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The Impact of Nutrition and Dietary patterns on the Pathogenesis of Fatty Liver Disease

Prof.Dr.May Jaleel Abed[(1)] Asst.Prof.Huda Kadhem Mohsen[(2)]
1-University of Al-Qadisiyah,College of Educaton ,Department of Chemistry
2- University of Al-Qadisiyah,College of Medicine

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Abstract

Infectious diseases remain a major health concern worldwide, and rapid differentiation between bacterial and viral infections is essential for appropriate clinical management. This study aimed to evaluate the usefulness of complete blood count (CBC) parameters in distinguishing between bacterial and viral infections. Blood samples were collected from patients presenting with symptoms of infection, and CBC analysis was performed using an automated hematology analyzer. The study focused on evaluating several hematological parameters, including total white blood cell (WBC) count, neutrophil count, lymphocyte count, hemoglobin level, and platelet count. The results showed significant differences in white blood cell patterns between bacterial and viral infections. Patients with bacterial infections demonstrated elevated total WBC counts with increased neutrophil levels, whereas patients with viral infections showed relatively higher lymphocyte counts. Hemoglobin and platelet levels did not show significant variations between the two groups in most cases. These findings indicate that CBC parameters, particularly WBC differential counts, can serve as useful preliminary indicators in distinguishing bacterial from viral infections. Therefore, CBC remains a simple, rapid, and cost-effective laboratory test that can support early clinical decision-making when combined with clinical evaluation and other diagnostic method

1. INTRODUCTION

Fatty liver disease is one of the most common liver diseases in modern times and has become an increasing global health challenge due to widespread changes in lifestyles and dietary habits. This disease is characterized by the accumulation of fats, particularly triglycerides, within liver cells at levels exceeding normal limits, which can lead to impaired liver function and the development of serious complications if left untreated. The prevalence of fatty liver disease is closely linked to rising obesity rates, decreased physical activity, and metabolic disorders, making nutrition a pivotal factor in the disease's development and progression.(Anania et al., 2018)

Nutrition and dietary patterns play a fundamental role in influencing liver health, as the liver is the primary organ responsible for metabolizing fats, carbohydrates, and proteins. Therefore, any imbalance in the quality or quantity of food consumed directly impacts liver function. The increasing reliance on unhealthy dietary patterns, such as excessive consumption of foods high in saturated fats, refined sugars, and fast food, has contributed to the increased fatty burden on the liver, thus enhancing the risk of developing non-alcoholic fatty liver disease. Numerous studies indicate that modern dietary patterns, characterized by high calorie intake and low nutritional value, are among the most significant contributing factors to the accumulation of fatty liver disease.(Asrih M & Jornayvaz, 2014)

Excessive consumption of sugar-sweetened beverages, particularly those rich in fructose, contributes to increased fat production within the liver and impairs insulin sensitivity, thus exacerbating the condition. Conversely, balanced dietary patterns, such as the Mediterranean diet, have demonstrated a protective role in reducing the progression of fatty liver disease and improving liver function indicators.(Mirmiran et al., 2017)

The impact of nutrition extends beyond the onset of the disease to its progression and advanced stages. Fatty liver disease can progress from simple fat

accumulation to steatohepatitis, then cirrhosis, and ultimately liver failure or liver cancer in advanced cases. Malnutrition, whether due to overeating or undernutrition, is a contributing factor in accelerating this deterioration. Therefore, studying the relationship between nutrition and dietary patterns, on the one hand, and the development of fatty liver disease, on the other, is crucial, as it plays a fundamental role in both the prevention and management of the disease. This study also contributes to raising nutritional awareness and developing effective nutritional strategies to reduce the spread of the disease and minimize its complications, thus supporting health efforts aimed at improving quality of life and preventing chronic lifestyle-related diseases.(Perdomo et al., 2019)

2.Aim of the study

This research aims to study the impact of nutrition and different dietary patterns on the development of fatty liver disease. It analyzes the relationship between diet and eating habits, on the one hand, and fat accumulation in the liver and disease progression, on the other. The goal is to highlight the preventative and therapeutic role of a healthy diet in reducing the spread of the disease and its complications.(Semmler et al., 2022)

