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Non-alcoholic Fatty Liver Risk Identification and Perceptions of Obese and Non-Obese People

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Abstract: **Background**: Non-alcoholic fatty liver disease (NAFLD) is the most common chronic liver disease. It is a major risk factor for liver related morbidity and mortality. Obesity is the main risk factors of non-alcoholic fatty liver. High level perception of non-alcoholic fatty liver risk factors is critical in developing measures to prevent progression of the disease. **Purpose**: To identify non-alcoholic fatty liver risk and perceptions of obese and on-obese people. **Design**: Descriptive comparative design. Sampling and setting: Purposive sample of 75 obese and 75 non-obese participants that were chosen from two randomly selected non-health related faculties affiliated to Menoufia University, Egypt. **Instruments**: Two instruments were used (sociodemografic characteristics and fatty liver index, Risk Perception Likert Scale of NAFL). **Results**: The mean FLI was 75.3±20.4 for obese and 25.2±21.9 for non-obese. Also, 74.7% of obese had high level risk for NAFLD, with FLI ≥ 60 while, 73.3 % of non-obese had low level of risk for NAFLD with FLI <30; with statistically significant difference between them based on F LI categories. Moreover, 89.30% of obese and 98.70% of non-obese had low level of perception about NAFLD risk factors, with statistically significant difference between them. BMI was positively correlated with Triglyceride, Gamma-glutamyl Transferase and FLI. **Conclusion**: Obese participants were at higher risk for non-alcoholic fatty liver. Both obese and non-obese people had low level of perception of non-alcoholic fatty liver disease. **Recommendations**: public perception and awareness toward NAFLD should be enhanced. Noninvasive methods are needed for early identification of people at risk for NAFLD considering anthropometric measurement as indicator of risk.

Key words: *Fatty liver index, Non-alcoholic fatty liver Risk perception.*

Introduction

Non-alcoholic fatty liver disease (NAFLD) is a global public health problem and a common cause of the chronic liver disease. Its estimated prevalence was 38% of the global adult population and Middle East has increased in NAFLD prevalence in recent years, from 36.53% in 1990 to

42.62% in 2019 (Younossi et al., 2023).

Obesity and NAFLD are common worldwide health problems with a strong relationship among them. Obesity is the main risk factor and constitutes 40% or more among patients with non-alcoholic fatty liver (Ali et al., 2022). In a meta-analysis of five studies, the NAFLD incidence in lean patients was 23.2 per 1,000 person-years and the incidence in nonobese individuals was 24·6 per 1,000 person-years; while in contrast, NAFLD incidence in the obese population was 77.5 per 1,000 person-years (Ye et al., 2020). Progression of NAFLD is higher with presence of obesity, diabetes and metabolic syndrome (Mantovani et al., 2024); it is a risk factor of hepatic complications fibrosis progression, cirrhosis, and hepatocellular carcinoma (HCC) (Xiao et al., 2023).

Risk identification is essential to determine the risks and help to handle these risks effectively before they become problems need complex management (Ameller et al., 2017). Recently, there are variety of validated non-invasive diagnostic tests using simple algorithms to assist primary care providers in identifying patients with NAFLD, at high risk individuals and patients with NAFLD who should be referred along with suggestions for care management. From these non-invasive diagnostic tests is Fatty liver index (FLI) that based on body mass index, waist circumference, levels of triglycerides and gamma-glutamyltransferase (Kaneva & Bojko., 2024).

Nurses are in a prime position to influence best practice in patient care and public health service. The American Association of study liver diseases guidelines for management of NAFLD encourages nurses to focus on identifying patients at high risk for steatohepatitis and prevention of progression of fibrosis in these patients through controlling of patient's metabolic comorbidities (Chalasani et al., 2018). Moreover, nurses have an important role in making difference in the lives of people with obesity by helping them to develop healthy dietary habits and practice regular exercises (Panuganti et al., 2021).

SIGNIFICANCE OF THE STUDY

Non-alcoholic fatty liver can lead to non-alcoholic steatohepatitis that has a potentially progressive course leading to liver fibrosis, cirrhosis, hepatocellular carcinoma. NAFLD is the third most common cause of hepatocellular carcinoma (Paulino et al., 2024).

The highest number of NAFLD cases is expected in Egypt to be 25.71 million, followed by Türkiye (23.33 million) and Iran (19.85 million). Estimated NAFLD prevalence exceeded 40% in 10 of 21 countries with the top countries being Kuwait 45.37%, Egypt 45.0%, Qatar 44.4%, and Jordan 43.3% (Younossi et al., 2024).

Since NAFLD is usually discovered during routine liver enzymes analysis or abdominal imaging (Thong & Quynh, 2021), and the misperceptions about the condition can lead to irresponsible behaviors with detrimental actions. So that early

identification of this disease is essential step to prevent its serious consequences (Alemany et al., 2020); therefore, this study was conducted to identify NAFLD risk and risk perception among obese and non-obese people.

