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Research Article

**A META ANALYSIS STUDY ON NON -ALCOHOLIC FATTY
LIVER DISEASE IN CHILDRENS****Rangam Chariitha*, K. Preethi, Reddigari Kalpana, Ramsha Khanam, T.Mangilal**Department of Pharmacology, Smt. Sarojini Ramulamma College of Pharmacy,
Mahabubnagar-509001, Telangana, India.**Abstract:**

Non-Alcoholic Fatty Liver Disease (NAFLD) is an increasingly prevalent condition among children and adolescents, often associated with multiple metabolic comorbidities. This systematic review analysed data from 20 published studies, comprising a total of 9,946 patients, to evaluate age-wise distribution, gender differences, associated comorbidities, and treatment patterns in NAFLD. The age-wise distribution revealed that NAFLD was most common in the 2–5 years age group and higher prevalence among males. Among the identified causes, obesity was the most prominent factor. Other comorbidities observed were obesity, dyslipidaemia and insulin resistance, followed by elevated alanine aminotransferase (ALT) levels, type 2 diabetes mellitus, hypertension, metabolic syndrome, and hyperuricemia. In conclusion, NAFLD in children is strongly associated with early age onset, male predominance, and multiple metabolic comorbidities, particularly obesity and insulin resistance. Early diagnosis and comprehensive management strategies are essential to prevent disease progression and associated complications.

Keywords: *Non-Alcoholic Fatty Liver Disease, Paediatric NAFLD, Children and adolescents, Obesity, Dyslipidaemia, Type 2 Diabetes Mellitus, Hypertension, Alanine aminotransferase (ALT), Fat accumulation in liver, Lifestyle modification, Pioglitazone, Vitamin E, Metformin, Statins.*

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INTRODUCTION:

The liver, a multifaceted organ, is central to regulating physiological processes including metabolism, detoxification, protein synthesis, and immune response. ⁽¹⁾

Production of bile, which helps carry away waste and break down fats in the small intestine during digestion. Production of certain proteins for blood plasma., cholesterol and special proteins to help carry fats through the body. Conversion of excess glucose into glycogen for storage and to balance and make glucose as needed. Regulation of blood levels of amino acids, which form the building blocks of proteins. ⁽²⁾

The prevalence of NAFLD in the pediatric populations from Asia, Europe, and North America was 5.9%, 5.7%, and 6.5% respectively. ⁽³⁾

NAFLD is defined as the accumulation of fat in the liver in the absence of excessive alcohol consumption or other known liver pathologies. It is a spectrum of disease ranging from steatosis (fat infiltration into the liver) to steatohepatitis, which is characterized by hepatocellular inflammation and injury, to fibrosis and eventually cirrhosis. NAFLD is now recognized as one of the most common causes of chronic liver disease in young people in the developed world. The prevalence of NAFLD in adults and children in the general population is uncertain and difficult to assess accurately due to a lack of simple, non-invasive diagnostic tests. The 'gold standard' for diagnosing NAFLD and its severity is a liver biopsy, but this is neither feasible nor ethical to use in healthy populations. ⁽⁴⁾

Materials and Methods**Study Design**

- The study is systematic review.

Source of Data and Materials

- Published articles on prevalence of Non-Alcoholic Fatty Liver Disease.
- Published articles on Non- Alcoholic Fatty Liver Disease.
- Published articles on drug therapy management of Non- Alcoholic Fatty Liver Disease.

Inclusion criteria:

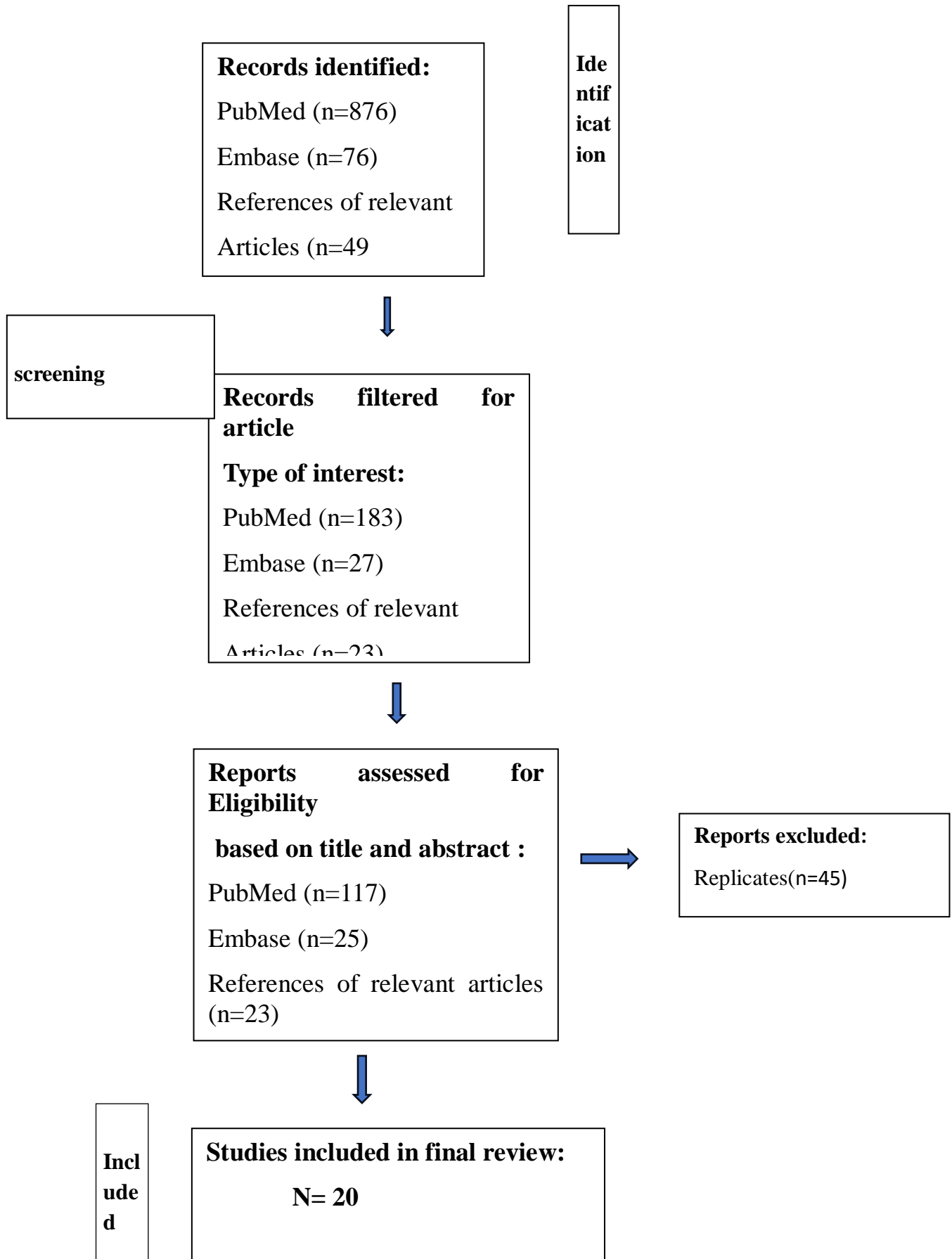
All gathered studies reporting the non-alcoholic fatty liver disease prevalence, available full texts, and studies with sufficient data (no. of patients, comorbidities, causes, risk factors, BMI) were totally included in this study.

Exclusion criteria

Alcohol consumption, other liver diseases, drug induced liver disease, participants aged more than 15 years, reviews, Case-control studies, cohort investigation, case series, case report, reviews, repetitive papers, studies with insufficient data, papers with unavailable full text, and conference studies were excluded.

Study Procedure

In this study, the primary search was conducted by using Databases of PubMed, Web of Science, Science Direct, Scopus, Embase, and Google scholar, Springer link search engine were hired for definition of searching strategy. Also, the main keywords of "Prevalence", Non-Alcoholic Fatty Liver Disease studies were used for comprehensive searching with no time and language – associated restrictions. Following paper selection, the related citations were imported to the information management software.