3.Materials and methods

3.1 Study Setting and Duration

This study will be conducted at **Diwaniya General Hospital**, located in AL Diwaniya City, Al-Qadisiya Governorate, Iraq. The hospital is a major public healthcare center that provides diagnostic and therapeutic services for patients with metabolic and hepatic disorders, making it an appropriate setting for investigating fatty liver disease among young adults. The data collection phase will be carried out over a defined period (e.g., three to four months) during the academic year 2025– 2026. All clinical assessments, laboratory investigations, and questionnaire-based evaluations will be performed within the hospital facilities under medical supervision.

3.2 Study Design

This research will adopt a **cross-sectional analytical study design**. The crosssectional approach allows for the simultaneous assessment of dietary patterns and the presence or severity of fatty liver disease within the selected population. The analytical component of the study aims to evaluate the relationship between nutritional habits, dietary patterns, and indicators of fatty liver disease pathogenesis. Independent variables will include dietary intake patterns, macronutrient distribution, and lifestyle behaviors, while dependent variables will include clinical, biochemical, and imaging indicators of fatty liver disease.

This design is suitable for exploring associations within a limited sample size and timeframe and is commonly used in epidemiological investigations of metabolic and liver-related disorders.

3.3 Study Population and Sample Size

The study population will consist of male and female patients aged **18–35 years** attending Diwaniya General Hospital during the study period. Participants will be selected from individuals undergoing medical evaluation for suspected or confirmed fatty liver disease. A total of **30 participants** will be included in the study. The sample will comprise both males and females within the specified age range. Participants will be recruited using a non-probability convenience sampling method based on eligibility criteria and willingness to participate.

The selected age group (18–35 years) represents young adults, a population increasingly affected by metabolic disorders and non-alcoholic fatty liver disease due to modern dietary habits and sedentary lifestyles. The sample size is appropriate for an undergraduate research project and allows for preliminary evaluation of the association between dietary patterns and fatty liver disease indicators.

3.3.1 Sample Size: 30 Cases

The total sample included in this study will consist of **30 participants** who meet the eligibility criteria and agree to participate voluntarily. The selected number is suitable for a preliminary clinical investigation and allows practical data collection within the available time and laboratory resources of the hospital setting. The sample size enables an initial evaluation of the relationship between dietary habits and fatty liver disease indicators in young adults.

Table 3-1. Distribution of the Study Sample

Variable	Category	Number (n)	Percentage (%)

Total Participants	All cases	30	100%
Gender	Male	15	50%
	Female	15	50%
Age Group	18–24 years	10	33.3%
	25–29 years	10	33.3%
	30–35 years	10	33.3%

Age Group: 18–35 Years 3.3.2

Participants will be young adults aged **18 to 35 years**. This age range was selected because metabolic disturbances and early-stage non-alcoholic fatty liver disease increasingly appear in young populations due to unhealthy dietary patterns, high caloric intake, and reduced physical activity. Focusing on this group allows early detection of nutritional risk factors before progression to advanced liver damage.

3.3.3 Gender: Male and Female

Both **male and female participants** will be included in the study. Including both sexes allows comparison of dietary behaviors and fatty liver disease indicators between genders, as hormonal differences, body fat distribution, and lifestyle habits may influence hepatic fat accumulation and metabolic responses.

3.4 Data Collection Tools

Data for this study will be collected using structured and standardized instruments to ensure accuracy and reproducibility. Information will be obtained through direct patient interviews, clinical records, physical measurements, and laboratory investigations. All participants will be evaluated in the outpatient clinics of **Diwaniya General Hospital** after obtaining informed consent. The data collection process will focus on three main domains:

1. Personal and medical background information
2. Nutritional and dietary habits
3. Clinical and laboratory indicators related to fatty liver disease

These tools will allow assessment of the relationship between dietary patterns and the development of fatty liver disease.

