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Observational Study

Impact of renaming NAFLD to MAFLD in prevalence, characteristics and risk factors :A cross-section study

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Abstract

BACKGROUND

Recently, a group of hepatologists proposed to rename non-alcoholic fatty liver disease (NAFLD) as metabolic associated fatty liver disease (MAFLD) with modified diagnostic criteria. It is important to note, however, that there are some differences between the diagnostic criteria used for NAFLD and MAFLD. Since the research on MAFLD is just beginning, however, evidence on its incidence and prevalence in the general population and in specific subpopulations remains limited.

AIM

To assess epidemiology of fatty liver in new definition and compare MAFLD with NAFLD. Exploreing risk factors of MAFLD individuals.

METHODS

This was a retrospective, cross-sectional study. A total of 85,242 adults were selected from the Chinese health management database in 2017–2022. Demographic and health-related clinical and laboratory data were obtained. MAFLD was diagnosed as ultrasound diagnosis of fatty liver and the presence of overweight/obesity, diabetes, or two other metabolic risk factors, with and without concomitant liver diseases. Metabolic factors were not considered in NAFLD diagnosis standard. The χ 2 test and independent t-test were performed to assess categorical and continuous data, respectively. An analysis of variance test was used to compare MAFLD, NAFLD, MAFLD&NAFLD multiple groups. Binary logistic regression was used to determine risk factors of the MAFLD.

RESULTS

The prevalence of MAFLD and NAFLD was 40.5% and 31.0%, respectively. The MAFLD or NAFLD population is more likely to be older (M:47.19±10.82 *vs* 43.43±11.96,p <0.001; N: 47.72±11.17 *vs* 43.71±11.66,p <0.001), male(M:54.15% *vs* 21.79%, p<0.001;N:36.45% vs 23.50%, p<0.001) and high BMI(M:26.79±2.69 *vs* 22.44±2.48,p <0.001; N: 26.29±2.84 *vs* 23.29±3.12,p <0.001) than the non-MAFLD or non-MAFLD population. In multivariate analysis, socio-demographic conditions (metabolic abnormalities OR=3.38, (95%CI, 2.99-3.81), P<0.001; diastolic blood pressure OR=1.01 , (95%CI,1.00–1.01), *P* = 0.002), laboratory results (TBIL OR=1.01,(95%CI ,1.00-1.02), *P* = 0.039; A/G OR=1.79 ,(95%CI,1.48-2.17),P <0.001), and lifestyle factors (drink beverage OR=0.32,(95%CI, 0.17-0.63) ,P=0.004) were risk factors for MAFLD. Our study results offer new insight into potential risk factors associated with fatty liver disease, including SUA, A/G, TBIL, and creatinine, all four of which are related to chronic renal disease (CKD).

CONCLUSION

MAFLD is more prevalent than NAFLD, with two-fifths of individuals meeting the diagnosis criteria. MAFLD and NAFLD populations have different clinical characteristics. CKD may be a risk factor for MAFLD.

Key Words: Metabolic dysfunction-associated fatty liver disease; Non-alcoholic fatty liver disease; Epidemiology; Risk factors; Characteristics; Cross-section study

INTRODUCTION

Non-alcoholic fatty liver disease (NAFLD) is associated with excessive lipid accumulation in the liver resulting from disordered hepatic lipid metabolism that is stimulated by non-alcohol-related factors[1]. In 2019, the global prevalence of NAFLD was approximately 30.6%[2]. In China, the prevalence was as high as 32.9%, making it the number one cause of chronic liver disease and abnormal liver biochemical indicators during routine physical examination[3]. These findings indicate that NAFLD imposes a heavy disease burden on patients and society. As its disease mechanism has become better understood, the limitations of the NAFLD nomenclature have become more apparent. These include 1) the lack of a uniform standard for calculating alcohol intake, which has led to an underestimation of the role of alcohol consumption in disease pathogenesis, and 2) a failure to recognize the influence of metabolic factors in disease etiology[4]. In 2020, Eslam et al.[5] suggested renaming NAFLD as 'metabolic (dysfunction) associated fatty liver disease' (MAFLD). A diagnosis of MAFLD includes the presence of hepatic steatosis and one or more of the following features: 1) overweight based on body mass index (BMI), 2) type 2 diabetes mellitus, or 3) lean or normal weight with evidence of metabolic dysregulation[6]. The new nomenclature aims to reflect the close relationship between fatty liver and overnutrition, sedentary lifestyle, and metabolic conditions such as type 2 diabetes, hypertension, dyslipidemia, and obesity[7]. Adopting a positive diagnosis like MAFLD recognizes the impact of metabolic conditions and fatty liver on the natural history of different liver diseases such as chronic viral hepatitis and alcohol-related liver disease[8]. It is important to note, however, that there are some differences between the diagnostic criteria used for NAFLD and MAFLD. Studies indicate that[6] some NAFLD patients are excluded under the proposed MAFLD definition, based on disparate characteristics included in each definition. The rates of diabetes, hypertriglyceridemia, hypertension, and fibrosis risk are significantly higher among MAFLD than NAFLD patients. The proposed MAFLD definition challenges the current understanding of the prevalence and associated factors of fatty liver. Meanwhile, MAFLD is shown to be a better predictor of cardiovascular disease risk among asymptomatic individuals than NAFLD[9]. Since the research on MAFLD is just beginning, however, evidence on its incidence and prevalence in the general population and in specific subpopulations remains limited. The few studies are based on small sample sizes and do not directly compare the characteristics of NAFLD and MAFLD[10]. Thus, the current study aims to conduct an updated analysis of the prevalence and factors associated with MAFLD. A more comparative analysis of the clinical characteristics of patients with NAFLD and MAFLD is also performed in order to identify MAFLD-specific risk factors.

