Journal of Clinical and Translational Hepatology **2025**
DOI: 10.14218/JCTH.2025.00286

Original Article

Mapping Metabolic Dysfunction-associated Steatotic Liver Disease Models of Care across 17 Middle East and North Africa Countries: Insights into Guidelines, Infrastructure, and Referral Systems

Mohamed El-Kassas[1,2,3*], Khalid M. AlNaamani[2,3,4], Rofida Khalifa[5], Yusuf Yilmaz[2,3,6], Asma Labidi[2,7], Maen Almattooq[2,8], Faisal M. Sanai[2,9], Maisam W.I. Akroush Nabil Debzi[2,11], Mohammed A. Medhat[2,12], Imam Waked[2,13], Ali Tumi[2,14], Mohamed Elbadry[1,2], Mohammed Omer Mohammed[15], Ala I. Sharara[2,16], Ali El Houni[17], Mohamed Alsenbesy[18,19], Hisham El-Khayat[20], Mina Tharwat[21], Abdel-Naser Elzouki[2,3,22], Khalid A. Alswat[2,3,23], and Zobair M. Younossi[3,24] on behalf of the Steatotic Liver Disease Study Foundation in Middle East and North Africa (SLMENA) Collaborators^

[1]Endemic Medicine Department, Faculty of Medicine, Helwan University, Cairo, Egypt; [2]Steatotic Liver Diseases Study Foundation in Middle East and North Africa, Cairo, Egypt; [3]The Global NASH/MASH Council, Washington DC, USA; [4]Department of Medicine, Division of Gastroenterology and Hepatology, The Medical City for Military and Security Services, Muscat, Oman; [5]Tropical Medicine Department, Faculty of Medicine, Minia University, Minya, Egypt; [6]Department of Gastroenterology, School of Medicine, Recep Tayyip Erdoğan University, Rize, Turkey; [7]Department of Gastroenterology "A", Rabta Hospital, Tunis, Tunisia; [8]Gastroenterology and Hepatology Department, Jaber AlAhmad Hospital, Kuwait City, Kuwait; [9]Gastroenterology Section, Department of Medicine, King Abdulaziz Medical City, King Abdullah International Medical Research Center, Ministry of National Guard - Health Affairs, Jeddah, Saudi Arabia; [10]Digestive and Liver Disease Clinic, Private Sector, Faculty of Medicine, Jordan University, Amman, Jordan; [11]Hepatology Department, Mustapha Bacha University Hospital, Algiers, Algeria; [12]Tropical Medicine and Gastroenterology Department, Assiut University, Assiut, Egypt; [13]Hepatology Department, National Liver Institute, Menoufia University, Shebeen ElKom, Egypt; [14]Medical Department, Central Hospital, Tripoli, Libya; [15]Department of Clinical Science, University of Sulaimani, Sulaimani, Iraq; [16]Department of Internal Medicine, Division of Gastroenterology, American University of Beirut Medical Center, Lebanon; [17]Medicine Department, Dubai Medical University, Dubai, United Arab Emirates; [18]Internal Medicine Department, Arabian Gulf University, Manama, Bahrain; [19]Internal Medicine Department, Qena University, Qena, Egypt; [20]Department of Gastroenterology, Hepatology and Endemic Medicine, Theodore Bilharz Research Institute, Giza, Egypt; [21]Tropical Medicine and Gastroenterology Department, Faculty of Medicine, Aswan University, Aswan, Egypt; [22]Department of Medicine, Hamad Medical Corporation and College of Medicine, Qatar University, Doha, Qatar; [23]Liver Disease Research Center, Department of Medicine, College of Medicine, King Saud University, Riyadh, Saudi Arabia; [24]Beatty Liver and Obesity Research Program, Inova Health System, Washington DC, USA

Received: June 14, 2025 | **Revised:** August 02, 2025 | **Accepted:** August 09, 2025 | **Published online:** September 01, 2025

Abstract

Background and Aims: Metabolic dysfunction-associated steatotic liver disease (MASLD) represents an escalating healthcare burden across the Middle East and North Africa (MENA) region; however, system-level preparedness remains largely undefined. This study aimed to assess existing models of care, clinical infrastructure, policy frameworks, and provider perspectives across 17 MENA countries. ***Methods:*** A cross-sectional, mixed-methods survey was distributed to clinicians from MASLD-related specialties across the region. A total of 130 experts (87.2% response rate) from academic, public, and private sectors in 17 countries participated. The questionnaire addressed national policies, diagnostic and therapeutic practices, referral pathways, multidisciplinary team (MDT) integration, and patient/public engagement. Quantitative responses were analyzed descriptively, while qualitative inputs underwent thematic analysis. ***Results:*** Only 35.4% of respondents confirmed the presence of national clinical guidelines for MASLD, and 73.1% reported the absence of a national strategy. Structured referral pathways were reported by 39.2% of participants, and only 31.5% be-

Keywords: Metabolic dysfunction-associated steatotic liver disease; MASLD; Middle East and North Africa region; MENA; Models of care; MoCs; Multidisciplinary care.

^The complete list of SLMENA Collaborators appears in the Acknowledgments.