Definition of Variables

- **Non-Alcoholic Fatty Liver:** Non-Alcoholic Fatty Liver is theoretically defined as an accumulation of lipids inside the hepatocytes, in the absence of other cause of hepatic damage (Youssef et al., 2021). While in this study, it is operationally defined based on the identified risk factors for NAFL.
- **Risk identification**: Risk identification is enumerating their factors that help to handle it effectively before they become problems need to manage (Ameller et al. 2017). While in this study, it is operationally defined as measure of Fatty Liver Index to identify the level of risk for NAFL.
- **Risk Perception**: Risk perception is theoretically defined as a people's subjective judgments about the likelihood of negative occurrences such as injury, illness, disease, and death (Paek & Hove, 2017). While in this study, it is operationally defined as measure of the affective and cognitive holistic perception of risk for NAFL.
- **Obesity**: Obesity is theoretically defined as an abnormal or excessive fat accumulation that may impair health (WHO, 2020). While in this study, it is operationally defined as a person's weight in kilograms divided by the square of his height in meters (kg/m2) for each subject without shoes and weight will be approximately to near 0.5Kg.

Purpose of the Study

The purpose of the study is to identify Non-alcoholic Fatty Liver risk and perception among obese and on-obese people.

Research Question

1) What is the level of risk for NAFL among obese and non-obese participants?
2) What is the level of NAFL risk perception among obese and non-obese participants?
3) Is there a relationship between the risk for Non-Alcoholic fatty liver, general obesity and abdominal obesity?

Methods

Study Design:

Descriptive comparative design was used

Research Settings:

Faculty of Law and Faculty of Commerce that were selected randomly from 12 non-health related faculties affiliated to Menoufia University Egypt.

Sampling:

A Purposive sample of 150 participants (75 obese subjects and 75 non-obese). They were selected according to the following criteria:

- **Inclusion Criteria**: Obese and non-obese males and females aged from 20 - 60 years. The participants were selected based on the BMI range

which was ≥30/ kg in obese and ≤ 25/ kg in non-obese.

- **Exclusion Criteria**: Presence of other etiology of fatty liver diseases as reported by study participants:

1) Alcohol intake.

2) Intake of Medications such as amiodarone, valproate or methotrexate because these drugs can lead to steatohepatitis (Pavlik et al., 2019).

3) Diagnosed with chronic diseases such as type 2 diabetes, hypertension, and cardiovascular disease. NAFL has close relationship with obesity, type 2diabetes and metabolic syndrome (Pais et al., 2021).

4) Diagnosed with any liver diseases to exclude another causes of NAFL.

Sample size:

Sample size was estimated based on previous literatures; the prevalence of NAFLD ranged from 57.5% to 80% in obese persons (Nomura et al., 1988 & Patell et al., 2014), while the percentage of NAFLD in the non-obese population was 24.6% (95% CI 13.4–39.2) per 1000 person-years (Ye et al., 2020). Minimum calculated sample is 68 persons; according to the following formula:

$$p = \frac{p_1 + r p_2}{1 + r}$$

$$n \geq \frac{\left[Z_{1-\alpha/2} \sqrt{(r+1)p(1-p)} + Z_{1-\beta} \sqrt{r p_1 (1-p_1) + p_2 (1-p_2)} \right]^2}{r (p_2 - p_1)^2}$$

Where: n: sample size, z1-α: z score for CI 95% and equals 1.96 z1-β: z score for power of the study 80% and equals 0.84 Proportion of NAFLD in group 1 (P1): 0.575

Instruments

The data collection instruments that were used to collect data for this study were 2 instruments.

Instrument one: This instrument was composed of two main parts.

- **Part 1** was concerned with participantsts' socio-demographic characteristics as age, gender, marital status, education level, income, and place of residence and the source of information about fatty liver disease.
- **Part 2** was Fatty Liver Index (FLI) Fatty Liver Index concerned with estimation of fatty liver risk It was developed by Bedogni et al., (2006) and modified by Ze et al., (2018). The formula used to measure the level of risk for NAFL was as following:

$$\mathbf{FLI = [e^{0.953\times\log e\,(TG)+0.139\times BMI+0.718\times\log e\,(GGT)+0.053\times WC-15.745}]/[1+e^{0.953\times\log e\,(TG)+0.139\times BMI+0.718\times\log e\,(GGT)+0.053\times WC-15.745}]\times 100.}$$

- **Triglycerides (TG),** Body mass index (BMI), Gamma-glutamyl Transferees (GGT) and Waist circumference (WC).
- **Categories of BMI** according to (WHO, 2020) are: The normal BMI is ≤ 25/kgm2, overweight 25/kgm2 < BMI < 30/kgm2 and obese BMI ≥ 30kg/m2.
- **Waist circumference (WC):** according scoring system was

classified as follows: normal WC is <94 cm in men and <80 cm in women, increased risk is 94–101 cm in men and 80–87 cm in women and high risk is ≥102 cm in men and ≥88 cm in women.

