly used to measure as per following criteria:

- a) No risk ( $<0.5$ )
- b) Increased risk ( $>0.5 \ \& \ <0.6$ )

c) Very high risk ( $>0.6$ )

**Section C: - Global Physical Activity Questionere (GPAQ):** This tool consists of 16 questions to check the physical activity of individuals with non alcoholic fatty liver disease. It collects information on physical activity participation in three setting as well as sedentary behaviour, comprising 16 questions (P1-P16). The domains are:

- Activity at work
- Travel to and places
- Recreational activities

The GPAQ has developed for face-to-face interviews conducted by trained interviewers. It has been tested in large scale population-based surveys with the general adult populations. GPAQ tool used for following criteria measure to assess the level of physical activity:

High If:  $(P2 + P11) \geq 3$  days AND Total physical activity MET minutes per week is  $\geq 1500$

OR

If:  $(P2 + P5 + P8 + P11 + P14) \geq 7$  days AND total physical activity MET minutes per week is  $\geq 3000$

Moderate If:  $(P2 + P11) \geq 3$  days AND  $((P2 * P3) + (P11 * P12)) \geq 60$  minutes

OR

If:  $(P5 + P8 + P14) \geq 5$  days AND  $((P5 * P6) + (P8 * P9) + (P14 * P15)) \geq 150$  minutes

OR

If:  $(P2 + P5 + P8 + P11 + P14) \geq 5$  days AND Total physical activity MET minutes per week  $\geq 600$

Low If: the value does not reach the criteria for either high or moderate levels of physical activity

## Ethical considerations

- Approval was obtained from institutional research and ethics approval committee.
- Permission was obtained to conduct the study from senior Medical Officer / Director of selected hospitals.
- The purpose of the study was explained to all the subjects and written consent was obtained from them for the study.
- The responses were kept confidential and the personal interpersonal relationship with subjects was maintained.
- Routine treatment / care of subjects was not disturbed in selected groups.
- All anti-covid precaution were observed while collection of data.

## ANALYSIS AND INTERPRETATION

### SECTION A

#### Sample characteristics: Socio-demographic Profile

**Table -1**

**Frequency and percentage distribution of individuals with NAFLD as per their socio-demographic variables.**

**N=60**

<b>Demographic variables</b>	<b>n</b>	<b>%</b>
<b>Age in years</b>		
a) <30	2	3.3
b) 30-40	5	8.3
c) 40-50	15	25.0
d) 50-60	25	41.7
e) >60	13	21.7
<b>Gender</b>		
a) Male	26	43.3
b) female	34	56.7
<b>Residence</b>		
a) Rural	30	50.0
b) Urban	30	50.0
<b>Educational qualification</b>		
a) No formal education	15	25.0
b) Under graduation	25	41.7

c) Post graduation	18	30.0
d) Above post graduation	2	3.3
<b>Religion</b>		
a) Hindu	25	41.7
b) Sikh	34	56.7
c) Christian	1	1.7
<b>Occupation</b>		
a) Unemployed	20	33.3
b) Private job	19	31.7
c) Government job	7	11.7
d) Retired	9	15.0
e) Businessman	5	8.3
<b>Monthly income (In rupees)</b>		
a) <10,000	17	28.3
b) 10,001-20,000	14	23.3
c) 20,001-30,000	14	23.3
d) >30,000	15	25.0
<b>Consumption of fruits servings per day</b>		
a) Nil	18	30.0
b) 1	33	55.0
c) 2	8	13.3
d) >2	1	1.7
<b>Consumption of vegetables servings per day</b>		
a) Nil	0	0
b) 1	4	6.7
c) 2	38	63.3
d) >2	18	30

Table no. 1 shows frequency and percentage distribution of individuals with NAFLD as per their socio-demographic variables.

According to age ,41.7% subjects were in the age group of 50- 59 years of age, 25% were in the 40-49 years of age , 21.7% were in the >60 years, 8.3% were 30-39 years of age and 3.3% were in <30 year of age. Majority of the subjects i.e. 56.7% were females and 43.3% subjects were males.

This table depicts that 50% of the subjects were the residents of rural areas and 50% of the subjects were the residing in the urban area.

Majority of the subjects i.e. 41.7% were undergraduate, 30% subjects were post graduation, 25% were no formal education and 3.3 % subjects had above post graduation education.

Table shows that 56.7% subjects were Sikh 41.7% were Hindu and 1.7% was Christian.

Majority of subjects i.e. 33.3% subject's were unemployed, 31.7% of subject had private job, 15% were retired, 11.7% had govt. Job and 8.3% of subjects were businessman.

Table shows that 28.3% of subjects had monthly income was below 10,000, 25% subject's income was under the category above 30,000, 23.3 % had the income up to 10,00-20,000 and 23.3% subjects had monthly income more than 20,001-30,000.

Majority of subjects i.e. 55% were consumed fruits servings 1 time per day, 30% of subjects not consume fruits servings per day, 13.3% of subjects consume 2 times and 1.7% of subjects consume fruits servings more than 2 times.

As per consumption of vegetables servings per day majority of subjects i.e. 63.3% were consumed vegetables servings 2 times per day, 30% of subjects consume vegetables servings more than 2 times, 6.7% of subjects consume 1 time per day.

## SECTION B

### Sample characteristics: Anthropometric measurements

Table -2

Frequency and percentage distribution of individuals with NAFLD as per their anthropometric measures.

N=60

Anthropometric measurements	Criteria measure	n	%
<b>BMI</b>			
a) Underweight	<18.5kg/m <sup>2</sup>	0	0
b) Normal weight	18.5-22.9kg/m <sup>2</sup>	8	13.3
c) Overweight obese	23-27.49kg/m <sup>2</sup>	37	61.7
d) obese	≥27.5kg/m <sup>2</sup>	15	25

### Waist circumference

#### Male

a) Normal	<90cm	2	3.3
b) High	95-102cm	15	25
c) Very high	>102cm	9	15

**Female**

a) Normal	<80cm	2	3.3
b) High	80-88cm	10	16.7
c) Very high	≥88cm	22	36.7

**Waist to hip ratio****In men (Health risk)**

Low risk	0.95 or lower	3	5
Moderate risk	0.96-1.0	12	20
High risk	1.0 or higher	11	18.3

**In women (Health risk)**

Low risk	0.80 or lower	2	3.3
Moderate risk	0.81-0.85	13	21.7
High risk	0.86 or higher	19	31.7

**4. Waist-to-height ratio****(Health risk)**

a) No risk	<0.5	8	13.3
b) Increased risk	>0.5 & <0.6	28	46.7
c) Very high risk	≥0.6	24	40

Table no. 2 shows 61.7% subjects were overweight, 25% were obese and 13% of subjects having normal weight. Majority of non alcoholic fatty liver disease individuals were overweight and obese.

