Original Article

Knowledge and Awareness of Metabolic Dysfunction-Associated Steatotic Liver Disease (MASLD), Its Relationship with Metabolic Syndrome, and Associated Complications Among Health Specialty Students at Umm Al-Qura University

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ABSTRACT

Background: Metabolic dysfunction-associated steatotic liver disease (MASLD), previously non-alcoholic fatty liver disease (NAFLD), is closely linked to obesity, insulin resistance, and metabolic syndrome. Addressing this condition emphasizes the critical need for adequate knowledge and positive attitudes among future healthcare professionals to ensure early recognition.

Objectives: This study aims to assess the levels of knowledge, attitudes, lifestyle related factors, and awareness of available diagnostic and treatment options regarding MASLD and its metabolic complications among health specialty students.

Methods: A web-based cross-sectional study was conducted among undergraduate health specialty students at Umm Al-Qura University, Makkah, Saudi Arabia. Data were collected using an online structured questionnaire distributed via snowball sampling. Knowledge was scored by assigning one point per correct response, using a 60% cutoff to define good versus poor knowledge. Descriptive statistics and Pearson's chi-square or Fisher's exact tests were used for analysis via SPSS version 28.

Results: The study included 143 health specialty students, with 61.5% demonstrating good knowledge of MASLD. Recognition of obesity or overweight (95.8%), high triglycerides (94.4%), and smoking (93.7%) as risk factors was high, while awareness of the terminology change from NAFLD to MASLD was limited (23.8%). Most participants recognized cirrhosis (97.2%) and cardiovascular disease (81.1%) as complications. Good knowledge was significantly associated with female gender ($p = 0.023$), clinical-year status ($p = 0.044$), and non-smoking ($p = 0.005$).

Conclusion: Although baseline awareness exists, important gaps remain regarding metabolic complications and diagnostic options. These findings underscore the clear necessity for implementing targeted educational interventions and integrating comprehensive MASLD training into medical curricula to correct misconceptions and better prepare future healthcare providers.

Keyword: Metabolic Dysfunction-Associated Steatotic Liver Disease, Health Specialty Students, Health Knowledge.

Introduction

Globally, metabolic dysfunction-associated steatotic liver disease (MASLD), formerly known as non-alcoholic fatty liver disease (NAFLD), is now recognized as the most prevalent chronic liver disease and represents a growing public health concern [1]. MASLD is defined by excess fat accumulation in

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the liver in individuals without substantial alcohol intake or other identifiable causes of hepatic steatosis [2]. In 2023, an international expert consensus introduced the term MASLD to better reflect the close relationship between hepatic steatosis and metabolic dysfunction while replacing the previous NAFLD nomenclature [3]. The global prevalence of MASLD has increased markedly over the past two decades, largely due to increasing rates of obesity and type 2 diabetes mellitus, together with a declining level of physical activity. Recent evidence has revealed that nearly one-third of the world's adult population is affected by MASLD, making it a major contributor to the global burden of chronic liver disease [4, 5]. The prevalence is particularly high among individuals with metabolic syndrome, obesity, insulin resistance, dyslipidemia, and type 2 diabetes, which are important metabolic factors in the development and progression of hepatic steatosis [6, 7]. The pathogenesis of MASLD is complex and involves multiple metabolic abnormalities. Insulin resistance has a central role in this process as it increases free fatty acid delivery to the liver and promotes hepatic lipid accumulation, oxidative stress, inflammation, and hepatocellular injury [8]. Although simple steatosis is the initial presentation in many patients, some may substantially develop metabolic dysfunction-associated steatohepatitis (MASH), followed by liver fibrosis, cirrhosis, and eventually hepatocellular carcinoma if left untreated [9]. Beyond its hepatic complications, MASLD is linked to several extra-hepatic conditions including, cardiovascular disease, chronic kidney disease, and type 2 diabetes mellitus, which are substantial contributors to morbidity and mortality in patients with MASLD [10]. Lifestyle modification particularly sustained weight loss continues to be the cornerstone of MASLD/MASH management. In patients with MASH and moderate-to-advanced fibrosis who meet treatment criteria, FDA-approved pharmacological options include resmetirom and semaglutide [11]. Early diagnosis and public awareness are key to reducing MASLD progression and preventing complications. However, despite the increasing prevalence of MASLD in Saudi Arabia, limited research has evaluated the level of awareness among health specialty students. Therefore, this study aimed to assess awareness of MASLD, its association with metabolic syndrome, and awareness of its associated complications among health specialty students at Umm Al-Qura University.