***Correspondence to:** Mohamed El-Kassas, Endemic Medicine Department, Faculty of Medicine, Helwan University, Ain Helwan, Cairo 11795, Egypt. ORCID: https://orcid.org/0000-0002-3396-6894. Tel: +20-111-445-5552, E-mail: m_elkassas@hq.helwan.edu.eg.

lieved the current model adequately addresses MASLD. While 60% supported MDT approaches, implementation remained inconsistent. Limited access to transient elastography was reported by 26.2% of providers. Public education efforts were minimal: 22.3% reported no available tools, and 87.7% indicated the absence of patient-reported outcomes data. Nearly half (47.7%) cited poor patient adherence, attributed to low awareness, financial barriers, and lack of follow-up. ***Conclusions:*** Significant policy, structural, and educational gaps persist in MASLD care across the MENA region. To address this rising burden, countries must adopt integrated national strategies, expand access to non-invasive diagnostic tests, institutionalize MDT care, and invest in both public and provider education as essential pillars of system-wide preparedness.

Citation of this article: El-Kassas M, AlNaamani KM, Khalifa R, Yilmaz Y, Labidi A, Almattooq M, *et al*. Mapping Metabolic Dysfunction-associated Steatotic Liver Disease Models of Care across 17 Middle East and North Africa Countries: Insights into Guidelines, Infrastructure, and Referral Systems. J Clin Transl Hepatol 2025. doi: 10.14218/JCTH.2025.00286.

Introduction

Metabolic dysfunction-associated steatotic liver disease (MASLD), previously termed non-alcoholic fatty liver disease (NAFLD), is currently the most prevalent cause of chronic liver disease worldwide.[1] Approximately 20% of individuals with MASLD progress to metabolic dysfunction-associated steatohepatitis, a major contributor to advanced liver fibrosis, cirrhosis, and hepatocellular carcinoma, leading to substantial economic burdens, increased healthcare costs, and reduced patient quality of life.[2,3]

Globally, MASLD prevalence has increased markedly in recent decades, rising from 25.3% during 1990–2006 to 38.2% between 2016–2019, representing a 50.4% increase over 30 years.[4] The Middle East and North Africa (MENA) region, including Arab countries in North Africa, the Levant, the Gulf, and Turkey, exhibits one of the highest global prevalence rates of MASLD, second only to Latin America, at approximately 36.5%.[5,6] Notably, prevalence within this region varies considerably, reaching as high as 56% in Egypt (reference). This increased prevalence is largely attributable to the high burden of MASLD-associated risk factors in the region, such as obesity, which is reported to affect 55% of females and 30% of males in Kuwait, significantly surpassing global averages of 19% and 14%, respectively.[3,6,7] The prevalence of type 2 diabetes in the MENA region is also exceptionally high, ranking first globally at 12%, compared to the global average of 8%.[7] Additionally, sedentary lifestyles are more common in the MENA region (33%) than globally (28%).[8] The region is also experiencing a rapid increase in MASLD-related complications, with annual rates per 100,000 individuals of 3.45 for liver-related complications, 1.76 for mortality, and 1.71 for disability-adjusted life years, all significantly exceeding global averages.[9]

Given the complexity of MASLD, effective management requires integrated, patient-centered models of care (MoCs) across all levels of healthcare. These frameworks enable timely diagnosis, coordinated multidisciplinary treatment, and ongoing follow-up involving primary care, hepatology, endocrinology, cardiology, nutrition, obesity medicine, bariatric surgery, and mental health services.[10] Despite this obvious need, previous studies have highlighted significant deficiencies within national and subnational strategic frameworks for MASLD management in many regions, including MENA.[11] Public health responses remain fragmented and insufficiently developed to address the escalating disease burden adequately.[10,11] Importantly, there is a lack of region-wide assessments evaluating the presence of national strategies, referral systems, and integrated MoCs tailored to MASLD in the MENA region. Most existing studies have focused on epidemiological trends or isolated national experiences, leaving a substantial gap in understanding the systemic and structural readiness of MENA health systems. The region remains at the epicenter of the global MASLD epidemic, yet responses are hindered by the absence of region-specific guidelines, fragmented care models, and limited data. A recently proposed regional research and action agenda underscored the urgency of multisectoral coordination to strengthen surveillance systems, integrate MASLD into non-communicable disease policies, and prioritize workforce training and capacity building.[12] This study was therefore designed to fill that critical gap by capturing frontline expert insights from 17 countries to identify strengths, systemic deficiencies, and actionable priorities. The findings aim to inform evidence-based strategies and support regionally tailored improvements in MASLD care delivery.

Methods

Study design

This study employed a cross-sectional, mixed-methods design to assess the current landscape of MASLD care across the MENA region. The approach integrated both quantitative and qualitative components to capture a broad range of clinical practices, system-level preparedness, and provider perspectives.

Setting and sampling frame

The study was conducted under the auspices of the Steatotic Liver Disease Study Foundation in Middle East and North Africa (hereinafter referred to as SLMENA), a regional scientific consortium established to advance research, awareness, and clinical collaboration on MASLD (www.slmena.org). Survey participants were selected using purposive and convenience sampling methods. Leveraging SLMENA's professional network, a curated list of experts actively involved in MASLD diagnosis and management from 17 MENA countries was compiled. The survey invitation was initially distributed to 149 eligible professionals via direct email and affiliated professional societies.

Survey instrument and data collection

Data were collected through an online survey developed collaboratively by a panel of regional experts. The survey was pilot-tested among five senior experts from different MENA countries to ensure clarity, relevance, and contextual appropriateness. Based on their feedback, minor adjustments were made to enhance comprehensibility and content validity.