According to waist circumference 51.7% of subjects were having very high waist circumference, 41% of subject having high waist circumference and 6.6% having normal waist circumference.

Hence it is concluded non alcoholic fatty liver disease individuals had high waist circumference.

This table show 50% of subjects were having high risk according to waist to hip ratio, 41.7% of subjects had moderate risk, 8.3% of subjects had low risk category according waist to hip ratio.

Majority of subjects with non alcoholic fatty liver disease had high waist to hip ratio.

According to waist to height ratio 46.7% of subjects were in the category of increased risk of central obesity, 40% were fall in very high risk category and 13.3% were in no risk category.

Majority of subjects with non alcoholic fatty liver disease were in increased risk of central obesity.

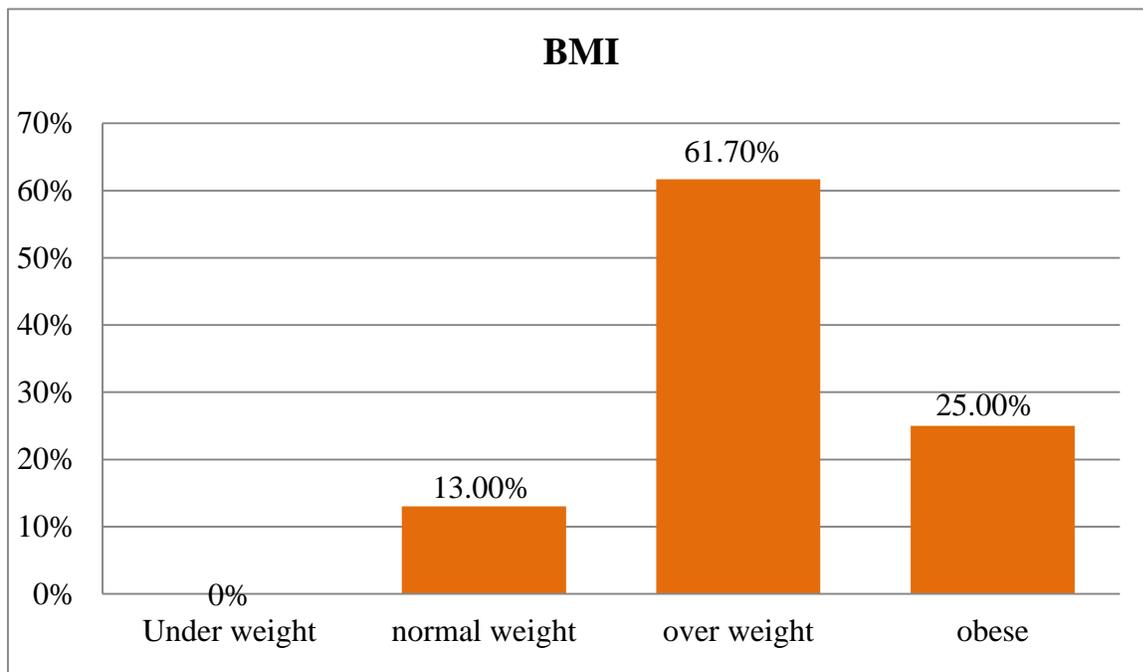


Fig. 1: Percentage distribution of subjects as per body mass index (BMI)

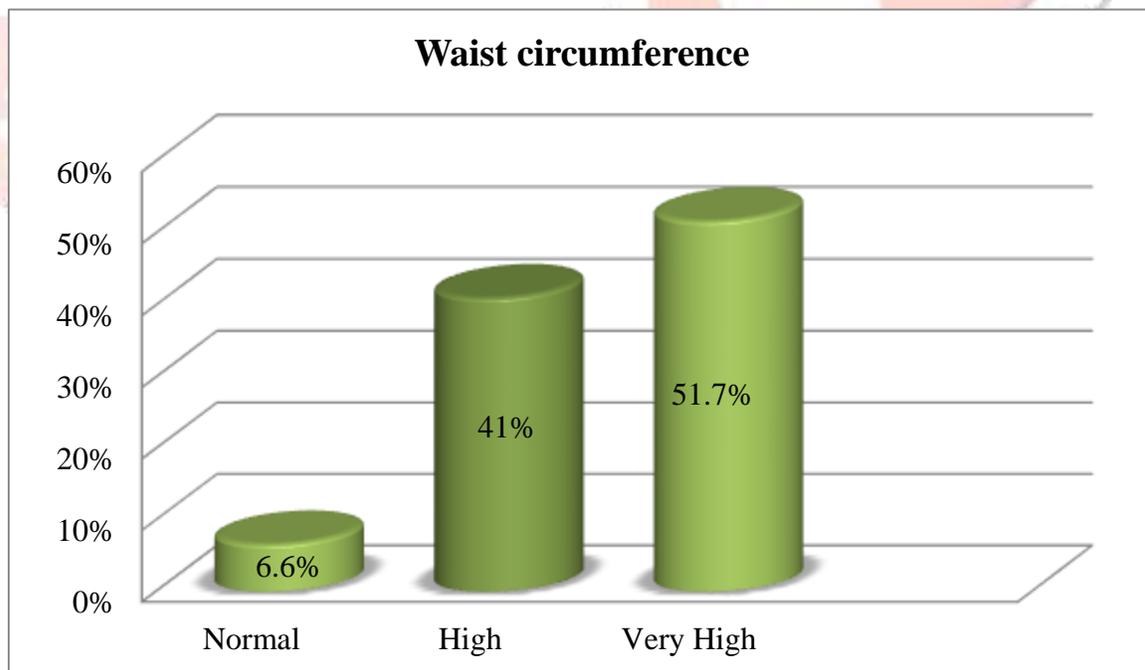


Fig.2: Percentage distribution of subjects as per waist circumference (WC)