Results

A systematic review studied on comorbidities in NAFLD the total 9946 patients data taken into considerations from 20 published articles. ⁽⁵⁻²⁵⁾

This study includes the following parameters:

- 1.Age-wise distribution
- 2.Gender wise distribution
- 3.Comorbidities of NAFLD
- 4.Treatment of NAFLD

Table Distribution of patients based on age

| AGE | NUMBER OF PATIENTS | PERCENTAGE |
|-------|--------------------|------------|
| 2-5 | 5,971 | 60% |
| 6-8 | 1,491 | 15% |
| 9-11 | 994 | 10% |
| 12-14 | 795 | 8% |
| 15-18 | 695 | 7% |
| TOTAL | 9946 | 100% |

Age wise Distribution of NAFLD Patients

The Results reveal that NAFLD disease is more common in this age groups of 2-5yrs which include 5971 patients (60%); 6-8years implied by 1491 patients (15%); 9-11years implied by 994 patients (10%); 12-14years implied by 795 patients (8%); 15-18years implied by 695 patients (7%)

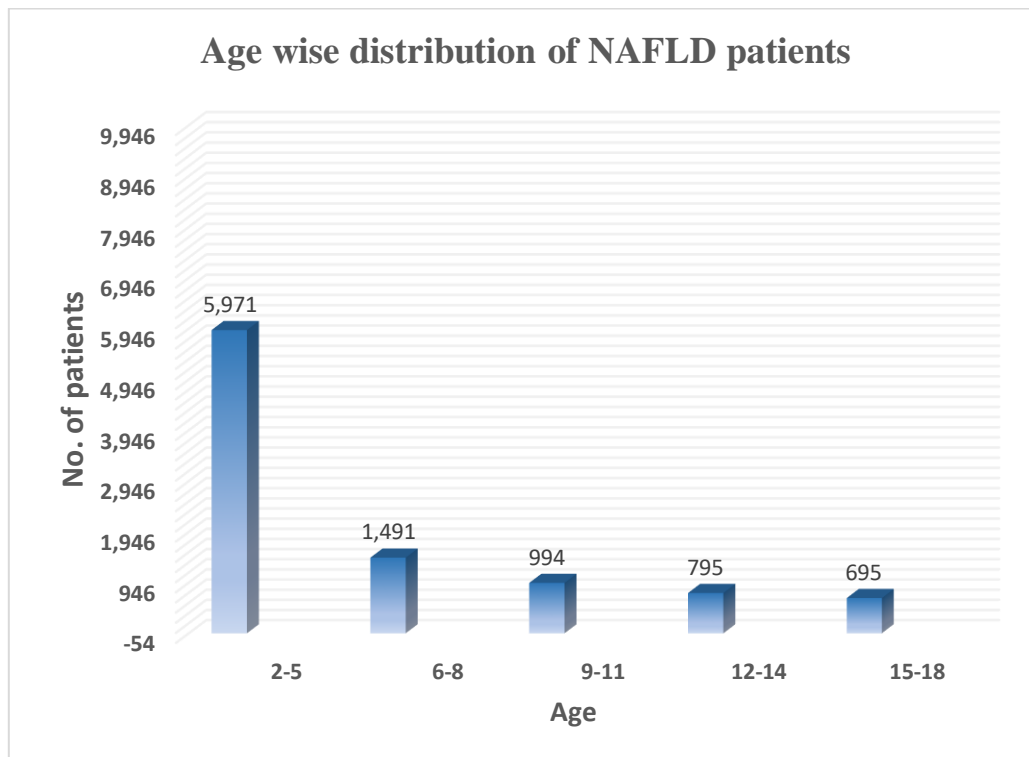


Figure Age wise distribution of NAFLD patients

Gender wise Distribution

Table Gender wise distribution

| GENDER | NUMBER OF PATIENTS | PERCENTAGE |
|--------|--------------------|------------|
| Male | 5320 | 53.5% |
| Female | 4626 | 46.5% |
| TOTAL | 9946 | 100% |

The results of the study clearly show that among the 9946 patients males (5320 patients, or 53.5%) are more likely than female (4626 patients, or 46.5%) to develop comorbidities in NAFLD.