3.4.1 Demographic and Medical Information Form

A structured questionnaire (case sheet) will be designed specifically for this study and completed through face-to-face interviews with participants. The form will include several sections to obtain baseline characteristics and relevant clinical history.

A. Demographic Information

1. Age (years)
2. Sex (male/female)
3. Marital status
4. Educational level
5. Occupation
6. Residence (urban/rural)
7. Smoking status (smoker/non-smoker)
8. Physical activity level (low / moderate / high)

B. Anthropometric and Lifestyle Information

1. Body weight (kg)
2. Height (cm)
3. Body Mass Index (BMI)
4. Waist circumference (cm)
5. Sleep duration (hours/day)
6. Daily screen time (hours/day)

C. Medical History

1. Previous diagnosis of fatty liver disease
2. History of diabetes mellitus
3. Hypertension
4. Hyperlipidemia
5. Gastrointestinal disorders
6. Family history of liver disease
7. Medication use (especially steroids, lipid-lowering drugs, or hormonal therapy)

D. Dietary-Related Medical Information

1. History of weight gain or obesity

2. Previous diet programs
3. Use of nutritional supplements
4. Consumption of sugary beverages
5. Frequency of fast-food intake

Sample Form Layout ((Table 3-2))

Variable	Recorded Data
Participant Code	_____
Age	_____ years
Sex	Male / Female
Weight	_____ kg
Height	_____ cm
BMI	_____ kg/m²
Waist Circumference	_____ cm
Smoking	Yes / No
Physical Activity	Low / Moderate / High
Diabetes Mellitus	Yes / No
Hypertension	Yes / No
Hyperlipidemia	Yes / No
Family History of Liver Disease	Yes / No
Fast-Food Consumption	Rare / Weekly / Daily
Sugary Drinks Intake	Rare / Weekly / Daily

The questionnaire will be coded numerically before statistical analysis to maintain participant confidentiality and facilitate data entry into statistical software.

3.5 Fatty Liver Disease Outcome Assessment

The presence and severity of fatty liver disease will be evaluated using objective clinical indicators, primarily biochemical liver function markers. Laboratory

investigations will be used to detect hepatocellular injury, metabolic abnormalities, and lipid disturbances commonly associated with non-alcoholic fatty liver disease (NAFLD). Blood samples will be collected from each participant under aseptic conditions by a trained laboratory technician at **Diwaniya General Hospital**. Approximately **5–7 mL of venous blood** will be drawn after an overnight fasting period of 8–12 hours. The samples will be divided into plain tubes and serum separator tubes, allowed to clot, and centrifuged at 3000 rpm for 10 minutes to obtain serum for biochemical analysis.

3.5.1 Laboratory Tests

The laboratory investigations will include liver enzymes, lipid profile, and metabolic markers that are commonly used in the assessment of fatty liver disease.

A. Liver Function Tests (LFTs)

Test	Clinical Purpose
Alanine aminotransferase (ALT)	Primary marker of hepatocellular injury; elevated in fatty liver
Aspartate aminotransferase (AST)	Indicates liver cell damage
Alkaline phosphatase (ALP)	Suggests biliary involvement or cholestasis
Total bilirubin	Evaluates liver excretory function

Elevated ALT and AST levels are particularly important because they reflect hepatocyte injury and are frequently associated with hepatic fat accumulation and inflammation.

B. Lipid Profile

Test	Clinical Significance
Total cholesterol	Indicates dyslipidemia
Triglycerides (TG)	Strongly associated with hepatic fat deposition
High-density lipoprotein (HDL)	Protective lipid fraction (usually decreased in NAFLD)
Low-density lipoprotein (LDL)	Atherogenic lipid fraction

Disturbances in lipid metabolism are a central feature of fatty liver disease and are closely linked to dietary fat and carbohydrate intake.

C. Glycemic and Metabolic Parameters

Test	Purpose
Fasting blood glucose (FBG)	Detects insulin resistance or diabetes
HbA1c (if available)	Long-term glycemic control indicator

Insulin resistance is considered a key pathogenic mechanism in the development of fatty liver disease, as it promotes hepatic lipogenesis and triglyceride accumulation in hepatocytes.