MATERIALS AND METHODS

2.1. Study design

A cross-sectional study was conducted by recruiting participants from the health management center of the general tertiary hospital of Southern China between 1 August 2017 and 31 October 2022. Patients who were ≥18 years of age, had received a fatty liver color Doppler ultrasonography result, blood lipid examination, exercise, and dietary evaluation, and were voluntary participants in this study were included. Patients who lacked imaging or laboratory data for a MAFLD diagnosis, had incomplete Diet and Exercise Health Check survey responses, or were pregnant at the time of examination due to different waist circumference and BMI measurements caused by pregnancy, were excluded from the study. This study was reviewed and approved by the Central South University Ethics Review Board (IRB2022-S217). All patients provided their written informed consent to participate in the study.

2.2 Diagnostic criteria and group definitions

2.2.1 Definition of hepatic steatosis

Hepatic steatosis was defined in NHANES III participants using the Hepatic Steatosis Ultrasound Examination (HSUE). Adult patients received a hepatic ultrasound at a mobile examination center using a Toshiba Sonolayer SSA-90A ultrasound machine (Toshiba America Medical Systems, Inc., Tustin, California)[11]. Board-certified radiologists used five different parameters to assess hepatic steatosis: parenchymal brightness, liver-to-kidney contrast, deep beam attenuation, bright vessel walls, and gallbladder wall definition[12]. Ultrasonographic assessments were reported as normal, mild, moderate, or severe hepatic steatosis. Abiding by quality control procedures, reliability results (intra-rater and inter-rater) were calculated. The intra-rater and inter-rater reliabilities were 91.3% (kappa 0.77) and 88.7% (kappa 0.70), respectively.

2.2.2 Definition of MAFLD

MAFLD was defined as the presence of hepatic steatosis (based on hepatic and renal echogenic contrast, liver parenchymal brightness, deep debilitation, and vascular blurring[13]) by liver ultrasound plus one or more of the following conditions: 1) overweight (BMI ≥25 and <30 kg/m^2, or obese (BMI ≥30 kg/m^2), 2) type 2 diabetes mellitus (T2DM), or 3) at least two metabolic risk abnormalities. Metabolic risk abnormalities included 1) a waist circumference ≥90 cm in males or ≥80 cm in females, 2) a blood pressure ≥130/85 mmHg or specific drug treatment, 3) plasma triglycerides ≥150 mg/dL (≥1.70 mmol/L) or specific drug treatment, 4) plasma HDL-cholesterol <40 mg/dL (<1.0 mmol/L) for males and <50 mg/dL (<1.3 mmol/L) for females or specific drug treatment, 5) prediabetes (fasting glucose levels of 100–125 mg/dL [5.6–6.9 mmol/L] or hemoglobin A1c (HbA1c [5.7–6.4% [39–47 mmol/mol]), 6) homeostasis model assessment of insulin resistance (HOMA-IR) score ≥2.5, and/or 7) a plasma high sensitivity C-reactive protein level >2 mg/L.