- **Fatty Liver Index (FLI):** according to Bedobni et al., (2006), scoring system for fatty liver index was as follows: low risk is < 30, indeterminate risk is from 30 to< 60 and high risk is ≥ 60.

Instrument two: Risk Perception Likert Scale of NAFL

This instrument was developed by the researchers after reviewing the related national and international literature (Butt et al., (2021); Alamri et al., (2021); Aljahdli et al., (2021) and Goh et al., (2016). It was developed to determine the perception about risk factors of NAFL. The participants were asked to indicate their perception of each question in 3-point Likert Scale that indicated with disagree, agree and strongly agree It was consisted of 22 statements that divided into 3 parts as following:

- **Part 1** included 10 statements concerned with perception about physical exercise.
- **Part 2** included 9 statements concerned with perception about nutritional habits.
- **Part 3** included 3 statements about the indicators of risk for fatty liver.

Scoring System:

The responses for each statement were 3 responses disagree = 1, agree = 2, strongly agree=3. The total scores of their report perception about physical exercise ranged from 10- 30 and the total score of their report perception about nutritional habits ranged from 9-27. The total score of their report perception about the indicator of risk for fatty liver ranged from 3-9. The grand total scores for the scale ranged from 22 to 66 and categorized to: high risk perception for 70% or more of the grand total score and low risk perception for less than 70% of the grand total score (The HLS-EU Consortium, 2012). The percentage of subjects with agree and strongly agree were grouped together in the results for easiest presentation.

Validity

After revision for translation by English-Arabic specialist, the data collection instruments were revised for face validity, completeness and clarity by a jury of five experts. Four from the community health nursing and one expert from medical-surgical nursing. Their recommended modifications were considered and carried out.

Reliability of study instruments

- Instrument one part: The reliability of this part was tested for its reliability by Bedogni et al., (2006) using the Hosmer-Lemeshow statistic and Hosmer-Lemeshow = 0.84 (95%CI 0.81–0.87).
- Instrument two: test-retest to test the reliability of the instruments by Cronbach' alpha test that was 0.810. So that instrument was reliable.

Pilot study

A pilot study was carried out on 10% of the total sample (15 subjects), that meet

the same criteria of the study sample to assess the feasibility, clarity and applicability of the instruments as well as the time need to fill the instruments. The needed modifications were done as revealed from the pilot study. The participants of the pilot study were not included in the actual study sample.

Ethical Considerations

The approval of the study was obtained from the Ethics Committee of Scientific Research in the Faculty of Nursing, Menoufia University before starting of the study and its number with 915. An official letter to conduct the study was obtained from the Dean of the Faculty of Nursing, Menoufia University to the authorized persons of selected faculties (setting for data collection). The letters included the purpose of the study, methods and the duration of data collection.

For apply the rights of privacy and safety of subjects, the data collection instruments were coded without names and kept secured in closed cupboard and seen by the researchers only. They assured that their data will used for research purpose only without any indication for their personality. The subjects were informed that their participation is volunteer, and they can withdraw from the study at any time during data collection.

Procedure:

- An official letter including the purpose of the study and methods of data collection was sent from the dean of the Faculty of Nursing to the dean of faculty of Low and faculty of Commerce of Menoufia University, Egypt.
- An interview was conducted by the researchers after introducing themself to the study participants. Explanation the purpose of the study was done to gain their cooperation and assurance.
- Each participant participant was interviewed to collect data using instruments one and two. The interview lasted for 30 to 40 minutes. It was carried out in private room to confirm privacy, comfort participants
- Measurements of weight, height, and waist circumference were obtained. A 5 ml of venous blood sample was obtained to measure GGT, TG. The subjects were asked to fast for 10-12 hours and wear light clothes.
- The weight was measured with a digital personal scale Sinbo (model No; SBS4427) without shoes. Height was measured by using non stretching tape for each barefoot participant. The height was measured in centimeters and rounded to 0.1. To measure body mass index the participant's weight was recorded in meters (kg/m2). Weight and height were used to calculate BMI to determine obese and non-obese according to WHO classification (2020).
- Waist circumference was measured at the approximate midpoint between the lower margin of the last palpable rib and top of the iliac crest running by the umbilicus with non-stretched tap It was recorded in centimeters.
- A venous blood sample of 5 ml was obtained from each participant by the researchers and saved in an ice

box. Then, it was sent to a lab in the liver institute within two hours to measure TG and GGT.