Methods

The study followed a descriptive cross-sectional design, with data obtained through a web-based survey of undergraduate students enrolled in health specialties at Umm Al-Qura University, Makkah, Saudi Arabia, from October 11, 2025, to February 10, 2026. Ethical approval was obtained from the Biomedical Ethics Committee of the Faculty of Medicine at Umm Al-Qura University (Approval No.: HAPO-02-K-012-2025-10-2944) in October 2025. The minimum required sample size was calculated using OpenEpi version 3.0, based on an estimated population of 1,300 students a 95% confidence level, an anticipated frequency of 50%, and a design effect of 1, yielding 297 participants. However, due to recruitment limitations, 143 participants were included. Participants were recruited through snowball sampling using an online, self-administered questionnaire. Participation was voluntary, and electronic informed consent was obtained before questionnaire completion. The survey assessed sociodemographic and academic characteristics, knowledge of MASLD, attitudes toward the disease, lifestyle-related behaviors, and awareness of diagnostic and therapeutic modalities. Inclusion criteria: The study included male and female students enrolled in health specialty program, at Umm Al-Qura University.Exclusion criteria: Students not enrolled in a health specialty program, students who declined consent, and questionnaires with incomplete responses to the knowledge items.

Data Analysis

All statistical analyses were conducted using SPSS version 28 (IBM Corp., Armonk, NY, USA). Participants' characteristics were summarized using descriptive statistics. Categorical variables were reported as frequencies and percentages, whereas continuous variables were expressed as means and standard deviation. To determine the overall MASLD knowledge score, each correct answer was awarded one point, while incorrect and uncertain responses received zero points. Scores were converted to percentages, with <60% classified as poor knowledge and ≥60% as good knowledge. Associations between knowledge level and categorical variables were assessed using Pearson's chi-square (χ^2) test, with the exact probability test applied when appropriate. Statistical significance was defined as a p-value of <0.05.

Results

(Table 1) presents the sociodemographic, academic, lifestyle, and health characteristics of the 143 health specialty students who participated in this study at Umm Al-Qura University. The age distribution was relatively balanced, with 30.1% aged 18–20 years, 39.9% aged 21–22 years, and 30.1% aged 23–25 years. Female students (60.8%) were more frequent than males (39.2%). Most participants were enrolled in Medicine & Surgery (80.4%), while the remaining students represented other health specialties. Most students were in clinical years (66.4%), and BMI analysis showed that 55.2% had normal weight, 28.0% were overweight, and 16.8% were obese, with a mean BMI of 24.91 ± 5.69. Nearly all participants were Saudi (97.9%) and single (95.8%), and most resided in Makkah (86.0%). The majority had never smoked (91.6%), 86.7% reported no chronic disease, and 68.5% reported a family history of chronic disease. (Table 2) summarizes students' knowledge, awareness, and sources of information regarding MASLD. Less than half (43.4%) reported knowing what MASLD is, while 23.8% did not know and 32.9% were unsure. Most participants had limited knowledge, with 46.9% reporting only a little knowledge and 34.3% recognizing only the term. Health education programs (44.4%), the internet (41.5%), and doctors (30.3%) were the main sources of information. Awareness of the terminology change from NAFLD to MASLD was low, as 49.0% were unaware and only 23.8% knew about the change. Regarding disease prevalence, 39.9% considered MASLD common, whereas 37.1% were unsure. (Table 3) presents students' responses to the MASLD knowledge questionnaire. Most participants correctly recognized obesity or overweight (95.8%), high triglycerides (94.4%), smoking (93.7%), diabetes (88.8%), genetics or family history (86.7%), and hypertension (84.6%) as risk factors. Other recognized risk factors included physical inactivity (78.3%), chronic medications (76.9%), and alcohol consumption (69.9%). Most students also identified cirrhosis (97.2%), cardiovascular disease (81.1%), and liver cancer (70.6%) as complications. However, 28.7% incorrectly believed MASLD could spread to others, and 22.4% thought it had no adverse consequences. Only 38.5% believed most patients show symptoms at diagnosis, while 55.2% correctly reported that lifespan depends on fibrosis degree. More than half recognized liver-related causes of death (54.5%), and 43.4% selected cardiovascular causes. Most participants (80.4%) recognized that symptoms increase as fibrosis progresses, although 53.1% were uncertain about the rate of progression. (Table 4) illustrates students' knowledge regarding MASLD management, diagnostic methods, and complications. Weight management strategies were the most frequently recognized intervention (65.0%) and the most commonly identified mainstay of management (40.6%). Other treatment options, including statins, semaglutide, vitamin E, resmetirom, and pioglitazone, were selected less frequently. Liver biopsy was identified by 65.7% as the definitive diagnostic method, while FibroScan and blood tests were selected by fewer students. Participants also identified important indications for liver biopsy, including suspected alternative liver disease, inconsistent blood tests with FibroScan, symptoms of liver dysfunction, and inconclusive FibroScan findings. Most students recognized cirrhosis (76.9%), cardiovascular disease (68.5%), and liver cancer (58.0%) as complications of progressive fibrosis. Regarding future therapies, 42.0% expected new treatments, while 46.2% were unsure. (Figure 1) shows that 61.5% of students had good overall MASLD knowledge, whereas 38.5% had poor knowledge. (Table 5) presents students' perceptions and attitudes toward MASLD. Most participants agreed or strongly agreed that MASLD is a dangerous disease. Nearly half agreed that they should undergo medical screening. Many expressed concerns regarding treatment, treatment costs, and possible side effects. Some believed MASLD could affect their ability to work and expressed concerns about healthcare providers' expertise. Most participants indicated that they would consult a healthcare professional and educate themselves if diagnosed with MASLD. (Table 6) examines factors associated with overall MASLD knowledge. Gender was significantly associated with knowledge ($p = 0.023$), with females demonstrating better knowledge than males. Clinical-year students also had significantly better knowledge than preclinical students ($p = 0.044$). Smoking status was significantly associated with knowledge ($p = 0.005$), as all current smokers had poor knowledge, whereas most never-smokers demonstrated good knowledge. No significant associations were found between knowledge and age, BMI, nationality, marital status, chronic disease history, or family history of chronic disease. (Table 7) shows the association between students' perceptions and overall knowledge. Agreement with undergoing MASLD screening