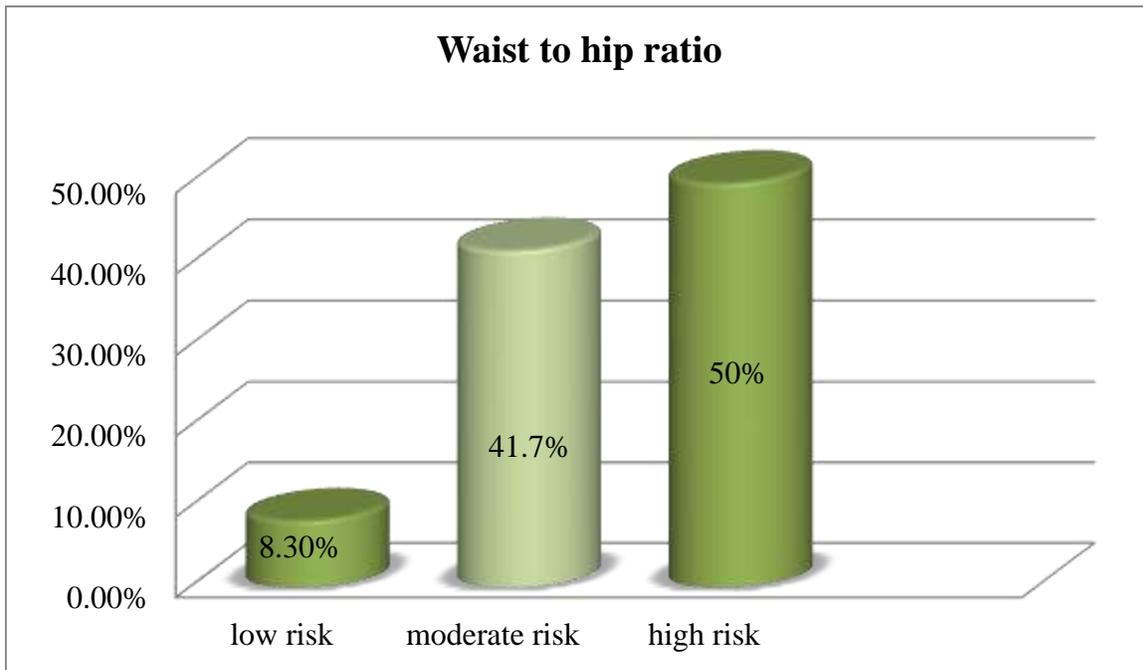


Fig. 3: Percentage distribution of subjects as per waist to hip ratio (WHR)

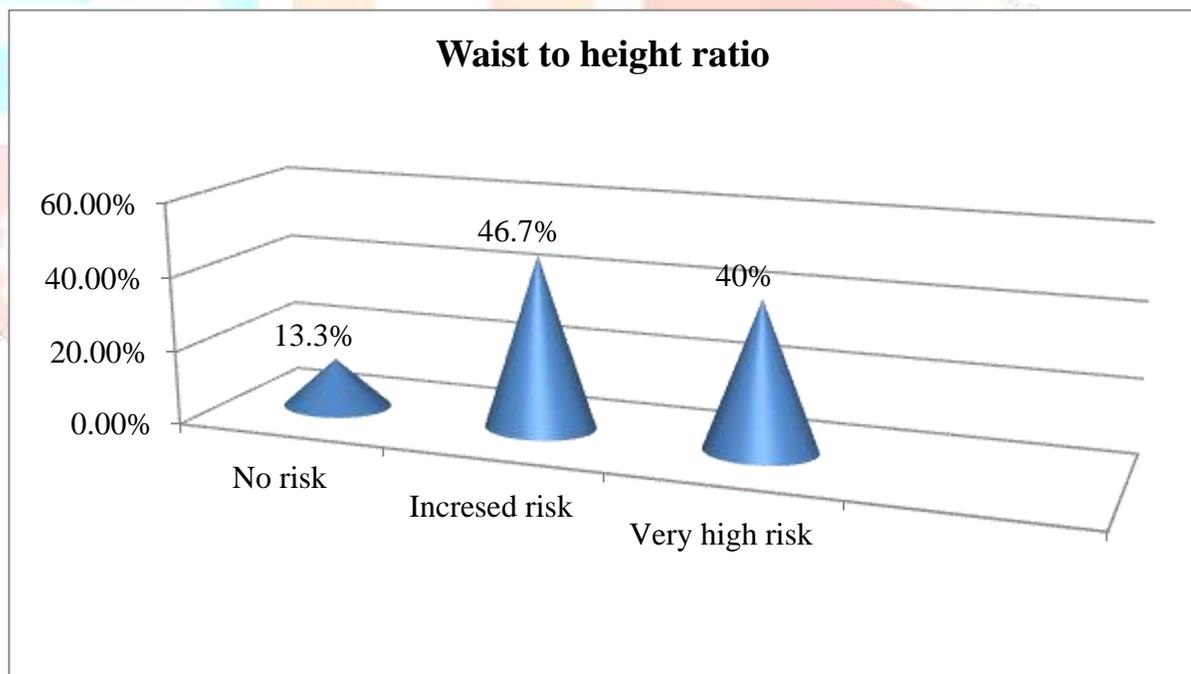


Fig. 4: Percentage distribution of subjects as per waist to height ratio (WHtR)

**Table-3**

**Frequency and percentage distribution of subjects with NAFLD as per their level of physical activity.**

**N=60**

Level of physical activity	Criteria measure	Frequency	Percentage
High	If: $(P2 + P11) \geq 3$ days AND Total physical activity MET minutes per week is $\geq 1500$ OR • If: $(P2 + P5 + P8 + P11 + P14) \geq 7$ days AND total physical activity MET minutes per week is $\geq 3000$	13	21.7
Moderate	• If: $(P2 + P11) \geq 3$ days AND $((P2 * P3) + (P11 * P12)) \geq 60$ minutes OR • If: $(P5 + P8 + P14) \geq 5$ days AND $((P5 * P6) + (P8 * P9) + (P14 * P15)) \geq 150$ minutes OR • If: $(P2 + P5 + P8 + P11 + P14) \geq 5$ days AND Total physical activity MET minutes per week $\geq 600$	39	65.0
Low	If: the value does not reach the criteria for either high or moderate levels of physical activity	8	13.3

Table No. 3 shows that 65% of subjects had moderate physical activity, 21.7% of subjects had high physical activity and 13.3% of subjects perform low physical activity during their work and recreational activity. According to this table majority of individuals with non-alcoholic fatty liver disease perform moderate level of physical activity during work and recreational activity.