- The researcher used BMI, WC, TG and GGT to calculate FLI by FLI calculator in a website (http//www.mdapp.co/fatty-liver-index-fli-calculator-356/). Based on this calculation; the researchers identified the level of risk for NAFL of each.
- The participants who were at risk to NAFL were referred to gastrointestinal tract (GIT) clinic in the Liver Institute Hospital, Menoufia University hospital for diagnosis and treatment.
- Data was collected throughout a six months period starting in June 2023 until December 2023.

Statistical Analysis

Data were collected, coded, tabulated and statistically analyzed using an IBM personal computer with Statistical Package of Social Science (SPSS) version 22 (SPSS, Inc, Chicago, Illinois, USA) and the following statistics were applied:

- **Descriptive statistics** were used for quantitative data such as mean ($\bar{x}$) and standard deviation (SD), range, and qualitative data were presented in the form numbers and percentages.
- **Chi-square test ($\chi 2$)** and Mann Whitney test (nonparametric test): were also used.

Results:

Table 1 shows that the mean age was 44.4±9.74 and 37.0±10.4 in obese and non-obese respectively. Obese females represented 70.7% while non-obese were 44.0%. Also, 37.3% and 62.7% of obese and non-obese had basic education.

Table 2 demonstrates that, the mean height and weight of obese and non-obese were 164.6±8.51, 168.7±8.95, 97.1±12.4 and 70.0±12.3 with statistically significant difference between them, p= 0003 and p= 0.001 respectively. Also, there were statistically significant differences between mean BMI, WC, TG and GGT among obese and non-obese groups respectively. The obese subjects had higher mean in BMI, WC, TG and GGT.

Table 3 reveals that mean of Fatty Liver Index was 75.3±20.4 for obese and 25.2±21.9 for non-obese with statistically significant difference between them, P = 0.001. Also, 74.7% of obese had high risk for NAFL with FLI≥60 while, only 13.3% of non-obese had high risk for NAFL A very highly statistically significant difference was found between them P = 0.001 based on Fatty Liver Index categories.

Table 4 clarifies comparison between the studied obese and non-obese groups regarding their reported perception about physical exercises as a risk factor of Percentage of subjects who either agreed and strongly agree was higher among obese than non-obese. On the other hand, the percentage of participants who agreed and strongly agreed was higher among obese than nnon-obese. Also, a very highly statistically significant difference was found between participants' reported perceptions about physical exercise

among obese and non-obese was exist, p= 0.001.

Table 5 displays comparison between studied obese and non-obese groups regarding their reported perception about dietary habits as risk factor of NAFL It clarifies that 58.7% of obese and 42.7% of non-obese disagree that they are eating healthy food with very highly statistically significant difference between them, P = 0.049. In addition, 56% and 53.3% of obese and 68% and 69.3% of non-obese disagree that they need to reduce intake of carbohydrates and sugary foods respectively with very highly statistical significant differences between them, P= 0.001. Finally, 74.7 % of obese group and 70.7% of non-obese perceived that eating a lot of fast food can cause NAFL with a statistically significant difference between them, P= 0.028

Table 6 shows comparison between studied obese and non-obese groups regarding their reported perception about indicators of risk for NAFL. It shows that the majority of obese and of non-obese perceived abdominal obesity, increased blood triglycerides are risk factor of NAFL without statistically significant differences between them, p> 0.05. In addition, 82.70% of obese and 66.70% of non-obese agree or strongly agree that they are at risk factor of NAFL, with statistically significant difference between them, p= 0.023. Regarding the mean score of indicators of risk for NAFL, it was 5.74±0.95 among obese and 5.37±1.20 among non-obese with no statistically significant difference between them, p = 0.195

Figure 1 shows comparison between studied obese and non-obese groups regarding their level of perception about risk factors NAFL. It indicates that, 89.3% of obese and 98.70% of non-obese have low perception regarding risk factors of NAFL. Only, 10.7% of obese compared to 1.3% of non-obese have high perception about risk factors of NAFL with a statistically significant difference between them, P=0.034.

Table 7 clarifies correlation between body mass index and triglyceride, gamma-glutamyl transferase, fatty liver index, level of risk for NAFL It indicates that there is a positive correlation between BMI and both of triglyceride, gamma-glutamyl transferase, fatty liver index and level of risk for NAFL (P=0.002, 0.007 and < 0.001) respectively. While, there is no correlation between BMI and grand total score of reported perception about of risk factors of NAFL (P= 0.265). The findings of table 7 provide answer to third research question

Table (1) Distribution of socio-demographic characteristics of studied obese and non-obese groups (n=150).