Table 1: Sociodemographic, academic, lifestyle, and health characteristics of health specialties students participating in the study at Umm Al-Qura University (n = 143).

Variable	Category	No. (%)
Age (years)	18–20	43 (30.1%)
	21–22	57 (39.9%)
	23–25	43 (30.1%)
Gender	Male	56 (39.2%)
	Female	87 (60.8%)
Current major/field of study	Medicine & Surgery (MBBS)	115 (80.4%)
	Health Education & Promotion	6 (4.2%)
	Nursing	5 (3.5%)
	Pharmacy	5 (3.5%)
	Clinical Nutrition	4 (2.8%)
	Public Health	2 (1.4%)
	Health Informatics & Management	2 (1.4%)
	Medical Laboratory Sciences	1 (0.7%)
	Anesthesia Technology	1 (0.7%)
	Dentistry	1 (0.7%)
	Respiratory Therapy	1 (0.7%)
Academic phase	Pre-clinical years	48 (33.6%)
	Clinical years	95 (66.4%)
Body Mass Index category	Normal weight	79 (55.2%)
	Overweight	40 (28.0%)
	Obese	24 (16.8%)
Weight (kg)	Mean ± SD	67.68 ± 19.26
Height (cm)	Mean ± SD	164.03 ± 8.28
BMI	Mean ± SD	24.91 ± 5.69
Nationality	Saudi	140 (97.9%)
	Non-Saudi	3 (2.1%)
Marital status	Single	137 (95.8%)
	Married	6 (4.2%)
Current residence	Makkah	123 (86.0%)
	Jeddah	10 (7.0%)

	Taif	5 (3.5%)
	Riyadh	2 (1.4%)
	Kunfudah	2(1.4%)
	Madinah	1 (0.7%)
Smoking status	Never smoked	131 (91.6%)
	Ex-smoker	6 (4.2%)
	Current cigarette/e-cigarette smoker	6 (4.2%)
Cigarettes per day	< 1 pack	6/6 (100%)
Diagnosed with a chronic disease	Yes	10 (7.0%)
	No	124 (86.7%)
	Don't know	9 (6.3%)
Family history of chronic disease	Yes	98 (68.5%)
	No	40 (28.0%)
	Don't know	5 (3.5%)

N: Number of participants.

Table 2: General Knowledge, awareness, and sources of information regarding MASLD among health specialties students at Umm Al-Qura University (n = 143).

Variable	No. (%)
Do you know what MASLD is?	
Yes	62 (43.4%)
No	34 (23.8%)
Not sure	47 (32.9%)
How much do you know about MASLD?	
Only know the term "MASLD"	49 (34.3%)
A little bit	67 (46.9%)
A fair amount	24 (16.8%)
A lot	3 (2.1%)
Source of information about MASLD	
None	5 (3.5%)
My doctor	43 (30.3%)
Family or friends	22 (15.5%)
Internet	59 (41.5%)
Health education (hospital/community)	63 (44.4%)
TV	7 (4.9%)
Radio	7 (4.9%)

Books, magazines, newspapers	36 (25.4%)
Public advertisements	7 (4.9%)
Study	3 (2.1%)
Has the information you have given you a negative impression?	
Yes	54 (37.8%)
No	25 (17.5%)
I don't know	64 (44.8%)
Awareness of terminology change (NAFLD → MASLD)	
Not aware	70 (49.0%)
Heard of it, but don't know the details	39 (27.3%)
Aware of the change	34 (23.8%)
How common is MASLD in the general population?	
Uncommon	20 (14.0%)
Common	57 (39.9%)
Very common	13 (9.1%)
I don't know	53 (37.1%)

N: Number of participants.