The survey was administered over two months (February–March 2025). It consisted of both closed-ended questions (multiple-choice and Likert-scale formats) to capture quantitative data, and open-ended questions to elicit qualitative insights into barriers, facilitators, and actionable strategies for improving MASLD care. Survey domains included:

- National policies and public health strategies related to MASLD;
- Availability and accessibility of clinical guidelines;
- Diagnostic and therapeutic modalities currently in use;
- Structure and efficiency of referral pathways;

- Degree of multidisciplinary collaboration in MASLD care;
- Provider perceptions of system gaps, public awareness, and opportunities for improvement.

Data analysis

Quantitative data were analyzed using descriptive statistics, including frequencies, percentages, means, and standard deviations. Comparative analyses explored differences in practices and capacities across countries and care settings. Qualitative data from open-ended responses were analyzed using thematic content analysis.

Ethical considerations

The study was approved by the Research Ethics Committee of the Faculty of Medicine, Helwan University, Cairo, Egypt (Serial 152-2024). Before beginning the survey, participants were informed of the study's purpose, their eligibility, and the voluntary nature of participation. Informed consent was obtained electronically prior to survey access. Although participants were asked to provide their names for verification and coordination purposes, all identifying information was stored separately from the survey responses and was not linked to the analytical dataset. Anonymity of responses was maintained during data analysis, and all information was handled in accordance with data protection and confidentiality standards.

Results

A total of 130 healthcare professionals involved in the diagnosis and management of MASLD who met the inclusion criteria completed the survey, yielding a high response rate of 87.2%. All participants were actively engaged in diagnosing, treating, or managing MASLD across diverse healthcare settings, including hospitals, specialized clinics, and primary care facilities, representing 17 countries within the MENA region. The sample included 81 male and 48 female respondents, with one participant preferring not to disclose their gender. The majority were senior clinicians, with 66.1% aged 46 years or older, most commonly in the 46–55-year range (36.9%). Professional backgrounds reflected the study's clinical focus: 58.5% identified as hepatologists and 38.5% as gastroenterologists. Geographically, the strongest representation came from Turkey (22.3%), Egypt (17.7%), Saudi Arabia (17.7%), and Tunisia (15.4%). Academic and public sector institutions were the most common practice settings, with 48.5% working in university hospitals and 38.5% in government or public healthcare systems. Most participants (93.1%) were practicing clinicians. Regarding scholarly activity, 74.6% had authored between one and five publications related to MASLD, while 19.2% had published six to twenty-five papers. Notably, 67.7% had more than a decade of professional experience, and 49.3% had over 10 years of direct experience managing MASLD cases. Table 1 presents demographic, professional, and MASLD-related characteristics of study participants.

The following sections provide a detailed analysis of each survey domain to explore patterns, gaps, and contextual insights related to MASLD care across the region.

National policy or strategy for MASLD

MASLD remains underrepresented in national healthcare strategies, with 73.1% of respondents reporting that their country lacks a dedicated national policy or strategy. Among the 26.9% whose countries do have a policy, only 6.1% rated it as comprehensive, addressing nearly all key aspects of MASLD management. Furthermore, only 10.8% believed MASLD is recognized as a public health concern to a great or very great extent, underscoring the need for stronger policy prioritization.

Gaps in national clinical guidelines

National clinical guidelines are also lacking, with only 35.4% of respondents reporting the presence of nationally recognized MASLD guidelines, while 64.6% indicated their absence. Turkey (Turkish Association for the Study of the Liver; 15.4%) and Saudi Arabia (The Saudi Society for the Study of Liver Disease and Transplantation; 10.8%) were the primary contributors, though other MENA countries had limited representation. Only 29.2% of respondents could locate and share their national guidelines' URLs. While 30.7% found their national guidelines easy or very easy to access, only 20% reported them as widely available. Implementation in clinical practice remains limited, with just 9.2% stating that guidelines are applied to a great or very great extent, suggesting barriers to adoption.

Reliance on international guidelines

In the absence of national guidelines, 58.5% of respondents reported relying on international guidelines, primarily from the European Association for the Study of the Liver (EASL) (37.7%) and the American Association for the Study of Liver Diseases (20%). Additionally, 23.1% reported using both national and international guidelines (Table 2).

Diagnostic and therapeutic modalities in current use

Transient elastography (FibroScan®) (85.4%) was the most commonly used diagnostic tool, followed by imaging (72.3%) and blood-based tests (70.8%). Although non-invasive approaches are preferred, liver biopsy (31.5%) continues to be used in selected cases. Among non-invasive tests (NITs), FIB-4 (70%) was widely used, whereas APRI (33.8%) was less common. FibroScan was used frequently or routinely by 58.4% of respondents, but 12.3% reported very infrequent use, suggesting variability in accessibility. Serological NITs followed a similar pattern: 52.3% reported frequent or routine use, while 19.2% reported rare or no use. Notably, 26.2% of respondents found FibroScan difficult to access, despite 73.8% considering it at least moderately available. Insurance coverage for NITs was limited, with only 37.7% reporting full coverage and 33.1% reporting partial coverage.