TABLE 4

Association of BMI among individuals with NAFLD and socio demographic variables

N=60

Demographic variables	n	%	BMI				df	$\chi^2$	P
			Under weight (0)	Normal weight (8)	Over weight (37)	Obese (15)			
<b>Age in years</b>									
a) <30	2	3.3	0	0	2	0			
b) 30-40	5	8.3	0	0	2	3			
b) 40-50	15	25	0	1	10	4	8	1.36 <sup>NS</sup>	0.91
c) 50-60	25	41	0	6	17	2			
d) ≥60	13	21.7	0	1	6	6			
<b>Gender</b>									
a) Male	26	43.3	0	2	16	8	2	1.70 <sup>NS</sup>	0.426
b)female	34	56.7	0	6	21	7			
<b>Residence</b>									
a)Rural	30	50	0	3	17	9	2	1.27 <sup>NS</sup>	0.528
b)Urban	30	50	0	5	20	6			
<b>Educational qualification</b>									
No formal education	15	25	0	3	9	3			
Under graduation	25	41.7	0	4	17	4	6	9.55 <sup>NS</sup>	0.145
Post graduation	18	30	0	0	10	8			
Above post graduation	2	3.3	0	1	1	0			
<b>Religion</b>									
a) Hindu	25	41.7	0	5	15	5			
b)Sikh	34	56.7	0	3	21	10	4	2.5 <sup>NS</sup>	0.64
c) Christian	1	1.7	0	0	1	0			

<b>Occupation</b>									
a)Unemployed	20	33.3	0	3	15	2			
b) Private job	19	31.7	0	3	12	4			
c) Government job	7	11.7	0	1	3	3	8	6.87 <sup>NS</sup>	0.55
d) Retired	9	15	0	1	4	4			
e)Businessman	5	8.3	0	0	3	2			
<b>Monthly income (In rupees)</b>									
a) ≤10,000	17	28.3	0	3	12	2			
b) 10,001-20,000	14	23.3	0	2	10	2	6	8.57 <sup>NS</sup>	0.19
c) 20,001-30,000	14	23.3	0	3	7	4			
d) ≥30,000	15	25.0	0	0	8	7			
<b>Consumption of fruits servings per day</b>									
a) Nil	18	30	0	3	13	2			
b)1	33	55	0	2	19	12	6	9.77 <sup>NS</sup>	0.13
c) 2	8	13.3	0	3	4	1			
d)>2	1	1.7	0	0	1	0			
<b>Consumption of vegetables servings per day</b>									
a) Nil	0	0	0	0	0	0			
b) 1	4	6.7	0	0	2	2	4	3.67 <sup>NS</sup>	0.45
c) 2	38	63.3	0	7	22	9			
d) >2	18	30	0	1	13	4			

NS = non significant at  $p < 0.05$  level of significance

Table No. 4 shows According to age majority i.e. 17 of subjects who were overweight belong to age group of 50- 60 and majority of the NAFLD patients who were obese i.e. 6 were in the age group  $\geq 60$  but age has not been found to be associated with BMI at  $p < 0.05$  level of significance.

According to gender majority of subjects i.e. 21 were females and 16 were males and majority of the NAFLD patients who were obese i.e. 8 were males and 7 were females but gender has not been found to be associated with BMI at  $p < 0.05$  level of significance.

According to residence majority of subjects i.e. 20 belong to rural area and 17 resides urban area and majority of the NAFLD patients who were obese i.e. 9 were belong to rural area and 6 belong to urban area but residence has not been found to be associated with BMI at  $p < 0.05$  level of significance.

According to educational qualification majority of subjects i.e. 17 who were overweight were under graduation and majority of the NAFLD patients who were obese i.e. 8 were post graduation but educational qualification has not been found to be associated with BMI at  $p < 0.05$  level of significance.

According to religion majority of subjects i.e. 21 who were overweight were Sikh and majority of the NAFLD patients who were obese i.e. 10 were also Sikh but religion has not been found to be associated with BMI at  $p < 0.05$  level of significance.

According to occupation majority of subjects i.e. 15 who were overweight were unemployed and majority of the NAFLD patients who were obese i.e. 8 were in private job and retired but occupation has not been found to be associated with BMI at  $p < 0.05$  level of significance.

According to monthly income majority of subjects i.e. 12 who were overweight having monthly income  $\leq 10,000$  and majority of the NAFLD patients who were obese i.e. 7 having monthly income  $\geq 30,000$  but monthly income has not been found to be associated with BMI at  $p < 0.05$  level of significance.

According to consumption of fruits servings majority of subjects i.e. 19 who were overweight consumed fruits 1 time and majority of the NAFLD patients who were obese i.e. 12 also consumed fruits 1 time per day but consumption of fruits per day has not been found to be associated with BMI at  $p < 0.05$  level of significance.

According to consumption of vegetables majority of subjects i.e. 22 who were overweight consumed vegetables 2 times and majority of the NAFLD patients who were obese i.e. 9 also consumed vegetables 2 times per day but consumption of vegetables per day has not been found to be associated with BMI at  $p < 0.05$  level of significance.

According to this table all of the variables in the socio demographic profile had no association with BMI at  $p < 0.05$  level of significance.