Table 3: Responses to the NAFLD/MASLD knowledge questionnaire among health specialties students at Umm Al-Qura University (n = 143).

NAFLD Knowledge Questionnaire items	Category	No. (%)
"MASLD is not reversible."	TRUE	25 (17.5%)
	FALSE	118 (82.5%)
Obesity or being overweight is a risk factor	TRUE	137 (95.8%)
	FALSE	6 (4.2%)
Diabetes is a risk factor	TRUE	127 (88.8%)
	FALSE	16 (11.2%)
High triglyceride levels are a risk factor	TRUE	135 (94.4%)
	FALSE	8 (5.6%)
High blood pressure is a risk factor	TRUE	121 (84.6%)
	FALSE	22 (15.4%)
Smoking is a risk factor	TRUE	134 (93.7%)
	FALSE	9 (6.3%)

Genetics or family history is a risk factor	TRUE	124 (86.7%)
	FALSE	19 (13.3%)
Drinking too much alcohol is a risk factor	TRUE	100 (69.9%)
	FALSE	43 (30.1%)
Decreased physical activity is a risk factor	TRUE	112 (78.3%)
	FALSE	31 (21.7%)
Some chronic medications are risk factors	TRUE	110 (76.9%)
	FALSE	33 (23.1%)
Cirrhosis is a complication of MASLD	TRUE	139 (97.2%)
	FALSE	4 (2.8%)
Liver cancer is a complication of MASLD	TRUE	101 (70.6%)
	FALSE	42 (29.4%)
Cardiovascular disease complications	TRUE	116 (81.1%)
	FALSE	27 (18.9%)
MASLD can spread to other people	TRUE	41 (28.7%)
	FALSE	102 (71.3%)
There are no adverse consequences	TRUE	32 (22.4%)
	FALSE	111 (77.6%)
Do most patients show symptoms at diagnosis?	Yes	55 (38.5%)
	Sometimes	66 (46.2%)
	No	22 (15.4%)
Do people with MASLD have the same lifespan as those without it?	Depends on the degree of fibrosis	79 (55.2%)
	Yes	14 (9.8%)
	No	19 (13.3%)
	Don’t know	31 (21.7%)
The most common cause of death in MASLD patients	Liver diseases	78 (54.5%)
	Cardiovascular diseases	62 (43.4%)
	Renal diseases	3 (2.1%)
Does MASLD progress rapidly?	Yes	35 (24.5%)
	No	32 (22.4%)
	I don’t know	76 (53.1%)
What happens as fibrosis progresses?	Increased symptoms	115 (80.4%)
	No change in symptoms	19 (13.3%)
	Decreased symptoms	9 (6.3%)

N: Number of participants.

Table 4: Knowledge of MASLD management, diagnostic methods, and complications among health specialties students at Umm Al-Qura University (n = 143).

Variable	No. (%)
Which of the following do you believe are ……...? (select all that apply)	
1. The FDA-approved medications for MASLD	
Semaglutide	58 (40.6%)
Statins	68 (47.6%)
Vitamin E	50 (35.0%)
Weight management strategies	93 (65.0%)
Resmetirom	42 (29.4%)
Pioglitazone	41 (28.7%)
2. The mainstay management strategy for MASLD	
Semaglutide	25 (17.5%)
Statins	21 (14.7%)
Vitamin E	10 (7.0%)
Weight management strategies	58 (40.6%)
Resmetirom	18 (12.6%)
Pioglitazone	11 (7.7%)
3. The most cost-effective methods to diagnose MASLD & stage fibrosis	
Blood tests	43 (30.1%)
FibroScan (Elastography)	46 (32.2%)
Liver biopsy	54 (37.8%)
4. The expected new MASLD treatments to be released soon?	
Yes	60 (42.0%)
No	17 (11.9%)
Not sure	66 (46.2%)
5. The definitive methods to diagnose MASLD & stage fibrosis	
Blood tests	11 (7.7%)
FibroScan (Elastography)	38 (26.6%)
Liver biopsy	94 (65.7%)
6. The times to consider liver biopsy in suspected MASLD	
Suspicion of another liver disease	87 (60.8%)
Blood tests inconsistent with FibroScan	82 (57.3%)
Symptoms of liver dysfunction	76 (53.1%)

Inconclusive FibroScan results	47 (32.9%)
7. The complications of progressive liver fibrosis (concerned about)	
Cardiovascular diseases (CVDs)	98 (68.5%)
Liver cancer	83 (58.0%)
Cirrhosis & related complications	110 (76.9%)

N: Number of participants. Multiple selections were permitted; percentages do not sum to 100%.