Socio-demographic characteristics	Obese group (No=75)		Non obese group (No=75)	
	No	%	No	%
Age / years				
< 40	27	36.00	46	61.30
>40	48	64.00	29	38.70
Mean ±SD	44.40±9.74		37.00±10.40	
Sex				
Male	22	29.30	42	56.00
Female	53	70.70	33	44.00
level of educational				
Illiterate	3	4.00	6	8.00
Basic education	28	37.30	47	62.70
Secondary	7	9.30	0	0.00
University	23	30.70	21	28.00
Postgraduate	14	18.70	1	1.30
Marital state				
Single	8	11.10	17	22.70
Married	55	73.30	54	72.00
Widow	6	8.30	4	5.30
Divorced	6	8.30	0	0.00
Residence				
Rural	21	28.00	34	45.30
Urban	54	72.00	41	54.70
Income				
Not enough	23	30.70	22	29.30
Enough	48	64.00	53	70.70
Enough and saved	4	5.30	0	0.00
Heard about fatty liver				
Yes	53	70.70	40	53.30
No	22	29.30	35	46.70
Source of information about fatty liver				
Health team	48	90.60	38	95.00
Books	4	7.50	0	0.00
Social media	1	1.90	2	5.00

Table 2: Mean score of NAFL Indicators among the studied obese and non-obese groups (n=150).

Studied Indicators	Obese group (No=75)	Non obese group (No=75)	U	P value
Height / cm				
Mean ±SD	164.60±8.51	168.7±8.95		
Median	164	170	2.93	0.003*
Range	152.00 – 184.00	152.0 – 186.0		
Weight /kg				
Mean ±SD	97.10±12.40	70.0±12.30	9.26	0.001*
Median	95	68		
Range	70.00 – 126.00	47.00 – 95.00		
Waist circumference				
Mean ±SD	107.40±10.00	87.40±9.77	8.91	0.001*
Median	106	85		
Range	85.00 – 131.00	69.00 - 106.00		
Body mass index				
Mean ±SD	36.10±5.06	24.3±3.71	10.50	0.001*
Median	34	25		
Range	30.10 – 40.20	16.30 – 29.40		
Triglyceride				
Mean ±SD	112.90±44.00	110.60±96.90	2.52	0.012*
Median	100	84		
Range	43.00 – 243.00	46.00 – 541.00		
Gamma-glutamyl Transferase				
Mean ±SD	37.10±51.60	18.80±10.10	3.77	0.001*
Median	19	14		
Range	11.00 – 246.00	11.00 – 50.00		

U: Mann Whitney test p: value

Table 3: Fatty Liver Index (FLI) among the studied obese and non-obese groups (n=150)

Fatty Liver Index	Obese group (No=75)		Non-obese group (No=75)		Test of sig.	P value
Fatty liver index					U	
Mean ±SD	75.30±20.40		25.20±21.90		9.21	0.001*
Median	80.50		19.20			
Range	24.00 – 99.50		1.86 – 77.40			
Level of risk for NAFL	No	%	No	%	Test of sig.	P value
Low risk<30	3	4.00	55	73.30	X2	0.001*
Intermediate (30.0 – 60.0)	16	21.30	10	13.30	80.10	
High ≥60	56	74.70	10	13.30		

U: Mann Whitney test χ^2: Chi square test

Table 4: Comparison between the studied obese and non-obese groups regarding their reported perception about physical exercises as a risk factor of NAFL (n=150).

Perception regarding physical exercises		Obese group (No=75)		Non obese group (No=75)		χ^2	P value
		No	%	No	%		
Exercise is good for health	Disagree Agree/Strongly agree	3 72	4.00 96.00	0 75	0.00 100.00	10.70	0.005*
Practices of physical exercise prevents NAFLD	Disagree Agree/Strongly agree	11 64	14.70 85.30	26 49	34.70 65.30	8.09	0.017*
Practices of physical exercise improves NAFL	Disagree Agree/Strongly agree	15 60	20.00 80.00	18 57	24.00 76.00	0.421	0.810
In need for practicing physical exercise	Disagree Agree/Strongly agree	12 63	16.00 84.00	33 42	44.00 56.00	14.10	0.001*
Sedentary lifestyle can cause NAFL	Disagree Agree/Strongly agree	13 62	17.30 82.70	18 57	24.00 76.00	2.38	0.303
Being an overweight	Disagree Agree/Strongly agree	13 72	17.30 82.70	49 26	65.30 34.60	39.80	0.001*
Being an obese	Disagree Agree/Strongly agree	25 40	33.30 66.30	58 17	77.30 22.70	32.40	0.001*
In need for weight lose	Disagree Agree/Strongly agree	17 58	22.70 77.30	49 26	65.70 34.70	29.90	0.001*
Overweight/obesity lead to NAFL	Disagree Agree/Strongly agree	10 65	13.30 86.60	17 58	22.70 77.30	8.14	0.017*
Weight loss can improve NAFL	Disagree Agree/Strongly agree	8 67	10.70 89.40	20 55	26.70 73.30	7.08	0.029*
Physical activity total score = (30) Mean ± SD Range		19.70±2.97 14.00-28.00		17.10±2.95 12.00–26.00		**U** 4.99	0.001*