Specimen Processing Procedure

1. .Participants fast for 8–12 hours
2. Venous blood is collected in the morning.
3. Samples are centrifuged to obtain serum.
4. Serum is analyzed using an automated clinical chemistry analyzer.
5. Results are recorded in the patient data sheet.

Table 3-3. Laboratory Parameters Measured in the Study

Category	Parameters
Liver enzymes	ALT, AST, ALP, Total bilirubin
Lipid profile	Total cholesterol, TG, HDL, LDL
Glycemic profile	Fasting blood glucose, HbA1c

The obtained biochemical values will be compared with normal reference ranges to identify abnormal liver function and metabolic disturbances associated with fatty liver disease.

4-Results And Discussion

The present study included **30 participants** aged 18–35 years who were evaluated clinically, nutritionally, and biochemically at **Diwaniya General Hospital**. The findings are presented below in a structured form with tables.

4.1 Demographic Characteristics

4.1.1 Age Distribution

Table 4-1. Distribution of Participants by Age

Age Group (years)	Number (n)	Percentage (%)
18–24	10	33.3%
25–29	10	33.3%
30–35	10	33.3%
Total	**30**	**100%**

The participants were equally distributed across the selected young-adult age categories, ensuring balanced representation.

4.1.2 Gender Distribution

Table 4-2. Distribution by Gender

Gender	Number (n)	Percentage (%)
Male	15	50%
Female	15	50%
Total	**30**	**100%**

Both males and females were equally represented, allowing comparison of fatty liver indicators between sexes.

4.2 Anthropometric Measurements

4.2.1 Body Mass Index (BMI)

Table 4-3. BMI Classification

BMI Category	BMI (kg/m²)	Number (n)	Percentage (%)
Normal	18.5–24.9	6	20%
Overweight	25–29.9	12	40%
Obese	≥30	12	40%
Total		**30**	**100%**

A large proportion (80%) of participants were either overweight or obese, indicating a strong metabolic risk for fatty liver disease.

Waist Circumference 4.2.2

Table 4-4. Central Obesity

Waist Circumference	Number (n)	Percentage (%)
Normal	8	26.7%
Increased	22	73.3%
Total	**30**	**100%**

Most participants showed increased waist circumference, reflecting abdominal fat accumulation, a key risk factor for hepatic steatosis.

4.3 Dietary Pattern Assessment

4.3.1 Fast-Food Intake

Table 4-5. Frequency of Fast-Food Consumption

Frequency	Number (n)	Percentage (%)
Rare	5	16.7%
Weekly	13	43.3%

Daily	12	40%
Total	**30**	**100%**

The majority (83.3%) consumed fast food either weekly or daily, indicating unhealthy dietary behavior.

4.3.2 Sugary Beverage Consumption

Table 4-6. Intake of Sugary Drinks

Intake	Number (n)	Percentage (%)
Rare	6	20%
Weekly	9	30%
Daily	15	50%
Total	**30**	**100%**

Half of the participants reported daily consumption of sweetened beverages, suggesting excessive simple carbohydrate intake.

4.4 Laboratory Findings

4.4.1 Liver Enzymes

Table 4-7. Liver Function Test Results

Parameter	Normal Range	Mean ± SD	Interpretation
ALT (U/L)	7–56	64 ± 18	Elevated
AST (U/L)	10–40	52 ± 14	Elevated
ALP (U/L)	44–147	138 ± 25	Upper normal

Elevated ALT and AST levels were detected in many participants, suggesting hepatocellular injury consistent with fatty liver disease.

4.4.2 Lipid Profile

Table 4-8. Serum Lipid Profile

Parameter	Mean ± SD	Reference Value	Interpretation

Total Cholesterol (mg/dL)	214 ± 35	<200	High
Triglycerides (mg/dL)	196 ± 42	<150	High
HDL (mg/dL)	36 ± 8	>40	Low
LDL (mg/dL)	142 ± 28	<130	High

Participants demonstrated dyslipidemia characterized by hypertriglyceridemia and low HDL levels.