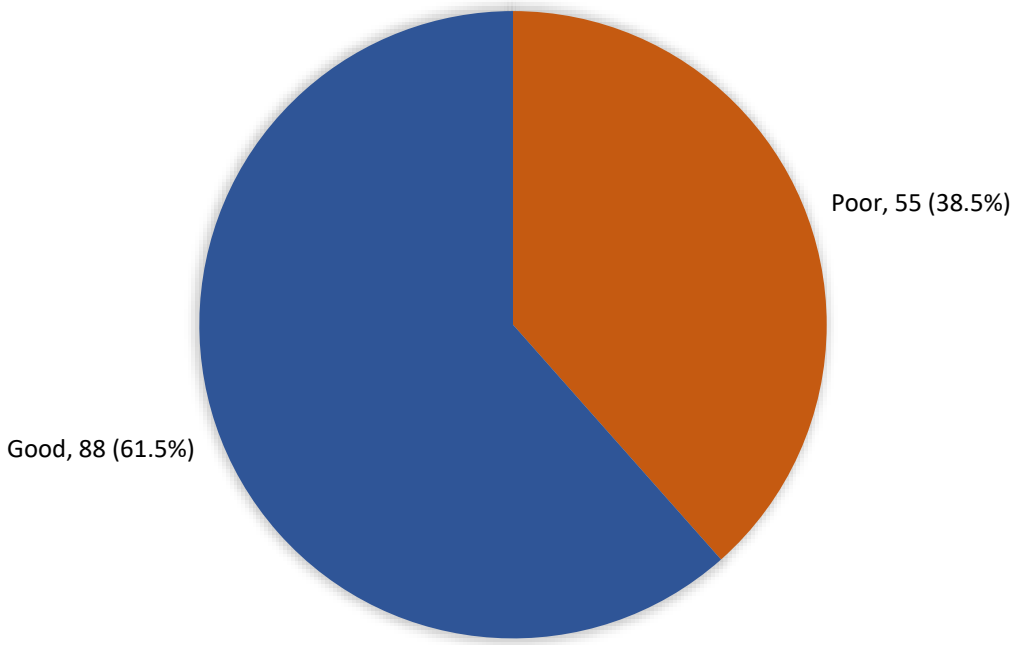

Figure1:Overall MASLD knowledge level among health specialties students at Umm Al-Qura University (n = 143), N: Number of participants.

Table 5: Perceptions and attitudes toward MASLD among health specialties students at Umm Al-Qura University (n = 143).

Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
I think MASLD can be a dangerous condition	0 (0.0%)	2 (1.4%)	21 (14.7%)	39 (27.3%)	81 (56.6%)
I think I should undergo medical screening for MASLD	7 (4.9%)	19 (13.3%)	50 (35.0%)	32 (22.4%)	35 (24.5%)
If I had MASLD, I wouldn't be able to work anymore	19 (13.3%)	34 (23.8%)	44 (30.8%)	24 (16.8%)	22 (15.4%)
If I had MASLD, I would be worried about finding the best treatment	2 (1.4%)	9 (6.3%)	37 (25.9%)	50 (35.0%)	45 (31.5%)
If I had MASLD, I would be worried about the costs of medical treatment	22 (15.4%)	6 (4.2%)	45 (31.5%)	38 (26.6%)	32 (22.4%)
I think treatment for MASLD is not worth the side effects of medications	12 (8.4%)	29 (20.3%)	50 (35.0%)	31 (21.7%)	21 (14.7%)
If I developed signs or symptoms of MASLD, I would not talk to anyone immediately	38 (26.6%)	18 (12.6%)	30 (21.0%)	25 (17.5%)	32 (22.4%)
I am worried that doctors and hospitals do not have sufficient knowledge and expertise to handle MASLD	18 (12.6%)	25 (17.5%)	42 (29.4%)	35 (24.5%)	23 (16.1%)
If I had MASLD, I would go to a healthcare professional and get educated on the disease	1 (0.7%)	2 (1.4%)	25 (17.5%)	31 (21.7%)	84 (58.7%)

N: Number of participants.

Table 6: Factors Associated with the overall MASLD knowledge level among health specialties students at Umm Al-Qura University (n = 143).