2.2.3 Definition of NAFLD

NAFLD was diagnosed according to the EASL-European Association for the Study of Diabetes-European Association for the Study of Obesity and American Association for the Study of Liver Diseases Clinical Practice Guidelines for the Management of NAFLD: 1) fatty liver by abdominal ultrasonography, 2) alcohol consumption £30 g/day for men and £20 g/day for women, and 3) no competing etiologies for fatty liver or coexisting causes of chronic liver disease[14].

2.3 Demographic variables

The following demographic variables were obtained from the patient electronic record database: age, gender, body mass index (BMI), waist circumference, hip circumference, smoking, alcohol consumption, history of hypertension, diabetes, and acquisition of medical knowledge. BMI was calculated as the weight (in kilograms) divided by the square of the height (in meters). Overweight was defined as $25 \leq$ BMI <30 kg/m^2). Waist and hip circumferences were determined in centimeters using a tape measure. Blood pressure was recorded in the sitting position using standardized equipment. Hypertension was defined as a systolic blood pressure (SBP) ≥130 mmHg and a diastolic blood pressure (DBP) ≥85 mmHg or the use of antihypertensive medications. A diagnosis of diabetes was based on a history of diabetes, use of antidiabetic medications, and/or a fasting plasma glucose ≥7.0 mmol/L or a 2-hour glucose ≥11.0 mmol/L. Information on lifestyle and psychological factors was acquired from the patient self-report questionnaires.

2.4 Laboratory parameters

Laboratory measurements included total bilirubin (TBIL), aspartate aminotransferase (AST), alanine transaminase (ALT), albumin/globulin (A/G), fasting plasma glucose (FPG), glycated haemoglobin (HbA1c), total cholesterol (TC), triglyceride (TG), low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C), platelet, creatinine, ≥2 metabolic abnormalities, blood urea nitrogen (BUN) and uric acid (UA). All biochemical assessments were performed using standard laboratory methods. HDL, LDL, and TG were reported in millimoles per liter (mmol/L) and liver enzymes were reported in units per liter (U/L).

2.5 Statistical analysis

Continuous variables were expressed as means ± SD. Categorical variables were expressed as percentages. The student t-test (for normally distributed variables), the Mann-Whitney U-test (for non-normally distributed variables), and the Chi-square test (for categorical variables) were used to investigate differences between the groups. An analysis of variance test was used to compare multiple groups. The prevalence of MAFLD and NAFLD was determined as the number of subjects with the corresponding conditions divided by the total number of subjects. Univariable and multivariable binary logistic regression analyses were also performed to determine factors associated with MAFLD. The univariate and multivariate odd ratios (OR) were reported along with 95% confidence intervals (CI). All tests were two-tail and results with a P value <0.05 were considered statistically significant. All analyses were conducted using SPSS 24 version.