Treatment strategies and availability of MASLD medications

Lifestyle modification (96.9%) was the most widely adopted intervention. Pharmacologic treatments not approved by the U.S. Food and Drug Administration (FDA) (e.g., vitamin E, pioglitazone) were commonly used (62.3%) and were available or widely available in 71.5% of cases. In contrast, FDA-approved medications (8.5%) were rarely used, mainly due to their unavailability (82.3%), highlighting a major gap in access to approved pharmacotherapies. Bariatric surgery (63.8%) was recognized as a treatment option, particularly for MASLD associated with obesity, and was moderately to widely available in 80.8% of cases, though accessibility challenges persisted in some regions. Insurance coverage varied: lifestyle interventions (43.1%) and non-FDA-approved drugs (47.7%) had the highest coverage, but substantial gaps remained. FDA-approved treatments faced major financial barriers, with only 5.4% reporting coverage and 90.8% reporting no coverage. Bariatric surgery was partially or fully covered in 63.8% of cases, yet 36.2% reported no coverage,

Table 1. Demographic, professional, and MASLD-related profiles of study participants from the MENA region

Variables	n = 130	%
Gender		
Woman	48	36.9
Man	81	62.3
Prefer not to say	1	0.8
Age (years)		
25 – 35	15	11.5
36 – 45	38	29.2
46 – 55	48	36.9
56 – 65	22	16.9
> 65	7	5.4
Primary specialty		
Hepatology	76	58.5
Gastroenterology	50	38.5
Endocrinology	1	0.8
Nutrition	1	0.8
Other[1]	2	1.5
Country of work		
Turkey	29	22.3
Egypt	23	17.7
Saudi Arabia	23	17.7
Tunisia	20	15.4
Oman	10	7.7
Libya	6	4.6
Kuwait	5	3.8
Jordan	3	2.3
Algeria	2	1.5
Iraq	2	1.5
Other[2]	7	5.4
Primary sector of work		
Academia (university hospital)	63	48.5
Public	50	38.5
Private	15	11.5
Civil society	1	0.8
Other[3]	1	0.8
Primary field or area of work		
Clinician/medical doctor	121	93.1
Healthcare administration	3	2.3
Clinical research	6	4.6
Number of authored publications focused on MASLD		
1 – 5	97	74.6
6 – 25	25	19.2
26 – 50	4	3.1

(continued)

Table 1. *(continued)*

Variables	n = 130	%
51 – 100	1	0.8
> 100	3	2.3
Years of experience in the field		
Less than 5 years	13	10.0
5–10 years	29	22.3
11–20 years	49	37.7
More than 20 years	39	30.0
Years of experience managing patients with MASLD		
Less than 5 years	18	13.8
5–10 years	48	36.9
11–20 years	47	36.2
More than 20 years	17	13.1

[1]One hepatobiliary and liver transplant surgeon and one acute medicine specialist. [2]Bahrain, Lebanon, Morocco, Palestine, Qatar, United Arab Emirates, and Yemen (one representative each). [3]Armed forces. MASLD, metabolic dysfunction-associated steatotic liver disease; MENA, Middle East and North Africa. MASLD, metabolic dysfunction-associated steatotic liver disease; MENA, Middle East and North Africa.

Table 2. National policies, strategies, and clinical guidelines for MASLD in the MENA region

Variables	n = 130	%
Does your country have a national policy or strategy specifically addressing MASLD?		
Yes	35	26.9
No	95	73.1
If a national MASLD policy or strategy exists, how would you rate its comprehensiveness in addressing all aspects of MASLD management? (n = 35)		
Lacks key elements	3	2.3
Addresses some key aspects	11	8.5
Addresses most key aspects	13	10.0
Addresses nearly all key aspects	5	3.8
Addresses all key aspects comprehensively	3	2.3
To what extent does your country's national healthcare strategy address MASLD as a significant public health concern? (n = 35)		
To a small extent	5	3.8
To some extent	16	12.3
To a great extent	10	7.7
To a very great extent	4	3.1
Does your country have nationally recognized clinical guidelines for the diagnosis and management of MASLD?		
Yes	46	35.4
No	84	64.6
If yes, which organization(s) developed these national guidelines? (n = 46)		
SASLT	14	10.8
TASL	20	15.4
ESHGID	2	1.5
MAIDEN	1	0.8
UCHID	1	0.8
Don't know	8	6.2

(continued)

Table 2. *(continued)*

Variables	n = 130	%
If this guideline is publicly available on the internet, please share its URL (n = 46)		
Know and share the URL	38	29.2
Don't know	8	6.2
If yes, how widely are these national MASLD guidelines available to healthcare professionals across the country? (n = 46)		
Difficult to access	1	0.8
Moderately easy to access	5	3.8
Easy to access	18	13.8
Very easy to access	22	16.9
To what extent are these national MASLD guidelines available in clinical practice across the country? (n = 46)		
To a small extent	8	6.2
To some extent	12	9.2
To a great extent	18	13.8
To a very great extent	8	6.2
To what extent are these national MASLD guidelines implemented in clinical practice across the country? (n = 46)		
To a small extent	10	7.7
To some extent	24	18.5
To a great extent	7	5.4
To a very great extent	5	3.8
If national guidelines are not available, are international guidelines (e.g., EASL, AASLD, etc.) utilized in your country for MASLD management?		
Yes	76	58.5
No	8	6.2
Both national and international guidelines are utilized	30	23.1
Only national guidelines are utilized	16	12.3
If national guidelines are not available, which international guidelines are primarily used in your country?		
EASL guidelines	49	37.7
AASLD guidelines	26	20.0
APASL guidelines	1	0.8
EASL guidelines and national guidelines	23	17.7
AASLD guidelines and national guidelines	6	4.6
APASL guidelines and national guidelines	1	0.8
Only national guidelines	16	12.3
No international guidelines are followed	8	6.2