Factors	Overall knowledge level		*P-value*
	Poor Knowledge	Good Knowledge	
Age (years)			
18–20	21 (48.8%)	22 (51.2%)	0.239
21–22	20 (35.1%)	37 (64.9%)	
23–25	14 (32.6%)	29 (67.4%)	
Gender			
Male	28 (50.0%)	28 (50.0%)	0.023*
Female	27 (31.0%)	60 (69.0%)	
Current major/field of study			
Anesthesia Technology	0 (0.0%)	1 (100.0%)	0.320^
Clinical Nutrition	0 (0.0%)	4 (100.0%)	
Dentistry	0 (0.0%)	1 (100.0%)	
Health Education & Promotion	2 (33.3%)	4 (66.7%)	
Health Informatics & Management	0 (0.0%)	2 (100.0%)	
Medical Laboratory Sciences	1 (100.0%)	0 (0.0%)	
Medicine & Surgery (MBBS)	45 (39.1%)	70 (60.9%)	
Nursing	3 (60.0%)	2 (40.0%)	
Pharmacy	2 (40.0%)	3 (60.0%)	
Public Health	2 (100.0%)	0 (0.0%)	
Respiratory Therapy	0 (0.0%)	1 (100.0%)	
Academic phase			
Pre-clinical years	24 (50.0%)	24 (50.0%)	0.044*
Clinical years	31 (32.6%)	64 (67.4%)	
Body Mass Index			
Normal weight	31 (39.2%)	48 (60.8%)	0.978
Overweight	15 (37.5%)	25 (62.5%)	
Obese	9 (37.5%)	15 (62.5%)	
Nationality			0.310^

Saudi	53 (37.9%)	87 (62.1%)	
Non-Saudi	2 (66.7%)	1 (33.3%)	
Marital status			
Single	54 (39.4%)	83 (60.6%)	0.262^
Married	1 (16.7%)	5 (83.3%)	
Smoking status			
Never smoked	46 (35.1%)	85 (64.9%)	0.005*
Ex-smoker	3 (50.0%)	3 (50.0%)	
Current smoker	6 (100.0%)	0 (0.0%)	
Diagnosed with chronic disease			
Yes	5 (50.0%)	5 (50.0%)	0.672
No	46 (37.1%)	78 (62.9%)	
Don't know	4 (44.4%)	5 (55.6%)	
Family history of chronic disease			
Yes	36 (36.7%)	62 (63.3%)	0.457^
No	18 (45.0%)	22 (55.0%)	
Don't know	1 (20.0%)	4 (80.0%)	

P: Pearson X^2 test *^: Exact Probability test* ** P < 0.05 (significant)*

N: Number of participants.

Table 7: Association between students' perceptions and attitudes toward MASLD and overall knowledge level among health specialties students at Umm Al-Qura University (n = 143).

Statement	Overall knowledge level		p-value
	Poor Knowledge	Good Knowledge	
I think MASLD can be a dangerous condition			
Disagree	1 (1.8%)	1 (1.1%)	0.148^
Neutral	12 (21.8%)	9 (10.2%)	
Agree	42 (76.4%)	78 (88.6%)	
I think I should undergo medical screening for MASLD			
Disagree	4 (7.3%)	22 (25.0%)	0.022*
Neutral	20 (36.4%)	30 (34.1%)	
Agree	31 (56.4%)	36 (40.9%)	

If I had MASLD, I wouldn't be able to work anymore			
Disagree	12 (21.8%)	41 (46.6%)	0.008*
Neutral	19 (34.5%)	25 (28.4%)	
Agree	24 (43.6%)	22 (25.0%)	
If I had MASLD, I would be worried about finding the best treatment			
Disagree	1 (1.8%)	10 (11.4%)	0.087^
Neutral	17 (30.9%)	20 (22.7%)	
Agree	37 (67.3%)	58 (65.9%)	
If I had MASLD, I would be worried about the costs of medical treatment			
Disagree	10 (18.2%)	18 (20.5%)	0.935
Neutral	18 (32.7%)	27 (30.7%)	
Agree	27 (49.1%)	43 (48.9%)	
I think treatment for MASLD is not worth the side effects of medications			
Disagree	13 (23.6%)	28 (31.8%)	0.330
Neutral	18 (32.7%)	32 (36.4%)	
Agree	24 (43.6%)	28 (31.8%)	
If I developed signs or symptoms of MASLD, I would not talk to anyone immediately			
Disagree	15 (27.3%)	41 (46.6%)	0.070
Neutral	14 (25.5%)	16 (18.2%)	
Agree	26 (47.3%)	31 (35.2%)	
I am worried that doctors and hospitals do not have sufficient knowledge and expertise to handle MASLD			
Disagree	11 (20.0%)	32 (36.4%)	0.096
Neutral	17 (30.9%)	25 (28.4%)	
Agree	27 (49.1%)	31 (35.2%)	
If I had MASLD, I would go to a healthcare professional and get educated on the disease			
Disagree	3 (5.5%)	0 (0.0%)	0.085^
Neutral	9 (16.4%)	16 (18.2%)	
Agree	43 (78.2%)	72 (81.8%)	

P: Pearson X^2 test *^: Exact Probability test* ** P < 0.05 (significant)*

N: Number of participants.