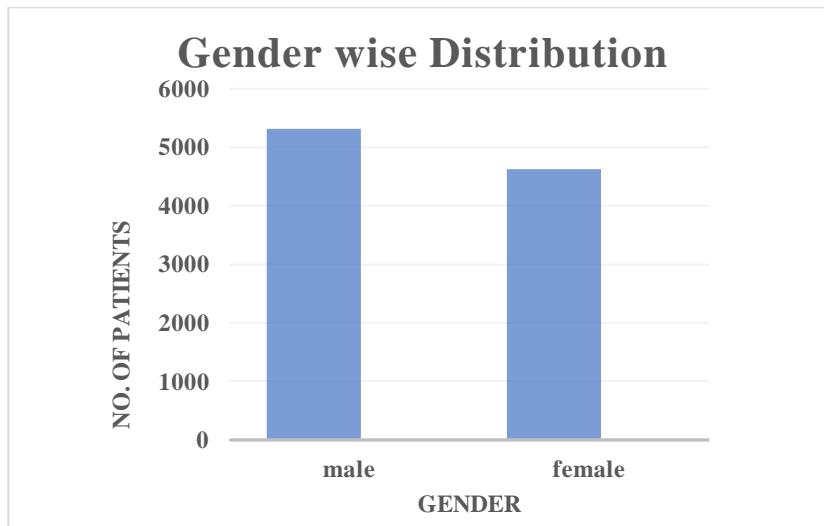


figure gender wise distribution

Distribution of patients based on comorbidities

Table 3: Distribution of patients based on comorbidities

| Comorbidities | No.of patients | Percentage (%) |
|--------------------|----------------|----------------|
| Obesity | 6,166 | 62% |
| Dyslipidemia | 4,575 | 46% |
| Insulin resistance | 4,277 | 43% |
| Elevated ALT | 3,083 | 31% |
| Type 2 DM | 1,691 | 17% |
| Hypertension | 1,492 | 15% |
| Hyperuricemia | 995 | 10% |
| Metabolic syndrome | 1,293 | 13% |

In our research, we found one and more than one comorbidities in the patients which includes obesity disease is a major comorbidities followed by dyslipidemia, insulin resistance, elevated ALT, Type 2 DM, Hypertension, Hyperuricemia disease was the minor comorbidities in patients with NAFLD.

Hyperuricemia is a condition characterized by elevated levels of uric acid in the blood, which can lead to the development of non

alcoholic fatty liver disease (NAFLD). The primary mechanism linking hyperuricemia to NAFLD involves the metabolism of fructose, a common sugar found in sweetened beverages and processed foods. When the liver rapidly metabolizes fructose, it depletes adenosine triphosphate (ATP), triggering the quick generation of uric acid. This process directly promotes hepatic lipogenesis, the production of fat within liver cells, contributing to the fat accumulation seen in NAFLD.

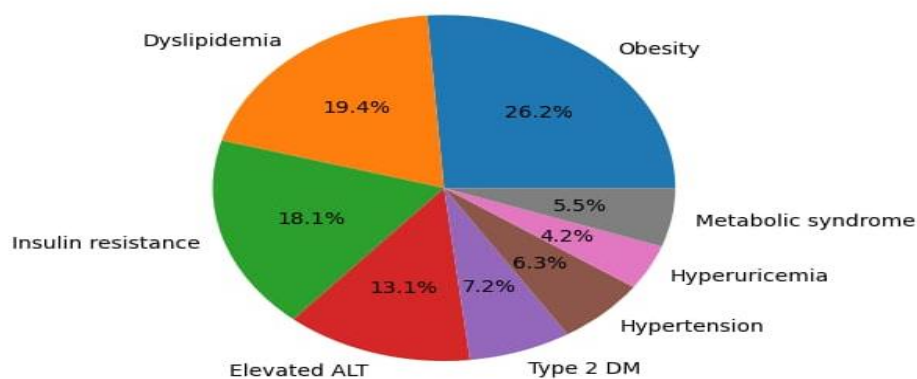


Figure Distribution of patients based on comorbidities

Treatment in NAFLD Patients

Treatment for NAFLD patients include pioglitazone, vitamin E, metformin, statins, lifestyle modifications and others. Pioglitazone improves insulin sensitivity and reduces liver fat accumulation. Vitamin E acts as an antioxidant and may reduce liver inflammation. Metformin helps in improving insulin resistance, though its role in NAFLD is still debated. Statins are used to manage dyslipidemia and reduce cardiovascular risk.