SASLT, The Saudi Society for the Study of Liver Diseases and Transplantation; TASL, Turkish Association for the Study of the Liver; ESHGID, Egyptian Society of Hepatology, Gastroenterology and Infectious Diseases; MAIDEN, Metabolic Fatty Liver Disease Consortium; UCHID, United Conference of Hepatogastroenterology & Infectious Diseases; EASL, European Association for the Study of the Liver; AASLD, American Association for the Study of Liver Diseases; APASL, Asian Pacific Association for the Study of the Liver. MASLD, metabolic dysfunction-associated steatotic liver disease; MENA, Middle East and North Africa; SASLT, The Saudi Society for the Study of Liver Diseases and Transplantation; TASL, Turkish Association for the Study of the Liver; ESHGID, Egyptian Society of Hepatology, Gastroenterology and Infectious Diseases; MAIDEN, Metabolic Fatty Liver Disease Consortium; UCHID, United Conference of Hepatogastroenterology & Infectious Diseases; EASL, European Association for the Study of the Liver; AASLD, American Association for the Study of Liver Diseases; APASL, Asian Pacific Association for the Study of the Liver.

reflecting disparities in access.

Guideline adherence and provider involvement

A total of 35.4% of respondents reported that treatment decisions were based on guidelines to a great or very great extent, while 46.9% followed guidelines to some extent, indicating inconsistencies in evidence-based practice. Hepatologists (84.6%) and gastroenterologists (81.5%) were the

primary providers managing MASLD, while endocrinologists (54.6%), primary care physicians (47.7%), and nutritionists (42.3%) also played significant roles. Other specialties, including internal medicine, cardiology, and surgery (7.7%), were involved to a lesser extent (Table 3).

Referral pathways for MASLD patients

A formal referral pathway from primary to secondary and tertiary care exists in only 39.2% of cases, while the majority (60.8%) reported the absence of such pathways, highlighting a major gap in structured patient transitions. Even when referral pathways exist, adherence remains suboptimal, with only 26.9% of respondents confirming consistent adherence and frequent adherence reported in just 17.7% of cases. The clarity of referral pathways is also a concern, as 23.1% reported moderate ambiguity and 7.7% found them unclear or difficult to follow. Referral delays present another issue, with 10% of respondents experiencing significant delays, while only 7.3% described the process as timely or extremely timely, suggesting poor access to specialized care. Overall, only 13.1% rated the referral process as effective, while 20% believed it was moderately effective, pointing to gaps in coordination. Unnecessary referrals remain a concern, occurring occasionally or frequently in 31.5% of cases, which may indicate inefficiencies in patient assessment at the primary care level. The most commonly cited reasons for unnecessary referrals include uncertainty regarding referral criteria (23.1%), lack of awareness among primary care physicians regarding MASLD management (22.3%), limited access to diagnostic tools in primary care (15.4%), inadequate communication between primary and secondary care (14.6%), and overestimation of disease severity (13.1%).

Multidisciplinary team (MDT) approach and access to MASLD specialists

The use of an MDT approach in MASLD care is limited, with 54.6% of respondents indicating it is rarely or never implemented, and only 8.5% reporting frequent or extensive use, highlighting a need for more integrated care. Despite this, MDT care is perceived as highly or extremely effective by 60% of respondents, suggesting strong potential benefits if implemented more widely. Access to MASLD specialists also varies across the MENA region. While 31.6% of respondents reported easy or very easy access to specialists, 47.7% described moderate ease of access, and 20.7% reported access as difficult or very difficult.

MASLD care, services, and follow-up

MASLD patients most frequently seek initial care at internal medicine (27.7%) and primary care clinics (27.7%), followed by hepatology (22.3%) and gastroenterology clinics (19.2%). Notably, specialized MASLD clinics are almost nonexistent (0.8%), suggesting a lack of dedicated care facilities for this growing public health concern. The most commonly performed services include abdominal ultrasound (90%), basic laboratory investigations (89.2%), management of comorbidities (71.5%), and fibrosis risk assessment (53.8%). Referral to higher-level care is initiated in only 27.7% of cases, suggesting that most MASLD cases are initially managed at the primary care level. Structured follow-up systems are also lacking, with only 17.7% of respondents reporting their existence, meaning the vast majority (82.3%) lack formal mechanisms for tracking patient progress. The most frequently cited reasons for lack of follow-up include lack of disease awareness (57.7%), fragmented healthcare systems (46.9%), high case volume (32.3%), lack of reporting systems (37.7%), and multiple physicians managing the same patient (20.8%), which may lead to disorganized care (Table 4).

Countries such as Saudi Arabia and Turkey reported the highest adoption of MDT care models, while others, including Algeria and Lebanon, demonstrated more limited implementation. Similarly, structured referral pathways were more frequently reported in Gulf countries than in North African settings.

Healthcare professionals' perceptions of effectiveness, challenges, and resources in MASLD MoCs and public awareness in the MENA region

Close to half of healthcare professionals (48.5%) believe that patients do not comply well with MASLD MoCs. The main reasons include lack of patient awareness (75.4%), disease underestimation by treating physicians (53.8%), and the high cost of investigations (30%). A notable 87.7% of respondents believe that there are insufficient studies on patient-reported outcomes (PROs) related to MASLD in their countries. When assessing the effectiveness of current MoCs, only 31.5% of respondents felt they adequately addressed MASLD, while 37.6% disagreed. Public awareness is also a major concern, with 56.9% of respondents rating it as low, 11.5% as very low, and only 1.5% considering it high. This underscores the need for nationwide awareness campaigns to improve early detection and patient engagement. In terms of patient education resources, websites are the most widely available (60%), while other tools such as brochures (32.3%), educational campaigns (30%), and support groups (10.8%) are less prevalent. Alarmingly, 22.3% of respondents reported no available resources at all.