Table – 5

Association of waist circumference among individuals with NAFLD and socio demographic variables

N=60

Demographic variables	n	%	Waist circumference			df	$\chi^2$	P
			Normal (0)	High (30)	Very high (30)			
<b>1. Age in years</b>								
a) ≤30	2	3.3	0	2	0			
b) 30-40	5	8.3	0	3	2			
b) 40-50	15	25	0	10	5	6	1.436 <sup>NS</sup>	0.184
c) 50-60	25	41.7	0	13	12			
d) ≥60	13	21.7	0	2	11			
<b>2. Gender</b>								
a) Male	26	43.3	0	12	14	4	1.878 <sup>NS</sup>	0.526
b) female	34	56.7	0	18	16			
<b>3. Residence</b>								
a) Rural	30	50	0	20	10	2	1.27 <sup>NS</sup>	0.428
b) Urban	30	50	0	10	20			
<b>4. Educational qualification</b>								
a) No formal education	15	25	0	3	12			
b) Under graduation	25	41.7	0	17	8	6	9.55 <sup>NS</sup>	0.145
c) Post graduation	18	56.7	0	10	8			
d) Above post graduation	2	1.7	0	0	2			
<b>5. Religion</b>								
a) Hindu	25	41.7	0	5	20			
b) Sikh	34	56.7	0	24	10	4	2.5 <sup>NS</sup>	0.64
c) Christian	1	1.7	0	1	0			

**6. Occupation**

a) Unemployed	20	33.3	0	15	5			
b) Private job	19	31.7	0	12	7			
c) Government job	7	11.7	0	1	6	8	6.87 <sup>NS</sup>	0.45
d) Retired	9	15	0	1	8			
e) Businessman	5	8.3	0	1	4			

**7. Monthly****income****(In rupees)**

a) <10,000	17	28.3	0	12	5			
b) 10,001-20,000	14	23.3	0	10	4	6	8.57 <sup>NS</sup>	0.39
c) 20,001-30,000	14	23.3	0	4	10			
d) >30,000	15	25	0	4	11			

**8. Consumption****of fruits****servings per****day**

a) Nil	18	30	0	5	13			
b) 1	33	55	0	21	12	6	9.87 <sup>NS</sup>	0.18
c) 2	8	13.3	0	4	4			
d) >2	1	1.7	0	0	1			

**9. Consumption****of vegetables****servings per****day**

a) Nil	0	0	0	0	0			
b) 1	4	6.7	0	2	2	4	4.67 <sup>NS</sup>	0.16
c) 2	38	63.3	0	23	15			

d) >2	18	30	0	5	13
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NS = non significant at  $p < 0.05$  level of significance

Table No. 5 shows According to age majority i.e. 13 of subjects having high waist circumference belong to age group of 50- 60 and majority of the NAFLD patients having very high waist circumference i.e. 12 were in the age group 50-60 but age has not been found to be associated with waist circumference at  $p < 0.05$  level of significance.

According to gender majority i.e. 18 subjects were females having high waist circumference and majority of the NAFLD patients having very high waist circumference i.e. 16 were females but gender has not been found to be associated with waist circumference at  $p < 0.05$  level of significance.

According to residence majority i.e. 20 subjects were resides rural area having high waist circumference and majority of the NAFLD patients having very high waist circumference i.e. 20 were resides urban area but residence has not been found to be associated with waist circumference at  $p < 0.05$  level of significance.

According to educational qualification majority i.e. 17 were undergraduate having high waist circumference and majority of the NAFLD patients having very high waist circumference i.e. 8 were postgraduate but educational qualification has not been found to be associated with waist circumference at  $p < 0.05$  level of significance.

According to educational qualification majority of subjects i.e. 17 were undergraduate having high waist circumference and majority of the NAFLD patients having very high waist circumference i.e. 8 were postgraduate but educational qualification has not been found to be associated with waist circumference at  $p < 0.05$  level of significance.

According to religion majority of subjects i.e. 24 were Sikh having high waist circumference and majority of the NAFLD patients having very high waist circumference i.e. 20 were Hindu but religion has not been found to be associated with waist circumference at  $p < 0.05$  level of significance.

According to occupation majority of subjects i.e. 15 were unemployed having high waist circumference and majority of the NAFLD patients having very high waist circumference i.e. 8 were retired but occupation has not been found to be associated with waist circumference at  $p < 0.05$  level of significance.

According to monthly income majority i.e. 12 subjects having monthly income  $\leq 10,000$  having high waist circumference and majority of the NAFLD patients having very high waist circumference i.e. 10 having monthly income 20,001-30,000 but occupation has not been found to be associated with waist circumference at  $p < 0.05$  level of significance.

According to consumption of fruits majority of subjects i.e. 21 who consumed fruits servings 1 time per day and majority of the NAFLD patients having very high waist circumference i.e. 13 nor consumed fruits servings per day but consumption of fruits has not been found to be associated with waist circumference at  $p < 0.05$  level of significance.

According to consumption of vegetables servings majority of subjects who were having high waist circumference i.e. 23 consumed vegetables servings 2 times per day and majority of the NAFLD patients having very high waist circumference i.e. 15 also consumed vegetables servings 2 times per day but consumption of vegetables servings has not been found to be associated with waist circumference at  $p < 0.05$  level of significance.

According to this table all variables in the socio demographic profile had no association with waist circumference at  $p < 0.05$  level of significance.

**Table -6**

**Association of waist to hip ratio among individuals with NAFLD and socio demographic variables**

**N=60**

Demographic variables	n	%	Waist to hip ratio			df	$\chi^2$	P
			low risk (0)	Moderate risk (19)	High risk (41)			
<b>1. Age in years</b>								
a) <30	2	3.3	0	0	2			
b) 30-40	5	8.3	0	3	2			
b) 40-50	15	25	0	5	10	6	1.535 <sup>NS</sup>	0.195
c) 50-60	25	41.7	0	8	17			
d) >60	13	21.7	0	3	10			
<b>2. Gender</b>								
a) Male	26	43.3	0	11	15	6	1.978 <sup>NS</sup>	0.526
b) female	34	56.7	0	8	26			
<b>3. Residence</b>								
a) Rural	30	50	0	10	20	2	1.27 <sup>NS</sup>	0.428
b) Urban	30	50	0	9	21			
<b>4. Educational</b>								

**qualification**

a) No formal education	15	25	0	1	14			
b) Under graduation	25	41.7	0	8	17	6	9.55 <sup>NS</sup>	0.145
c) Post graduation	18	30	0	9	9			
d) Above post graduation	2	3.3	0	1	1			

**5. Religion**

a) Hindu	25	41.7	0	10	15			
b)Sikh	34	56.7	0	9	25	4	2.5 <sup>NS</sup>	0.64
c) Christian	1	1.7	0	0	1			