Test: Chi square test ($\chi 2$), U: Mann Whitney test

Table 5: Comparison between studied obese and non-obese groups regarding their reported perception about dietary habits as risk factor of NAFL (n=150)

Perception regarding Dietary Habits		Obese group (No=75)		Non obese group (No=75)		$\chi 2$	P value
		No	%	No	%		
Eating healthy food	Disagree Agree/Strongly agree	44 31	58.70 41.30	32 43	42.70 57.30	6.03	0.049*
Meals contain vegetables and fruits are useful to health	Disagree Agree/Strongly agree	6 69	8.00 92.00	8 67	10.70 89.3	1.36	0.505
Eating the right amount of fat in the meal	Disagree Agree/Strongly agree	21 54	28.00 72.00	28 47	37.30 62.60	1.70	0.427
Eating the right amounts of sugars in the meal	Disagree Agree/Strongly agree	13 62	17.30 82.70	27 48	36.00 64.00	10.80	0.004*
Eating the right amounts of carbohydrates in the meal	Disagree Agree/Strongly agree	30 45	40.00 60.00	28 47	37.30 62.70	2.11	0.347
Need to reduce intake carbohydrates	Disagree Agree/Strongly agree	42 33	56.00 44.00	51 24	68.00 32.00	15.40	0.001*
Need to reduce intake of sugary foods	Disagree Agree/Strongly agree	40 35	53.30 46.70	52 23	69.30 30.70	9.88	0.001*
Need to reduce sugary drinks	Disagree Agree/Strongly agree	53 22	70.70 29.30	52 23	69.30 30.70	3.39	0.184
Eating a lot fast food can cause fatty liver	Disagree Agree/Strongly agree	19 56	25.30 74.70	22 53	29.30 70.70	7.17	0.028*
Dietary habits (total score= (27) Mean ± SD Range		15.30±2.07 11.00- 20.00		14.30±1.66 11.00-20.00		U 3.17	0.002*

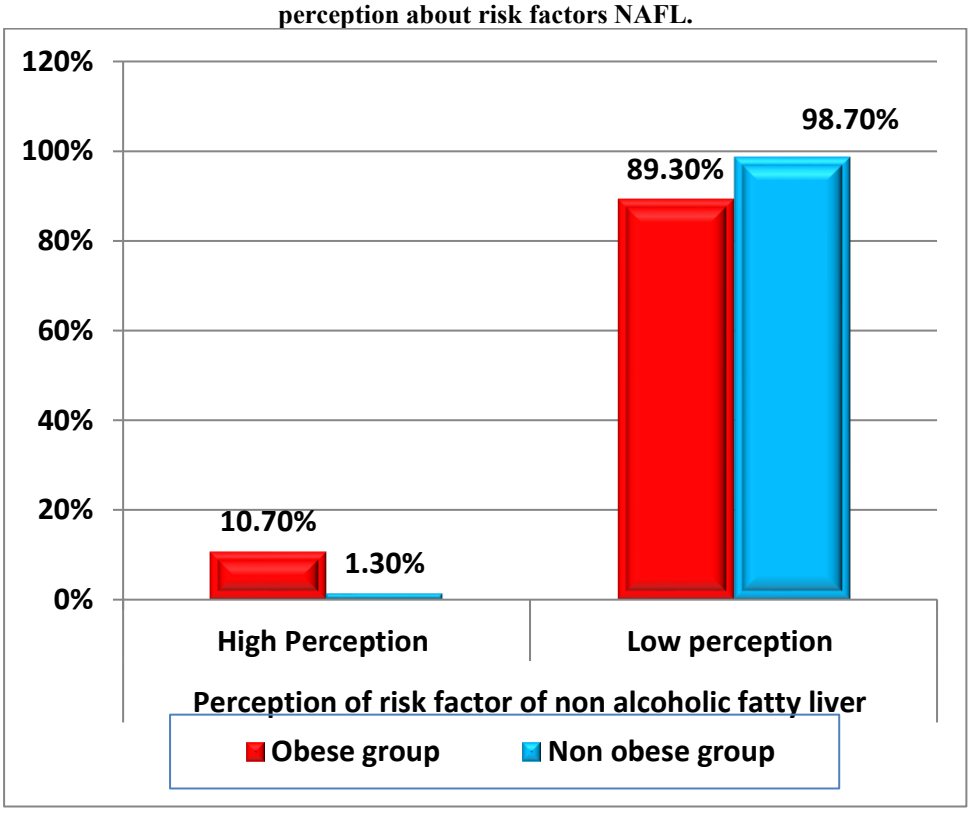
χ^2: Chi square test, U: Mann Whitney test

Table 6: Comparison between studied obese and non-obese groups regarding their reported perception about indicators of risk for NAFL (n=150)