Opinions on whether healthcare systems are well-equipped to manage MASLD are mixed, with only 37.7% believing their system is prepared. Major barriers to MASLD management include lack of awareness (48.5%), lack of national guidelines (45.4%), inadequate treatment options (40.8%), limited diagnostic access (39.2%), and insufficient funding (38.5%). Encouragingly, 48.5% of respondents believe that risk stratification is feasible in primary care; however, 27.6% disagreed, indicating ongoing challenges.

Regarding disparities in access to care, 42.3% of respondents observed moderate disparities, while 20% reported significant disparities. The biggest challenges to effective MASLD care include lack of patient awareness (76.9%), patient adherence issues (66.2%), insufficient physician knowledge of the disease (50%), resource limitations (48.5%), and lack of trained personnel (48.5%) (Table 5).

Thematic analysis of recommended strategies

Qualitative responses from 77 healthcare professionals (59.2%) revealed a clear consensus on the need for a comprehensive, multidisciplinary, and policy-driven approach to MASLD preparedness and management in the MENA region. Key themes included the urgent development and implementation of national guidelines, integration into primary healthcare protocols, and the establishment of national committees to guide policy and research. Enhancing public and provider awareness through campaigns, medical education, and school-based initiatives was strongly emphasized. Respondents also advocated for strengthening primary care through early detection programs, training on MASLD risk stratification, and establishing clear referral pathways. Multidisciplinary MoCs involving hepatologists, endocrinologists, nutritionists, and surgeons were encouraged, alongside improved access to diagnostics, pharmacologic therapies, and bariatric surgery. Lifestyle-focused interventions, such as dietary programs and regulation of unhealthy food environments, were

Table 3. MASLD risk stratification, diagnostic tools, treatment strategies, and accessibility in the MENA region

Variables	n = 130	%
Which diagnostic tools are routinely used for MASLD risk stratification in your country?*		
Liver biopsy	41	31.5
FibroScan (with or without CAP)	111	85.4
Blood tests (ALT, AST, GGT, etc.)	92	70.8
Imaging (ultrasound, MRI, CT)	94	72.3
FIB-4	91	70.0
APRI	44	33.8
NFS	27	20.8
Other (please specify)[1]	2	1.5
How often are radiological non-invasive tests (e.g., FibroScan/ CAP) used in your country for initial MASLD diagnosis?		
Never used	1	0.8
Used very infrequently	16	12.3
Used occasionally	37	28.5
Used frequently	45	34.6
Used routinely	31	23.8
How often are serological non-invasive tests (e.g., FIB-4, APRI, NFS) used in your country for initial MASLD diagnosis?		
Never used	2	1.5
Used very infrequently	23	17.7
Used occasionally	37	28.5
Used frequently	43	33.1
Used routinely	25	19.2
How would you rate the availability of FibroScan across your country?		
Difficult to access	34	26.2
Moderately accessible	53	40.8
Easily accessible	30	23.1
Very easily accessible	13	10.0
Are all these non-invasive tests covered by national health insurance (or similar organizations) or by relevant health insurance reimbursement policy?		
Yes	49	37.7
No	38	29.2
Partially covered	43	33.1
Which treatment strategies are typically used for MASLD patients in your country?*		
Lifestyle modifications (diet, exercise)	126	96.9
Non-FDA-approved pharmacologic interventions (e.g., vitamin E, pioglitazone)	81	62.3
FDA-approved pharmacologic interventions (e.g., resmetirom)	11	8.5
Bariatric surgery (when indicated according to guidelines)	83	63.8
Other (please specify)[2]	7	5.4
Please rate the availability of each of the following treatment options across your country using the scale below		
Non-FDA-approved pharmacologic interventions (e.g., vitamin E, pioglitazone)		
Unavailable	4	3.1
Limited	17	13.1
Moderate	16	12.3
Available	62	47.7
Widely available	31	23.8

(continued)

Table 3. *(continued)*

Variables	n = 130	%
FDA-approved pharmacologic interventions (e.g., resmetirom)		
Unavailable	107	82.3
Limited	18	13.8
Moderate	3	2.3
Available	1	0.8
Missing	1	0.8
Bariatric surgery (when indicated according to guidelines)		
Limited	25	19.2
Moderate	33	25.4
Available	48	36.9
Widely available	24	18.5
Are any of these treatment options covered by national health insurance (or similar organizations)?		
Lifestyle modifications (diet, exercise)		
Yes	56	43.1
No	55	42.3
Partially covered	19	14.6
Non-FDA-approved pharmacologic interventions (e.g., vitamin E, pioglitazone)		
Yes	62	47.7
No	41	31.5
Partially covered	27	20.8
FDA-approved pharmacologic interventions (e.g., resmetirom)		
Yes	7	5.4
No	118	90.8
Partially covered	5	3.8
Bariatric surgery (when indicated according to guidelines)		
Yes	46	35.4
No	47	36.2
Partially covered	37	28.4
To what extent are MASLD treatment decisions in your country based on evidence-based guidelines?		
Not at all	3	2.3
To a small extent	20	15.4
To some extent	61	46.9
To a great extent	43	33.1
To a very great extent	3	2.3
What are the specialties that primarily manage MASLD patients in your country*		
Hepatologists	110	84.6
Gastroenterologists	106	81.5
Endocrinologists	71	54.6
Primary care physicians (PCPs)	62	47.7
Nutritionist	55	42.3
Other (please specify)[3]	10	7.7