**6. Occupation**

a)Unemployed	20	33.3	0	4	16			
b) Private job	19	31.7	0	6	13			
c) Government job	7	11.7	0	4	3	8	6.87 <sup>NS</sup>	0.45
d) Retired	9	15.0	0	4	5			
e)Businessman	5	8.3	0	1	4			

**7.Monthly income**

**(In rupees)**

a) <10,000	17	28.3	0	5	12			
b) 10,001-20,000	14	23.3	0	4	10	6	8.57 <sup>NS</sup>	0.29
c) 20,001-30,000	14	23.3	0	6	8			
d) >30,000	15	25	0	3	12			

**8.Consumption of fruits**

**servings per day**

servings per day

a) Nil	18	30	0	10	8			
b)1	33	55	0	5	28	6	9.77 <sup>NS</sup>	0.19
c) 2	8	13.3	0	4	4			
d)>2	1	1.7	0	0	1			

### 9. Consumption of vegetables servings per day

a) Nil	0	0	0	0	0			
b) 1	4	6.7	0	2	2	4	3.67 <sup>NS</sup>	0.15
c) 2	38	63.3	0	12	26			
d) >2	18	30	0	5	13			

NS = non significant at  $p < 0.05$  level of significance

Table No. 6 shows According to age majority i.e. 17 of subjects having high waist to hip ratio belong to age group of 50- 60 and majority of the NAFLD patients having moderate waist to hip ratio i.e. 8 were in the age group 50-60 but age has not been found to be associated with waist to hip ratio at  $p < 0.05$  level of significance.

According to gender majority i.e. 26 of subjects having high waist to hip ratio were males and majority of the NAFLD patients having moderate waist to hip ratio i.e. 11 were females but gender has not been found to be associated with waist to hip ratio at  $p < 0.05$  level of significance.

According to residence majority i.e. 21 of subjects having high risk according to waist to hip ratio were belong to urban area and majority of the NAFLD patients having moderate waist to hip ratio i.e. 10 were belong to rural area but residence has not been found to be associated with waist to hip ratio at  $p < 0.05$  level of significance.

According to educational qualification majority i.e. 17 of subjects having high risk according waist to hip ratio were undergraduate and majority of the NAFLD patients having moderate waist to hip ratio i.e. 9 were postgraduate but educational qualification has not been found to be associated with waist to hip ratio at  $p < 0.05$  level of significance.

According to religion majority i.e. 25 of subjects having high risk according waist to hip ratio were Sikh and majority of the NAFLD patients having moderate waist to hip ratio i.e. 10 were Hindu but religion has not been found to be associated with waist to hip ratio at  $p < 0.05$  level of significance.

According to occupation majority i.e. 16 of subjects having high waist to hip ratio were unemployed and majority of the NAFLD patients having moderate waist to hip ratio i.e. 6 were in private job but occupation has not been found to be associated with waist to hip ratio at  $p < 0.05$  level of significance.

According to monthly income majority i.e. 12 of subjects having high risk according waist to hip ratio having monthly income  $\leq 10,000$  and majority of the NAFLD patients having moderate waist to hip ratio i.e. 6 having monthly income 20,001-30,000 but monthly income has not been found to be associated with waist to hip ratio at  $p < 0.05$  level of significance.

According to consumption of fruits servings per day majority i.e. 28 of subjects consumed fruits servings 1 time per day having high risk according to waist to hip ratio and majority of the NAFLD patients having moderate waist to hip ratio i.e. 10 nor consumed fruits servings per day but consumption of fruits has not been found to be associated with waist to hip ratio at  $p < 0.05$  level of significance.

According to consumption of vegetables servings per day majority i.e. 26 of subjects who consumed vegetables servings 2 times per day having high waist to hip ratio and majority of the NAFLD patients having moderate risk according to waist to hip ratio i.e. 12 consumed vegetables 2times per day but consumption of vegetables has not been found to be associated with waist to hip ratio at  $p < 0.05$  level of significance.

According to this table all variables in the socio demographic profile had no association with waist to hip ratio at  $p > 0.05$  level of significance.

**Table -7**

**Association of waist-to-height ratio among individuals with NAFLD and socio demographic variables.**

**N=60**

Demographic variables	n	%	Waist-to height-ratio			df	$\chi^2$	P
			No risk (0)	Increased risk (13)	High risk (47)			
<b>1. Age in years</b>								
a) <30	2	3.3	0	0	2			
b) 30-40	5	8.3	0	2	3			
b) 40-50	15	25	0	3	12	8	1.635 <sup>NS</sup>	0.265

c) 50-60	25	41.7	0	5	20
d) >60	13	21.7	0	3	10

## 2. Gender

a) Male	26	43.3	0	3	23	4	1.674 <sup>NS</sup>	0.546
b) female	34	56.7	0	10	24			

## 3. Residence

a) Rural	30	50	0	2	28	2	1.27 <sup>NS</sup>	0.428
b) Urban	30	50	0	11	19			

## 4. Educational qualification

a) No formal education	15	25	0	5	10			
b) Under graduation	25	41.7	0	5	20	4	9.55 <sup>NS</sup>	0.145
c) Post graduation	18	30	0	2	16			
d) Above post graduation	2	3.3	0	1	1			

## 5. Religion

a) Hindu	25	41.7	0	4	21			
b) Sikh	34	56.7	0	9	25	4	2.4 <sup>NS</sup>	0.84
c) Christian	1	1.7	0	0	1			

## 6. Occupation

a) Unemployed	20	33.3	0	5	15			
b) Private job	19	31.7	0	3	16			
c) Government job	7	11.7	0	2	5	8	6.87 <sup>NS</sup>	0.45
d) Retired	9	15	0	2	7			
e) Businessman	5	8.3	0	1	4			

## 7. Monthly income

(In rupees)

a) <10,000	17	28.3	0	5	12			
b) 10,001-20,000	14	23.3	0	4	10	6	8.57 <sup>NS</sup>	0.29
c) 20,001-30,000	14	23.3	0	2	12			
d) >30,000	15	25	0	2	13			

### 8. Consumption of fruits servings per day

a) Nil	18	30	0	5	13			
b) 1	33	55	0	6	27	6	9.77 <sup>NS</sup>	0.18
c) 2	8	13.3	0	2	6			
d) >2	1	1.7	0	0	1			

### 9. Consumption of vegetables servings per day

a) Nil	0	0	0	0	0	1		
b) 1	38	6.7	0	8	30	4	3.68 <sup>NS</sup>	0.14
c) 2	18	63.3	0	4	14			
d) >2	4	30	0	1	3			

NS = non significant at  $p < 0.05$  level of significance

Table No. 7 shows According to age majority i.e. 20 of subjects were at high risk of central obesity belong to age group of 50- 60 and majority of the NAFLD patients at increased health risk i.e. 5 were in the age group 50-60 but age has not been found to be associated with waist to height ratio at  $p < 0.05$  level of significance.