RESULTS

MAFLD and NAFLD prevalence and patient demographic characteristics. Of the 85,242 recruited participants (Figure 1), 26,403 (31.0%) had NAFLD [8,476 (23.5%) women, median age 47.72 ± 11.17 years], and 34,485 (40.5%) met the criteria for MAFLD [7,858 (21.79%) women; median age 47.19 ± 10.82 years] (Figure 2). Patients with MAFLD had a higher BMI than those without [26.79 ± 2.69 kg/m^2 vs. 22.44 ± 2.48 kg/m^2, respectively]. A total of 68.37% (1,775/2,596) of patients had T2DM, and 71.71% (27,536/38,399) had two or more metabolic abnormalities. Meanwhile, 2,498 patients met the definition of NAFLD but did not meet the MAFLD criteria (Figure 3). The clinical, laboratory, lifestyle, and psychological characteristics of the study population are summarized in Table 1. The comparison of MAFLD, NAFLD and MAFLD&NAFLD is shown in Table 3. All the patients were ethnic Chinese. Prevalence of MAFLD and NAFLD by age, BMI, and sex. The prevalence of MAFLD was lower among individuals <30 years of age (~1.3%) and highest among those 50–59 years of age (Figure 4). Disease prevalence was significantly higher among men than women. Changes in age-related prevalence were similar for patients with NAFLD and MAFLD, however, there was a lower overall prevalence of NAFLD than MAFLD. The prevalence of both MAFLD and NAFLD increased with BMI and for patients with a BMI >25, the risk of NAFLD and MAFLD increased dramatically (Figure 5). Risk factors associated with the presence of metabolic-associated fatty liver disease. In univariate analysis, female sex, older age, higher BMI, high diastolic blood pressure, high waist circumference and low hip circumference, alcohol consumption, medically knowledgeable, higher TC, HDL, ALT and ALT, A/G, glycated hemoglobin, uric acid, platelet, creatinine, drink beverage, exercise frequency, exercise duration, physical labor intensity, and sleep were associated with MAFLD. In contrast, smoking, diabetes, LDL, TBIL, blood urea nitrogen, fasting plasma glucose, total bile acid, night snacks, crapulent, food preferences, and psychological characteristics were not significantly associated with this disease (P >0.05). In multivariate analysis, female sex (OR 0.67, 95%CI 0.57–0.80, P <0.001), older age (OR 1.01, 95%CI 1.00–1.02, P <0.001), higher BMI (OR 1.45, 95%CI 1.40–1.51, P <0.001), diastolic blood pressure (OR 1.01, 95%CI 1.00–1.01, P <0.001), waist circumference (OR 1.12, 95%CI 1.11–1.14, P <0.001), hip circumference (OR 0.95, 95%CI 0.93–0.96, P <0.001), higher level of medical knowledge (OR 1.14, 95%CI 1.03–1.27, *P* = 0.009), TG (OR 1.33, 95%CI 1.27–1.40, P <0.001), HDL (OR 0.58, 95%CI 0.47–0.71, P <0.001), AST (OR 0.98, 95%CI 0.97–0.98, P <0.001), ALT (OR 1.02, 95%CI 1.02–1.03, P <0.001), A/G (OR 1.79, 95%CI 1.48–2.17, P <0.001), glycated hemoglobin (OR 1.32, 95%CI 1.24–1.42, P <0.001), higher uric acid level (OR 1.00, 95%CI1.00–1.01, P <0.001), platelets (OR 1.00, 95%CI1.00–1.00, P <0.001), creatinine (OR 0.99, 95%CI 0.99–1.00, P <0.001), drink drinks (OR 0.32, 95%CI 0.17–0.63, *P* = 0.001), exercise frequency (OR 0.82, 95%CI 0.71–0.95, *P* = 0.009), exercise duration (OR 1.24, 95%CI 1.04-1.47, *P* = 0.015), and labour intensity (OR 0.78, 95%CI 0.65–0.95, *P* = 0.013) remained as independent variables associated with MAFLD (Table 2).

DISCUSSION

This study found that the prevalence of fatty liver disease was higher when the MAFLD definition was used for diagnosis rather than the NAFLD definition (40.5% vs. 31.0%, respectively). Clinical characteristics of MAFLD and non-MAFLD were significantly different, except for SBP, A/G, platelets, drinks and exercise training. In the NAFLD and non-NAFLID populations, only take the initiative to acquire medical knowledge, A/G, total bile acid, crapulent, drinks and exercise training was not statistically significant in the comparison. And there were some different clinical characteristics in MAFLD, NAFLD and NAFLD& MAFLD participants. In addition, a higher number of factors were associated with MAFLD, including sociodemographic (e.g., metabolic abnormalities, diastolic blood pressure), laboratory (TBIL, A/G), and lifestyle (alcohol consumption) characteristics. In contrast, psychological factors were not significantly correlated with NAFLD. The study results offer new insight into the risk factors associated with fatty liver disease, including SUA, A/G, TBIL, and creatinine. All of these factors are related to chronic renal disease (CKD). Usually, patients with chronic renal disease may have elevated SUA levels[15], low A/G levels[16] and TBIL[17].

4.1 MAFLD prevalence. The prevalence of MAFLD in this study was 40.5%. Several studies have assessed the epidemiology of MAFLD, however, the reported prevalence of this condition varies. While some studies[18] demonstrate a lower prevalence of MAFLD (25–37.3%), a meta-analysis of 2,667,052 individuals estimated that the global prevalence[19] of this disease is 50.7%. A study using 2017–2018 NHANES data[20] indicated that MAFLD prevalence was 39.1%, a finding similar to that reported here. Like the current study, prior reports have also found that MAFLD[21] is more prevalent in males. Reported[22] variations in the prevalence of MAFLD may be the result of ethnic disparities and environment factors. Differences in the methods used to estimate steatosis (liver ultrasound, elastography, diagnostic scores) may account for some of the heterogeneity.

4.2 NAFLD prevalence. The prevalence of NAFLD (31%) was lower than the prevalence of MAFLD in this study. A total of 23,905 participants had overlapping diagnostic criteria for NAFLD and MAFLD. While 2,498 patients had NAFLD without metabolic dysregulation, 20,580 patients had fatty liver with metabolic abnormalities and alcohol use. A recent study[23] by Lee *et al* identified a similar number of cases using the MAFLD and NAFLD criteria on population-based data (n = 8,962,813) from National Health and Nutrition Examination surveys (37.3% *vs* 28.0%, respectively), a result consistent with our findings. It is probable that the high MAFLD prevalence in the current study was primarily caused by the high prevalence of overweight and metabolic dysfunction.