Perception about indicators of FLI as a risk factor		Obese group (No=75)		Non obese group (No=75)		χ^2	P value
		No	%	No	%		
Abdominal obesity is a risk factor of AFL	Disagree Agree/Strongly agree	9 66	12.00 88.00	15 60	20.00 80.00	1.79	0.408
Increasing blood triglycerides is a risk factor of NAFL	Disagree Agree/Strongly agree	13 62	17.30 82.70	15 60	20.00 80.00	2.84	0.241
Being at risk for NAFL	Disagree Agree/Strongly agree	13 62	17.30 82.70	25 50	33.30 66.70	7.53	0.023*
Indicators of risk of NAFL (total score =9(Mean±SD Range		5.74±0.95 3.00 – 8.00		5.37±1.20 3.00– 8.00		U 1.29	0.195

χ^2: Chi square test. U: Mann Whitney test

Figure 1: Comparison between studied obese and non-obese groups regarding their level of perception about risk factors NAFL.



(FE 5.79, P = **0.034***) FE = Fisher Exact Test

Table 7: Correlation between body mass index and triglyceride, gamma-glutamyl transferase, fatty liver index, level of risk for NAFL.

Variables	Body Mass Index	
	r	P value
Triglyceride	**0.353**	**0.002***
Gamma-glutamyl Transferase	**0.312**	**0.007***
Fatty liver index	**0.615**	**<0.001***
Total score perception risk	**-0.130**	**0.265**

Discussion

Non-alcoholic Fatty Liver disease is the major cause of end-stage liver disease, primary liver carcinoma, liver transplantation and it is a significant global burden (Powell et al., 2021). It is easily neglected especially in the non-obese people (Li et al., 2023).

Regarding NAFL risk indicators among the studied obese and non-obese groups that included body mass index, waist circumference, triglyceride and gamma-glutamyl transferase; the current study findings revealed a statistically significant between studied groups with increased mean in BMI and WC, triglyceride and gamma-glutamyl transferase in obese group. These findings were supported by Rahman et al. (2020), they conduct a study, in Bangladesh to determine the prevalence of non-obese and obese NAFLD, they found that abdominal obesity, dyslipidemia and obesity were the risk factors for NAFLD. Also, the current study findings were in the same line with those of Mostafa et al., (2019) who studied the epidemiologic profile and predictors of fatty liver in Egypt; they reported that cases with fatty liver had a significantly higher body mass index, waist circumference, triglyceride, than controls. This mean that subjects with higher body mass index, waist circumference, triglyceride were at increased risk to had fatty liver. In addition, the present study's findings were in agreement with the result of the study was conducted by Galal et al., (2022); who studied anthropometric measures as predictors of NAFLD in adult asymptomatic Egyptians. They found that the patients with NAFL had statistically significant higher BMI and WC compared to those without NAFLD. Moreover, AL-Khakani et al., (2023); who studied the role of type II diabetes mellitus and obesity as risk factors in patients with fatty liver disease in Iraq; they revealed that central obesity and higher BMI are associated with the presence of FLD. Furthermore Najafi et al., (2024). The researchers concluded that the obesity independently contribute to an increased risk of NAFL.

Mean gamma-glutamyl transferase (GGT) in the current study was significantly elevated in obese than non-obese and positive correlation between BMI and GGT was found. This result was in the line with Ali et al., (2021); who studied the relationship

of serum liver enzymes activity with general and abdominal obesity in an urban Bangladeshi population; they reported was significantly higher GGT in the obesity group compared to the normal BMI group and serum GGT showed a significant association with both general and abdominal obesity. In addition, this finding agreed with the Galal et al., (2022); who found that the patients with NAFLD showed a statistically significant higher levels of GGT and triglyceride. Also, this result was in same direction with Jalili et al., (2022); who studied the association between obesity with serum levels of liver enzymes, alanine aminotransferase, aspartate aminotransferase, alkaline phosphatase and GGT in adult women in Iran. The results indicated a positive association between BMI and serum level of GGT. Moreover, Xing et al., (2021) who studied triglycerides mediate body mass index and NAFLD in China; they concluded that high TG level was a risk factor in the high-BMI group (BMI ≥24) with positive associations between BMI and TG level remained in the two groups after adjusting for confounders. TG contributes about one quarter to incident NAFLD in people with obesity.

Furthermore, the current result in the same line with Shousha et al., (2020); who studied biochemical parameters in obese Egyptian patients; they reported that level of serum TG was significantly higher in obese fatty liver group compared to normal control participants. Also, Abdelghani et al., (2020) noted significantly increased TG in obese in comparison to lean NAFLD.