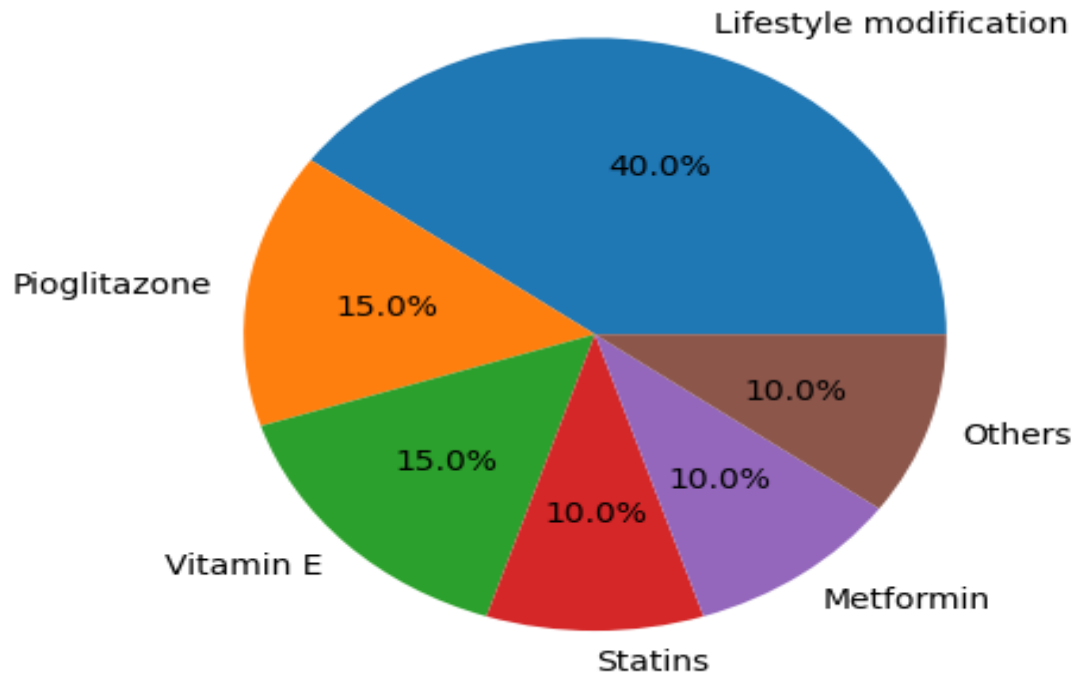


Figure Distribution of patients based on treatment

This systematic review focuses on Non-Alcoholic Fatty Liver Disease (NAFLD), a metabolic liver disorder characterized by excessive fat accumulation in the liver in the absence of alcohol consumption. The study compiles and analyses data from 9,946 patients across 20 published articles. Key focus areas include:

1. Epidemiology

- NAFLD is increasingly prevalent among children and adolescents worldwide.
- Most common in younger age groups (2–5 years) (60%).
- Shows male predominance (58%) compared to females (42%).

2. Pathogenesis

- Caused by fat accumulation in liver cells (hepatic steatosis).
- Triggered by obesity, insulin resistance, dyslipidemia, and metabolic disorders.
- Insulin resistance plays a central role in disease progression.
- Excess calorie intake and sedentary lifestyle contribute significantly.

3. Causes / Risk Factors

- Obesity – most significant cause
- High cholesterol and sodium intake
- Insulin resistance
- Metabolic disorders

- Elevated triglycerides (TG) and ALT levels
- Fat accumulation in the liver

4. Comorbidities

- Obesity – most common (62%)
- Dyslipidemia (46%)
- Insulin resistance (43%)
- Elevated ALT levels (31%)
- Type 2 Diabetes Mellitus (17%)
- Hypertension (15%)
- Metabolic syndrome (13%)
- Hyperuricemia (10%)
- Many patients had multiple metabolic comorbidities, indicating NAFLD as a multisystem disorder.

5. Treatment Approaches

- Lifestyle Modification: Diet control, weight reduction, physical activity
- Medical: Pioglitazone, Vitamin E, Metformin, Statins
- Preventive: Early screening and management of metabolic risk factors

6. Prevention & Support

Healthy diet, regular physical activity, early diagnosis, and weight management are essential.

- Screening for metabolic risk factors such as diabetes, hypertension, and dyslipidemia is important.

- Nutritional counselling and lifestyle education help in long-term disease management.
- Family support and awareness are important in improving adherence to treatment in children.

CONCLUSION:

NAFLD is a rapidly growing health concern in the paediatric population, with early onset seen predominantly in younger children. The strong association with obesity and metabolic abnormalities highlights the importance of early intervention. Male children are at slightly higher risk, and the presence of multiple comorbidities suggests that NAFLD should be managed as a multifactorial metabolic disorder.

Effective management requires a combination of early diagnosis, lifestyle modification, and appropriate medical therapy. Preventive strategies focusing on healthy diet, physical activity, and control of metabolic risk factors are essential to reduce disease burden and prevent long-term complications.

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