*Questions with multiple responses. [1]LiverFASt test and occasionally liver biopsy. [2]GLP-1 agonists (n = 3), GLP-1 RA for non-surgical weight loss, Liraglutide, endoscopic procedures (e.g., sleeve, balloon), and SGLT2 inhibitors. [3]Internal Medicine (n = 7), cardiologists, pediatricians, and surgeons. MASLD, metabolic dysfunction-associated steatotic liver disease; FibroScan, vibration-controlled transient elastography device; CAP, controlled attenuation parameter; FIB-4, fibrosis-4 index; APRI, aspartate aminotransferase–to–platelet ratio index; NFS, NAFLD fibrosis score; ALT, alanine aminotransferase; AST, aspartate aminotransferase; GGT, gamma-glutamyl transferase; MRI, magnetic resonance imaging; CT, computed tomography; NIT(s), non-invasive test(s); FDA, U.S. Food and Drug Administration.

Table 4. MASLD referral pathway, multidisciplinary team approach, services provided, and follow-up in the MENA region

Variables	n = 130	%
Does a referral care pathway exist for MASLD patients from primary to secondary/tertiary care in your country?		
Yes	51	39.2
No	79	60.8
Are the referral pathways for MASLD patients from primary to secondary/tertiary care adhered to in your country? (n = 51)		
Yes	35	26.9
No	16	12.3
How frequently are the referral pathways for MASLD patients from primary to secondary/tertiary care adhered to in your country? (n = 51)		
Frequently	23	17.7
Sometimes	25	19.2
Rarely	3	2.3
How clear and well-defined are the referral pathways for MASLD patients from primary to secondary/tertiary care in your country? (n = 51)		
Unclear and difficult to follow	10	7.7
Moderately clear; some ambiguity	30	23.1
Clear and easy to follow	11	8.5
How would you rate the timeliness of the referral process for MASLD patients in ensuring timely access to specialized care? (n = 51)		
Very slow; significant delays	5	3.8
Slow; noticeable delays	8	6.2
Moderately timely; some delays	25	19.2
Timely; minimal delays	11	5.8
Extremely timely; no delays	2	1.5
How effective is the referral process in your country at ensuring that MASLD patients receive appropriate and timely specialized care? (n = 51)		
Ineffective	8	6.2
Moderately effective	26	20.0
Effective	17	13.1
How frequently do unnecessary referrals occur for MASLD patients in your country? (n = 51)		
Very frequently	5	3.8
Frequently	10	7.7
Occasionally	26	20.0
Infrequently	10	7.7
What are the most common reasons for unnecessary referrals*		
Uncertainty regarding referral criteria	30	23.1
Lack of awareness among PCPs regarding MASLD management	29	22.3
Lack of access to diagnostic tools in primary care	20	15.4
Inadequate communication between primary and secondary care providers	19	14.6
Overestimation of disease severity by referring physicians	17	13.1
To what extent is a multidisciplinary team (MDT) approach used for managing MASLD patients across your country?		
Not at all used	18	13.8

(continued)

Table 4. *(continued)*

Variables	n = 130	%
Used rarely	53	40.8
Used sometimes	48	36.9
Used frequently	10	7.7
Used very extensively	1	0.8
Considering your own experiences in your practice, how effective would you say the MDT approach is in improving patient care coordination and outcomes for MASLD patients?		
Not at all effective	4	3.1
Minimally effective	13	10.0
Moderately effective	35	26.9
Highly effective	52	40.0
Extremely effective	26	20.0
How easy is it to access specialists with expertise in MASLD management across your country?		
Very difficult to access	2	1.5
Difficult to access	25	19.2
Moderately easy to access	62	47.7
Easy to access	34	26.2
Very easy to access	7	5.4
Where do patients typically first access care for MASLD in your country?		
Internal Medicine Clinic	36	27.7
Gastroenterology Clinic	25	19.2
Hepatology Clinic	29	22.3
MASLD Specialized Clinic	1	0.8
Endocrinology Clinic	3	2.3
Primary Care Clinic	36	27.7
When a patient is first diagnosed with MASLD, what services are typically provided at the initial point of contact?*		
Requesting basic laboratory investigations, including liver enzymes	116	89.2
Fibrosis risk assessment	70	53.8
Abdominal ultrasound examination	117	90.0
Evaluation of obesity-related comorbidities	73	56.2
Management of co-morbidities (DM, hypertension, and dyslipidemia)	93	71.5
Referral to secondary or tertiary care	36	27.7
All of the above	1	0.8
Is there a system to ensure strict follow-up of MASLD patients after initial diagnosis and/or the start of treatment in your country?		
Yes	23	17.7
No	107	82.3
In your opinion, what are the reasons for the lack of follow-up to diagnosed MASLD patients*		
High case volume	42	32.3
Fragmented healthcare system	61	46.9
Lack of disease awareness	75	57.7
Lack of a reporting system	49	37.7
Multiple physicians per patient	27	20.8

*Questions with multiple responses. MASLD, metabolic dysfunction-associated steatotic liver disease.

Table 5. Healthcare professionals' perceptions on effectiveness, challenges, and resources of MASLD models of care and public awareness in the MENA region.