According to gender majority i.e. 24 of subjects were at high risk of central obesity were females and majority of the NAFLD patients at increased risk i.e. 10 were females but gender has not been found to be associated with waist to height ratio at  $p < 0.05$  level of significance.

According to residence majority i.e. 28 of subjects were resides rural area at high risk of central obesity and majority of the NAFLD patients at increased risk i.e. 11 were resides urban area but residence has not been found to be associated with waist to height ratio at  $p < 0.05$  level of significance.

According to educational qualification majority i.e. 20 of subjects were undergraduate at high risk of central obesity were and majority of the NAFLD patients at increased risk i.e. 5 were having no formal education but educational qualification has not been found to be associated with waist to height ratio at  $p < 0.05$  level of significance.

According to religion majority i.e. 25 of subjects were Sikh at high risk of central obesity and majority of the NAFLD patients at increased risk i.e. 9 were also Sikh but religion has not been found to be associated with waist to height ratio at  $p < 0.05$  level of significance.

According to occupation majority i.e. 16 of subjects were in private job at high risk of central obesity and majority of the NAFLD patients at increased risk i.e. 5 were unemployed but occupation has not been found to be associated with waist to height ratio at  $p < 0.05$  level of significance.

According to monthly income majority i.e. 13 of subjects having monthly income  $\geq 30,000$  at high risk of central obesity and majority of the NAFLD patients at increased risk i.e. 5 having monthly income  $\geq 10,000$  but monthly income has not been found to be associated with waist to height ratio at  $p < 0.05$  level of significance.

According to consumption of fruits servings per day majority i.e. 27 of subjects who consumed fruits 1 time per day at high risk of central obesity and majority of the NAFLD patients at increased risk i.e. 6 consumed fruits also 1 time but consumption of fruits has not been found to be associated with waist to height ratio at  $p < 0.05$  level of significance.

According to consumption of vegetables servings per day majority i.e. 30 of subjects who consumed vegetables 1 time per day at high risk of central obesity and majority of the NAFLD patients at increased risk i.e. 8 consumed vegetables also 1 time but consumption of vegetables has not been found to be associated with waist to height ratio at  $p < 0.05$  level of significance.

According to this table all variables in the socio demographic profile had no association with waist-to-height- ratio at  $p > 0.05$  level of significance.

**TABLE-8**

**Association of physical activity among individuals with NAFLD and socio demographic variables.**

**N=60**

Demographic	n	%	Physical activity	df	$\chi^2$	P
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variables			High (13)	Moderate (39)	Low (8)			
<b>1. Age in years</b>								
a) <30	2	3.3	0	2	0			
b) 30-40	5	8.3	1	3	1			
b) 40-50	15	25	9	3	3	8	4.17 <sup>NS</sup>	0.76
c) 50-60	25	41.7	3	21	1			
d) >60	13	21.7	0	10	3			
<b>2. Gender</b>								
a) Male	26	43.3	10	16	0	2	0.15 <sup>NS</sup>	0.92
b) Female	34	56.7	9	20	5			
<b>3. Residence</b>								
a) Rural	30	50	7	19	3	4	1.11 <sup>NS</sup>	0.892
b) Urban	30	50	6	20	5			
<b>4. Educational qualification</b>								
a) No formal education	15	25	3	10	2			
b) Under graduate	25	41.7	5	16	4	6	1.69 <sup>NS</sup>	0.94
c) Post graduation	18	30	5	11	2			
d) Above post graduation	2	3.3	0	2	0			
<b>5. Religion</b>								
a) Hindu	25	41.7	8	13	4	4	0.94 <sup>NS</sup>	0.91
b) Sikh	34	56.7	5	23	6			
c) Christian	1	1.7	0	1	0			
<b>6. Occupation</b>								
a) Unemployed	20	33.3	4	14	2			
b) Private job	19	31.7	4	13	2			

c) Government job	7	11.7	0	5	2	8	6.34 <sup>NS</sup>	0.60
d) Retired	9	15	3	4	2			
e) Businessman	5	8.3	2	3	0			

## 7. Monthly income

(In rupees)

a) <10,000	17	28.3	3	12	2			
b) 10,001-20,000	14	23.3	2	10	2	6	2.48 <sup>NS</sup>	0.87
c) 20,001-30,000	14	23.3	5	7	2			
d) >30,000	15	25	3	10	2			

## 8. Consumption of fruits

servings per day

a) Nil	18	30	4	12	2			
b) 1	33	55	7	20	6	6	2.52 <sup>NS</sup>	0.86
c) 2	8	13.3	2	6	0			
d) >2	1	1.7	0	1	0			

## 9. Consumption of vegetables

servings per day

a) Nil	0	0	0	0	0			
b) 1	4	6.7	2	2	0			
c) 2	38	63.3	8	25	5	4	2.53 <sup>NS</sup>	0.639
d) >2	18	30	3	12	3			

NS = non significant at  $p < 0.05$  level of significance

Table No. 8 Shows According to age majority i.e. 21 of subjects perform moderate level of physical activity belong to age group of 50- 60 and majority of the NAFLD patients perform high level of physical activity i.e. 9 were in the age group 40-50 but age has not been found to be associated with physical activity ratio at  $p < 0.05$  level of significance.

According to gender majority i.e. 20 of subjects were female who perform moderate level of physical and majority of the NAFLD patients perform high level of physical activity i.e. 10 were male but gender has not been found to be associated with physical activity ratio at  $p < 0.05$  level of significance.