4.3 Comparison of MAFLD and NAFLD disease characteristics. Regardless of age, the prevalence of MAFLD and NAFLD was much higher in males than females, a finding consistent with a study by Ito *et al*[24] This may be because males are more prone to poor lifestyle habits, such as smoking and alcohol consumption. The current study also found that the peak prevalence of MAFLD occurred earlier among men (40–49 years) than women (50–59 years), a finding reported previously[25]. Women enter menopause and begin to lose estrogen after they are >50 years of age. Estrogen is thought to suppress visceral fat accumulation and increase subcutaneous fat accumulation. A higher BMI is linked to a higher prevalence of MAFLD and NAFLD. Thus, individuals with high BMI should be appropriately educated about these conditions.

4.4 Independent risk factors for MAFLD

4.4.1 Sociodemographic characteristics

This study found that 0.95 cm increases in hip circumference (range: 0.93–0.96 cm) were associated with a lower risk of MAFLD, a finding consistent with Lin *et al*[26] Indeed, fat accumulation on the hips may be beneficial to metabolic health and reduce the risk of metabolic-related diseases.[27] The risk of MAFLD was also 1.14 times higher among those who actively acquired medical knowledge than those who did not. This may be because individuals who are willing to actively acquire knowledge are more likely to attend medical check-ups for early detection and diagnosis. Meanwhile, people who aren't willing to acquire medical knowledge lack an understanding of self-health management and may be less likely to attend medical check-ups. This could cause an illusion of low MAFLD prevalence.

4.4.2 Laboratory indicators

Multivariate logistic regression analysis found that TG, HDL-cholesterol, TBIL, AST, ALT, A/G, glycated hemoglobin, serum uric acid (SUA), platelets, and creatinine were risk factors for MAFLD. These results offer new insight into potential risk factors associated with fatty liver disease such as SUA, A/G, TBIL, and creatinine, all four of which are related to chronic kidney disease (CKD). Longitudinal studies[28] have also shown an increased incidence of CKD among NAFLD patients. Despite these findings, however, there is little awareness about CKD in NAFLD, and research on the relationship between the new definition of MAFLD and CKD has not yet been reported. The current study found that SUA was significantly correlated with MAFLD. While the mechanisms remain unclear, there are a few hypotheses. First, SUA may act as an oxidant and elevated levels may increase oxidative stress, thereby promoting the development of MAFLD. Second, SUA[29] induces adipogenesis through the production of endoplasmic reticulum, activating fatty acid synthase and acetyl coenzyme A carboxylase and leading to the accumulation of fat in hepatocytes. Indeed, higher TBIL[30], A/G, and creatinine levels were associated with MAFLD risk. Jin *et al*[31] found that A/G is a much stronger independent predictor of glucose metabolism-related risk factors and is negatively correlated with insulin sensitivity, a finding confirmed by the current study. The descend creatinine levels are consistent with the findings of Liu *et al*[12] The reduction in creatinine associated with MAFLD may be the result of sarcopenia, which is linked to low skeletal muscle mass and reduced function. There are differing views on the relationship between TBIL and the risk of MAFLD. The current study showed a mild positive correlation. This may be because TBIL activates toll-like receptor 4 (TLR4) signaling and promotes inflammation.

4.4.3 Lifestyle indicators

Previous studies[32] have shown that consuming sugary beverages may increase the risk of MAFLD, while drinking coffee and tea may reduce the risk. The current study found that individuals who regularly consumed beverages were 0.34 times more likely to develop MAFLD than those who never drank beverages. This may be because coffee and tea, which contain biologically active compounds with anti-oxidant and anti-fibrotic potential, were the most consumed beverages in this population.[33] Our study found that the risk of developing MAFLD when exercising >5/week was only 0.82 times that of exercising 1–2/week. Meanwhile, prior studies have indicated that exercising <2/week has no effect[34]. However, these findings do not necessarily mean that more frequent exercise is beneficial. It is also important to consider frequency in relation to exercise intensity and length. The risk of MAFLD was found to be 1.25 times higher following exercise lasting >60 minutes than exercise lasting <30 minutes, suggesting that the benefit of exercise doesn't increase after a certain length, perhaps due to fatigue that reduces long-term adherence. Finally, labor intensity was a protective factor, with moderate labor intensity associated with a 0.79 times higher risk of MAFLD than light labor intensity. This finding is consistent with a study by Chen *et al*[35] and suggests that moderate physical labor is beneficial to health.