($p = 0.022$) and the belief that MASLD would prevent working ($p = 0.008$) were significantly associated with knowledge level. No significant associations were observed between knowledge and other perception statements, including disease severity, treatment concerns, costs, healthcare expertise, or willingness to seek professional advice.

Discussion

This study evaluated the knowledge, awareness, and perceptions of health specialty students at Umm Al-Qura University regarding metabolic dysfunction-associated steatotic liver disease (MASLD). Given the increasing global burden of MASLD, which is particularly associated with obesity, diabetes, and other metabolic disorders, health specialty students represent an important group whose knowledge will influence future patient education, disease prevention, and clinical practice. Overall, participants demonstrated a satisfactory level of knowledge regarding MASLD. This finding is encouraging and may reflect their healthcare background and the increasing emphasis on metabolic diseases in medical education. Nevertheless, important knowledge gaps remained in several aspects of the disease. One of the most notable findings was the limited awareness of the recent adoption of MASLD terminology in place of non-alcoholic fatty liver disease (NAFLD). Most participants were either unaware of the new terminology or had only heard about it without understanding its implications. This finding is unsurprising, as the updated nomenclature has only recently been introduced. Hsu and Loomba [12] emphasized that adopting the new terminology requires considerable educational efforts to ensure its widespread understanding among healthcare professionals and trainees. Therefore, the low awareness observed in this study may reflect the limited incorporation of these updates into undergraduate curricula. Awareness of the major risk factors for MASLD was generally high. Obesity was the most frequently recognized risk factor, followed by hypertriglyceridemia, diabetes mellitus, smoking, family history, and hypertension. These findings indicate that health specialty students have a good understanding of the metabolic basis of MASLD and are consistent with the findings of Abdelkhalik et al. [13], who reported greater awareness of metabolic risk factors than other aspects of the disease. This may also reflect the increasing prevalence of obesity and diabetes in Saudi Arabia and the greater emphasis placed on these conditions during healthcare training. Knowledge of MASLD complications was also encouraging. Most participants correctly identified cirrhosis, cardiovascular disease, and liver cancer as major complications. This finding is especially relevant given the substantial contribution of cardiovascular disease to morbidity and mortality among patients with MASLD. Adequate awareness of these complications among future healthcare professionals may facilitate earlier identification of at-risk individuals and promote preventive interventions. Despite the generally satisfactory knowledge, several misconceptions were identified. Some participants incorrectly believed that MASLD could be transmitted from person to person, while others believed that it has no significant health consequences or were uncertain about its rate of progression. Similar misconceptions have been reported by Abdelkhalik et al. [13], suggesting that although students understand the major risk factors, they have a less comprehensive understanding of the disease's natural history and prognosis. These findings highlight the need for educational programs that emphasize disease progression, prognosis, and long-term outcomes. Participants demonstrated better knowledge of lifestyle management than of diagnostic and therapeutic approaches. While weight reduction was widely recognized as a cornerstone of MASLD management and liver biopsy was correctly identified as the definitive diagnostic method, awareness of pharmacological treatment options and other diagnostic modalities was comparatively lower. These findings are consistent with previous studies and suggest that undergraduate education places greater emphasis on prevention than on diagnosis and management [14,15]. Regarding information sources, health education programs and internet resources were the most frequently reported sources of MASLD knowledge, whereas formal academic teaching was less commonly cited. This finding may indicate insufficient coverage of MASLD within undergraduate curricula and supports the need to strengthen educational content related to this increasingly prevalent disease. Participants generally expressed positive perceptions toward MASLD. Most regarded the disease as potentially serious and indicated that they would seek professional medical advice and educate themselves if diagnosed. Similar positive attitudes have been reported despite existing

knowledge gaps [12]. Such perceptions may contribute to improved prevention, earlier diagnosis, and better patient education in future clinical practice. Female students, clinical-year students, and non-smokers demonstrated significantly higher knowledge levels than their counterparts, suggesting that clinical exposure, educational experience, and healthy lifestyle behaviors positively influence disease awareness. In contrast, students with lower knowledge were more likely to overestimate the disease's impact on work and to support routine screening, indicating that limited knowledge may contribute to misconceptions regarding disease severity. These findings emphasize the importance of targeted educational interventions to improve awareness, address misconceptions, and better prepare future healthcare professionals to manage the growing burden of MASLD. Limitations: Several limitations should be considered when interpreting these findings. First, the use of self-reported data introduces the possibility of response bias. Second, the smaller-than-planned sample size and participants were recruited exclusively from health specialty students at Umm Al-Qura University, which may restrict the applicability of the findings to other student populations. Lastly, because of the cross-sectional nature of the study, causal relationships cannot be inferred. Recommendations: Although participants generally had positive attitudes toward MASLD, the identified misconceptions highlight the need for enhanced educational efforts. Integrating updated MASLD content into undergraduate curricula, along with educational workshops and awareness campaigns, may improve students' knowledge and better prepare future healthcare professionals for disease prevention, early detection, and patient education. Further multicenter studies with larger and more diverse student populations are recommended to validate these findings and assess the impact of educational interventions.