According to residence majority i.e. 20 of subjects were resides urban area who perform moderate level of physical and majority of the NAFLD patients perform high level of physical activity i.e. 7 were belong to rural area but residence has not been found to be associated with physical activity ratio at  $p < 0.05$  level of significance.

According to educational qualification majority i.e. 16 of subjects were undergraduate who perform moderate level of physical and majority of the NAFLD patients perform high level of physical activity i.e. 10 were undergraduate and post graduate but educational qualification has not been found to be associated with physical activity ratio at  $p < 0.05$  level of significance.

According to religion majority i.e. 23 of subjects were Sikh who perform moderate level of physical and majority of the NAFLD patients perform high level of physical activity i.e. 8 were Hindu but religion has not been found to be associated with physical activity ratio at  $p < 0.05$  level of significance.

According to occupation majority i.e. 14 of subjects were unemployed who perform moderate level of physical and majority of the NAFLD patients perform high level of physical activity i.e. 8 were in private job and unemployed but occupation has not been found to be associated with physical activity ratio at  $p < 0.05$  level of significance.

According to monthly income majority i.e. 12 of subjects were having monthly income  $\leq 10,000$  who perform moderate level of physical and majority of the NAFLD patients perform high level of physical activity i.e. 5 were having 20,001-30,000 but monthly income has not been found to be associated with physical activity ratio at  $p < 0.05$  level of significance .

According to consumption of fruits servings per day majority i.e. 20 of subjects consumed fruits 1 time per day and majority of the NAFLD patients perform high level of physical activity i.e. 7 also consumed 1 time per day but consumption of fruits has not been found to be associated with physical activity ratio at  $p < 0.05$  level of significance.

According to consumption of vegetables servings per day majority i.e. 25 of subjects consumed vegetables 2 times per day and majority of the NAFLD patients perform high level of physical activity i.e. 8 also consumed 2 times per day but consumption of vegetables has not been found to be associated with physical activity ratio at  $p < 0.05$  level of significance.

According to this table none of the variables in the socio demographic profile had no association with level of physical activity at  $p > 0.05$  level of significance.

## MAJOR FINDINGS

### Related to Sample characteristics:

- Majority of NAFLD individuals 41.7% were in the age group of 50-59 years of age.
- 56.7% of NAFLD patients were females and 43.3% subjects were males.
- 50% of subjects were the residents of rural areas and 50% of the subjects were the residing in the urban area.
- Majority of the subjects i.e.41.7% were undergraduate, 30% subjects were post graduate, 25% were no formal education and 3.3 % subjects had above postgraduate education.
- 56.7% subjects were Sikh 41.7% were Hindu and 1.7% were Christian.
- Majority of subjects with NAFLD i.e. 33.3% subject's were unemployed, 31.7% of subject had private job, 15% were retired, 11.7% had govt. Job and 8.3% of subjects were businessman.
- 28.3% of subjects had monthly income was below 10,000, 25% subject's income was under the category above 30,000, 23.3 % had the income up to 10,01-20,000 and 23.3% subjects had monthly income more than 20,001-30,000.
- 55% were consumed fruits 1 time per day, 30% of subjects not consume fruits per day, 13.3% of subjects consume 2 times and 1.7% of subjects consume fruits more than 2 times.
- Majority of subjects i.e. 63.3% were consumed vegetables 2 times per day, 30% of subjects consume vegetables more than 2 times, and 6.7% of subjects consume 1time per day.

### Anthropometric indices:

- 61.7% subjects were overweight, 25% were obese and 13% of subjects having normal weight.
- Majority of non alcoholic fatty liver disease individuals were overweight and obese.
- According to waist circumference majority of subjects 51.7% of subjects were having very high waist circumference and 41% having high waist circumference.
- 50% of subjects had high waist hip ratio, 41.7% of subjects had moderate waist hip ratio, 8.3% of subjects had low waist hip ratio.
- Majority of subjects with non alcoholic fatty liver disease had high waist hip ratio.
- 46.7% of subjects were in the category of increased risk, 40% were fall in very high risk category and 13.3% were in no risk category.
- Majority of subjects with non alcoholic fatty liver disease were in increased risk of central obesity.

### Level of physical activity:

65% of subjects with NAFLD perform moderate level of physical activity during work and recreational activity, 21.7 % perform high level of physical activity, and 13.3% perform low level of physical activity during work and recreational activity.

## SUMMARY

This chapter gives the brief account of the study undertaken on anthropometric measurements and physical activity of individuals with non-alcoholic fatty liver disease in selected hospitals, Hoshiarpur, Punjab. A descriptive cross-sectional research design was employed. Sample was drawn from Civil Hospital and Narad Hospital Hoshiarpur, Punjab.

To accomplish the objectives and determine methodology for study, a thorough review of literature was done. Quantitative approach was adopted for the study. Standardized tool i.e. GPAQ (Global Physical Activity Questionere) was used. The tool contains 3 sections:

**Section A:** This section consists of socio-demographic variables. It consist of 9 items for obtaining personal information including- age, gender, residence, educational qualification, religion, occupation, monthly income, consumption of fruits servings and consumption of vegetables servings per day.

**Section B:** This section consists of anthropometric indices. It consists of 4 items including BMI, waist circumference, waist to hip ratio, waist to height ratio.

**Section C:** This section consists of Global Physical Activity Questionnaire (GPAQ). It consists of 16 questions to assess physical activity of individuals with non-alcoholic fatty liver disease.

Pilot study was carried out on the sample of 6 patients and the study was found to be feasible. The study was conducted in the Civil Hospital and Narad Hospital, Hoshiarpur, Punjab. Purposive sampling technique was used to select the sample. There were 60 subjects with non-alcoholic fatty liver disease.

Before data collection, permission was taken from SMO Incharge of Civil Hospital and Narad Hospital, Hoshiarpur, Punjab. Written informed consent of the subjects was taken for their participation in the study. By observing all the ethical considerations, the data were collected in the month of February and March, 2021. The data were analyzed and interpreted in terms of objectives of the study. The descriptive and inferential statistics i.e. mean, standard deviation, chi square, were utilized for data analysis.

## CONCLUSION

Thus study concludes that majority of subjects with NAFLD were overweight. Majority of males and females had central obesity. Majority of subjects had moderate level of physical activity.

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