4.5 Limitations

To our knowledge, this is the first largest sample study to assess the new nomenclature of MAFLD in the Mid-South region of China. The study has some limitations, however. First, lifestyle information was self-reported by the participants, which may cause recall bias. Second, all the participants were recruited from one medical facility so the findings may not be generalizable to the Chinese population. Additional studies are needed to assess the prevalence and features of MAFLD in other regions of the country. Third, this study lacked histological information on steatosis and fibrosis diagnoses. While ultrasound imaging is highly sensitive and specific for liver fibrosis and steatosis, this technique is not the gold standard for diagnosis. In addition, transient elastography also been recommended for a wide range of studies related to NAFLD[36-40], and VTCE has good diagnostic performance in assessing steatosis. However, there are certain shortcomings that limit its use and make it less widespread than ultrasound, such as high dependence on operator experience, limited sampling range, large overlap in liver fibrosis staging data, and inconsistent delineation of Cut off values.

CONCLUSION

This study found that MAFLD was significantly more prevalent than NAFLD in our study population. In addition to the risk factors that both diagnoses have in common, our results suggest that CKD may be an additional risk factor for MAFLD. More research is needed to determine the potential mechanisms underlying the occurrence of MAFLD and to develop interventions to prevent and treat this disease.

ARTICLE HIGHLIGHTS

Research background

MAFLD was renamed from NAFLD, but there are differences in diagnostic criteria. Since the research on MAFLD is just beginning, however, evidence on its incidence and prevalence in the general population and in specific subpopulations remains limited.

Research motivation

MAFLD proposal is not only a change in nomenclature. On one hand, MAFLD includes patients with concomitant liver diseases and secondary causes of fatty liver. On the other hand, patients with hepatic steatosis but not fulfilling the metabolic criteria are not classified as MAFLD. How these criteria affect our understanding of the epidemiology of MAFLD is unclear.The clinical characteristics and risk factors between MAFLD and NAFLD has not been adequately explored. We aimed to further clarify a possible link and difference between the two diagnostic criteria.

Research objectives

We sought to assess the impact of the new definition on the epidemiology of fatty liver disease and compare MAFLD with NAFLD in a general population. Potential risk factors of MAFLD-diagnosed individuals were also explored.

Research methods

A total of 85,242 adults were selected from the Chinese health management database in 2017–2022. Specifically, the participants were divided into MAFLD group, NAFLD group and MAFLD & NAFLD group for analysis and comparison. Several elements were included such as prevalence, disease characteristics, and risk factors.

Research results

We found a higher prevalence of MAFLD than NAFLD .There are differences in clinical features between MAFLD, NAFLD and MAFLD&NAFLD. In addition to the common risk factors, we identified CKD as a possible risk factor for MAFLD.

Research conclusions

MAFLD was more prevalent than NAFLD in the study population, with two-fifths of individuals meeting the diagnosis criteria.Compared to NAFLD, MAFLD has its own disease characteristics and risk factors. Intervention program should address the risk factors for MAFLD and regular screening for the disease is recommended.

Research perspectives

Some of the risk factors for MAFLD have been initially identified, but cross-sectional studies of causality are weak and future multi-centre, multi-regional longitudinal studies could be conducted to elucidate the relationship between trajectory change and disease

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PRIMARY SOURCES

1	Vincent Wai-Sun Wong, Grace Lai-Hung Wong, Jean Woo, Jill M. Abrigo et al. "Impact of the new definition of metabolic associated fatty liver disease on the epidemiology of the disease", Clinical Gastroenterology and Hepatology, 2020 Crossref	123 words — 3%
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6	Danping Liu, Yinzhong Shen, Renfang Zhang, Jingna Xun, Jiangrong Wang, Li Liu, Corklin Steinhart, Jun Chen, Hongzhou Lu. "Prevalence and risk factors of metabolic associated fatty liver disease among people living with HIV in China", Journal of Gastroenterology and Hepatology, 2021 Crossref	31 words — 1%
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13 Yiping Li, Yang Liu, Zhiwei Chen, Kaiyue Tang et al. "Protopanaxadiol ameliorates NAFLD by regulating hepatocyte lipid metabolism through AMPK/SIRT1 signaling pathway", Biomedicine & Pharmacotherapy, 2023
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