Regarding fatty liver index (FLI) among obese and non-obese, the current study reported significantly higher mean of fatty liver index in obese than non-obese. Also, about three quarters of obese had high risk of NAFL with FLI ≥60, while, three quarters of non-obese had low risk of NAFL with FLI<30; based on fatty liver index categories. The current findings were in congruence with those of Chen et al., (2020); who studied a community-based study on the application of fatty liver index in screening subjects with nonalcoholic fatty liver disease in the northeastern region of Taiwan. They found that more subjects with non-alcoholic fatty liver (NAFLD) group had an FLI score of ≥60 than those in the control group. Moreover, this study′s outcome was on the same line with Castellana et al., (2021); who studied a meta-analysis to identify non-alcoholic fatty liver disease by fatty liver index. They founded that about one in six subjects classified as FLI < 30 were confirmed to be affected by NAFLD, compared to about two in three in those of those classified as FLI ≥ 60 conversely. Also, the finding of current study was supported by Najafi et al., (2024); who studied the association between different metabolic obesity phenotypes and NAFLD in Iran. They found that the prevalence of NAFLD was more than one third of subjects determined by the FLI.

Regarding the perception of obese and non-obese about physical exercise, the current study′s finding demonstrated

significantly difference regarding their reported perception about exercise is good for health, physical exercise prevents NAFL, they in need to practicing physical exercise, they are overweight, they are obese, they are in need for weight loss, being an overweight or obese lead to NAFL and weight loss improve NAFL, with higher percentage among obese; while no difference was reported regarding practicing physical exercise improve NAFL and sedentary lifestyle can cause NAFL. The current findings were in the same line with Butt et al., (2021); who studied perception of non-alcoholic fatty liver disease in Pakistan. They found that the majority of patients recognized the need for weight loss was heartening and about one third recognized the need for more physical activity/exercise in their daily lives and small proportion did not accept being overweight.

The present study findings demonstrated significantly difference between obese and non-obese regarding their perception about their dietary habits items as eating meals contain vegetables and fruits are useful to health, eating the right amount of sugar in the meal, they need to reduce intake of carbohydrates and sugary food, eating a lot of fast food can cause NAFL; with higher percentage of obese who agree and with higher the mean of reported dietary habits perception among obese. The present study findings came in agreement with many studies as Butt et al., (2021); who reported that about half of participants admitted to frequent overeating, and approximately less than half admitted to eating unhealthy foods. Also, Hegazy et al., (2024); who stated that about half of the enrolled participants agreed that increased oil, fat, and sugar consumption increased the risk of fatty liver disease. In addition, Aljahdli et al., (2021); who studied the awareness of non-alcoholic fatty liver disease population in Saudi Arabia. They found that participants thought that the risk factors for NAFL were obesity, diabetic, an unhealthy lifestyle (including an unhealthy diet with too much red meat and processed food), and physical inactivity.

The current study′s finding indicated that many of obese and non-obese agreed that abdominal obesity, increased blood triglycerides are risk factor of NAFL without statistically significant differences between them or their mean score of perception. Also, higher percent of obese agreed that they are at risk factor of NAFL than non-obese. In addition, the majority both of obese and non-obese had low level perception based on the grand total score of perception of regarding the three aspects of risk factors. The current findings were in the same direction with many studies as Someili et al., (2024); they revealed that participants had a low personal risk perception regarding recognized the potential severity of NAFLD. Also, Tincopa et al., (2021); who conducted a qualitative study to assess American' patients disease knowledge, attitude and behaviors related to NAFLD; they found that the perception of the risk for significant morbidity and mortality related to NAFLD was low. In addition, Goh et al., (2016), found the majority of

subjects did not feel that they were at risk of having NAFLD. Moreover, Hegazy et al., (2024); who studied non-alcoholic fatty liver disease related knowledge among a sample of Egyptians patients. They reported that more than half of the study participants did not think obesity was a risk factor for NAFL and more than half of participants did not believe that a lack of physical exercise was a cause of NAFL.

In contradiction to the current findings, Aljahdli et al., (2021); who studied the awareness of non-alcoholic fatty liver disease in the general population of Saudi Arabia. They found that the majority of participants and about one half of them thought that obesity and triglycerides were increased the risk of NAFLD respectively. Also, Alamri et al., (2021) who studied non-alcoholic fatty liver disease based on knowledge and attitude in Saudi Arabia; they found that more than one third of the respondents thought that they were at higher risk of developing NAFL. This contraindication might be due to differences in sociodemographic especially the educational level.

Conclusion

Obese people are at increased risk to develop Non-alcoholic Fatty Liver disease compared to non-obese based on Fatty Liver Index. The risk factors of NAFLD among obese were high BMI, WC, TG and GGT. Central obesity may be a risk factor for NAFL in obese and non-obese. Also, the level of perception of risk factor NAFL was low in obese and non-obese groups.

Recommendation

1) Public perception and awareness toward NAFLD.should be enhanced
2) The current study can be replicated on a larger sample size from different geographical areas to ensure generalization of the results.

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