Conclusion

In conclusion, health specialty students at Umm Al-Qura University demonstrated an overall satisfactory level of knowledge regarding metabolic dysfunction-associated steatotic liver disease (MASLD), particularly its major risk factors and complications. However, notable knowledge gaps remained regarding the recent terminology change, disease progression, diagnosis, and treatment options. Female students, clinical-year students, and non-smokers showed significantly higher knowledge levels.

Conflict of Interest

None

Funding

None

References

1. Huang DQ, Wong VW, Rinella ME, Boursier J, Lazarus JV, Yki-Järvinen H, et al. Metabolic dysfunction-associated steatotic liver disease in adults. Nat Rev Dis Primers. 2025;11(1):14.

2. De A, Panigrahi M, Duseja A, Singh SP. Metabolic-dysfunction associated steatotic liver disease (MASLD). In: Hepatology. Academic Press; 2025;32(3):861-88.

3. Rinella ME, Lazarus JV, Ratziu V, Francque SM, Sanyal AJ, Kanwal F, et al. A multisociety Delphi consensus statement on new fatty liver disease nomenclature. Ann Hepatol. 2024;29(1):101133.

4. Miao L, Targher G, Byrne CD, Cao YY, Zheng MH. Current status and future trends of the global burden of MASLD. Trends Endocrinol Metab. 2024;35(8):697-707.

5. Riazi K, Azhari H, Charette JH, Underwood FE, King JA, Afshar EE, et al. The prevalence and incidence of NAFLD worldwide: a systematic review and meta-analysis. Lancet Gastroenterol Hepatol. 2022;7(9):851-61.

6. Eslam M, Sanyal AJ, George J, Sanyal A, Neuschwander-Tetri B, Tiribelli C, et al. MAFLD: a consensus-driven proposed nomenclature for metabolic associated fatty liver disease. Gastroenterology. 2020;158(7):1999-2014.

7. Younossi ZM, Golabi P, Paik JM, Henry A, Van Dongen C, Henry L. The global epidemiology of nonalcoholic fatty liver disease (NAFLD) and nonalcoholic steatohepatitis (NASH): a systematic review. Hepatology. 2023;77(4):1335-47.

8. Bansal SK, Bansal MB. Pathogenesis of MASLD and MASH–role of insulin resistance and lipotoxicity. Aliment Pharmacol Ther. 2024;59:S10-22.

9. European Association for the Study of the Liver. EASL Clinical Practice Guidelines on the management of metabolic dysfunction-associated steatotic liver disease (MASLD). J Hepatol. 2024;81(3):492-542.

10. Byrne CD, Targher G. NAFLD as a driver of chronic kidney disease. J Hepatol. 2020;72(4):785-801.

11. Younossi ZM, Zelber-Sagi S, Henry L, Gerber LH. Lifestyle interventions in nonalcoholic fatty liver disease. Nat Rev Gastroenterol Hepatol. 2023;20(11):708-22.

12. Hsu CL, Loomba R. From NAFLD to MASLD: implications of the new nomenclature for preclinical and clinical research. Nat Metab. 2024;6(4):600-2.
13. Abdelkhalik M, Tawil SA, Fouani AE, Allakiss N, Mattar L, Faour WH, et al. Unveiling metabolic dysfunction-associated fatty liver disease: Knowledge gaps and attitudes among Lebanese university students. PLoS ONE. 2024;19(8):e0306825.
14. Chen S, Chao S, Konerman M, Zhang W, Rao H, Wu E, et al. Survey of nonalcoholic fatty liver disease knowledge, nutrition, and physical activity patterns among the general public in Beijing, China. Dig Dis Sci. 2019;64(12):3480-8.
15. Tawil SA, Abdelkhalik M, Fouani AE, Allakiss N, Mattar L, Faour WH, et al. Exploring the knowledge and attitudes towards metabolic dysfunction associated fatty liver disease (MAFLD): Validation and correlations of MAFLD-knowledge questionnaire and MAFLD-attitude questionnaire. Heliyon. 2024;10(22):e40217.