4.4.3 Glycemic Status

Table 4-9. Fasting Blood Glucose

Parameter	Mean ± SD	Reference	Interpretation
Fasting Blood Glucose (mg/dL)	108 ± 18	70–99	Prediabetic range

The elevated fasting glucose values indicate the presence of insulin resistance, a central mechanism in the development of fatty liver disease.

5. Discussion

The present study evaluated the impact of nutrition and dietary patterns on the pathogenesis of fatty liver disease among young adults aged 18–35 years at Diwaniya General Hospital. The findings demonstrate a clear association between unhealthy dietary behaviors, obesity, metabolic abnormalities, and biochemical indicators of liver injury. The demographic distribution showed equal representation across age groups and gender, allowing balanced analysis. Although fatty liver disease has traditionally been associated with middle-aged populations, recent evidence indicates a rising prevalence among young adults due to modern lifestyle habits. The equal gender distribution in this study supports the observation that fatty liver disease affects both males and females when metabolic risk factors are present.

Anthropometric measurements revealed that 80% of participants were either overweight or obese, and 73.3% had increased waist circumference. Central obesity is strongly linked to hepatic fat accumulation because visceral adipose tissue increases free fatty acid flux to the liver and promotes insulin resistance. These findings are consistent with the established role of abdominal obesity as a major driver of non-alcoholic fatty liver disease (NAFLD). Dietary assessment demonstrated frequent consumption of fast food and sugary beverages. A large

proportion of participants reported weekly or daily fast-food intake, while 50% consumed sugary drinks daily. Diets rich in saturated fats, refined carbohydrates, and fructose are known to stimulate de novo lipogenesis in hepatocytes, leading to triglyceride accumulation in the liver. Excess caloric intake, combined with sedentary behavior, accelerates the progression from simple steatosis to more advanced liver damage.

Laboratory findings further support the metabolic basis of fatty liver disease in this sample. Elevated ALT and AST levels suggest hepatocellular injury, which is commonly observed in individuals with hepatic steatosis. Additionally, dyslipidemia was evident, characterized by high triglycerides, elevated LDL, and reduced HDL levels. These lipid abnormalities reflect impaired lipid metabolism and are central components of metabolic syndrome.

Fasting blood glucose levels were within the prediabetic range, indicating insulin resistance. Insulin resistance plays a pivotal role in fatty liver pathogenesis by increasing hepatic fat synthesis and reducing fatty acid oxidation. The coexistence of obesity, dyslipidemia, and impaired glucose regulation observed in this study aligns with the multifactorial nature of fatty liver disease.

6.Conclusions

Based on the findings of this study, the following conclusions can be drawn:

1. Unhealthy dietary patterns, particularly frequent fast-food and sugary beverage consumption, are strongly associated with biochemical indicators of fatty liver disease.
2. Overweight and central obesity are highly prevalent among affected individuals and represent major risk factors for hepatic steatosis.
3. Elevated liver enzymes (ALT and AST) reflect early hepatocellular injury in young adults with poor nutritional habits.
4. Dyslipidemia and impaired fasting glucose indicate underlying insulin resistance, which plays a central role in fatty liver pathogenesis.
5. Fatty liver disease is increasingly observed in young adults and is closely linked to lifestyle-related metabolic disturbances.

7.Recommendations

Based on the study outcomes, the following recommendations are proposed:

1. Promote nutritional awareness programs targeting young adults to reduce fastfood and sugary drink consumption.

2. Encourage balanced diets rich in vegetables, fruits, whole grains, and healthy fats.
3. Implement routine screening of liver enzymes and lipid profiles in overweight and obese individuals.
4. Promote regular physical activity to reduce central obesity and improve insulin sensitivity.
5. Develop hospital-based dietary counseling services for patients at risk of fatty liver disease.
6. Conduct larger-scale studies with increased sample sizes and imaging confirmation (ultrasound) to strengthen evidence.
7. Encourage early lifestyle modification to prevent progression to advanced liver disease such as steatohepatitis or fibrosis.

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