Do you think that patients in your country have good compliance with the existing MASLD model of care (MoC)?		
Strongly disagree	8	6.2
Disagree	55	42.3
Neither agree nor disagree	54	41.5
Agree	13	10.0
If not, what are the main reasons for poor patient compliance?*		
Lack of patient awareness	98	75.4
Disease underestimation by the treating physician	70	53.8
High cost of investigations	39	30.0
Inconvenient access to care	36	27.7
Cultural barriers	30	23.1
Other (please specify)[1]	3	2.3
In your opinion, are there sufficient studies in your country measuring patient-reported outcomes (PROs) related to MASLD MoC application?		
Yes	16	12.3
No	114	87.7
Do you think the currently available MoC adequately addresses the full spectrum of MASLD, including its various manifestations and complications?		
Strongly disagree	5	3.8
Disagree	44	33.8
Neither agree nor disagree	39	30.0
Agree	41	31.5
Strongly agree	1	0.8
How would you rate the level of public awareness regarding MASLD in your country?		
Very low	15	11.5
Low	74	56.9
Average	39	30.0
High	2	1.5
What resources are available for patient education on MASLD in your country?*		
Websites	78	60.0
Brochures	42	32.3
Educational campaigns	39	30.0
Support groups	14	10.8
No available resources at all	29	22.3
Other (please specify)[2]	9	6.9
Do you think the healthcare system in your country is well-equipped to effectively manage MASLD?		
Strongly disagree	7	5.4
Disagree	30	23.1
Neither agree nor disagree	44	33.8
Agree	41	31.5
Strongly agree	8	6.2
If not well-equipped, select all that apply as causes for this:*		
Lack of awareness	63	48.5

(continued)

Table 5. *(continued)*

Lack of national guidelines	59	45.4
Inadequate treatment options	53	40.8
Limited access to diagnostic tools and technologies	51	39.2
Insufficient funding	50	38.5
Lack of trained personnel	48	36.9
Lack of basic disease epidemiological data	47	36.2
Inefficient referral systems	46	35.4
Poor healthcare infrastructure	26	20.0
Considering available resources, it is easy to implement risk stratification for liver disease in primary care centers in your country:		
Strongly disagree	5	3.8
Disagree	31	23.8
Neither agree nor disagree	26	20.0
Agree	63	48.5
Strongly agree	5	3.8
Do you observe any disparities in access to diagnosis or treatment for MASLD among different demographic groups in your country?		
No disparities	23	17.7
Minor disparities	23	17.7
Moderate disparities	55	42.3
Significant disparities	26	20.0
Extreme disparities	3	2.3
What are the main challenges to providing effective MASLD care across your country?*		
Lack of patient awareness	100	76.9
Patient adherence to treatment	86	66.2
Lack of physicians' disease knowledge	65	50.0
Resource limitations	63	48.5
Lack of trained personnel	63	48.5
Limited access to advanced technologies	53	40.8
Insufficient funding	48	36.9
Cultural factors	38	29.2
Systemic barriers	36	27.7

*Questions with multiple responses. [1]Lack of effective treatment, the disease is asymptomatic, and poor judgment. [2]Social media (n = 4), media, posters, physician-dependent education, if they visit a doctor for another reason, the doctor informs them about MASLD, and organizations run by national liver and major gastroenterological associations. MASLD, metabolic dysfunction-associated steatotic liver disease; MoC(s), model(s) of care; PRO(s), patient-reported outcome(s).

considered essential. Participants additionally emphasized the need for robust epidemiological research, MASLD registries, and inclusion in global collaborations. Finally, increased government funding, insurance coverage, and investment in health system infrastructure were identified as critical enablers of effective MASLD care. The thematic analysis of strategies recommended by healthcare professionals for MASLD preparedness and management in the MENA region is detailed in Supplementary Table 1.

Discussion

Our study highlights a substantial misalignment between the rapidly increasing burden of MASLD in the MENA region and the current capacity of healthcare systems to respond effectively. Key systemic shortcomings include the absence of national strategies, limited implementation of multidisciplinary MoCs, and fragmented referral and follow-up pathways.

Notably, 73.1% of respondents reported the absence of a national MASLD strategy in their countries, underscoring a critical policy void. This lack of strategic direction likely contributes to delayed diagnosis, suboptimal management, and inconsistent quality of care across the region. This trend is not unique to MENA: an extensive 2022 global analysis covering 102 countries similarly found no national or subnational MASLD action plans,[13] reflecting the persistent underrecognition of MASLD in global public health agendas and its limited integration into broader health strategies addressing other metabolic comorbidities.[13] Likewise, a 29-country European review found that none had adopted a national strategy for

MASLD, and regional efforts such as the European NAFLD Registry, backed by the EU and EASL, remain primarily academic and lack integration into formal policy frameworks.[14]

MASLD also remains largely absent from major global health frameworks. Neither the World Health Organization's Universal Health Coverage Initiative nor the United Nations Sustainable Development Goals explicitly address MASLD or its progressive form, metabolic dysfunction-associated steatohepatitis.[15,16] Similarly, the World Health Organization's Package of Essential Noncommunicable Disease Interventions for primary healthcare in low-resource settings only indirectly addresses MASLD, primarily through diabetes management recommendations.[17]

At the country level, the lack of formal clinical guidelines further compounds the challenge. In our study, only 35.4% of respondents, primarily from Turkey and Saudi Arabia, reported the existence of MASLD-specific national guidelines. This finding is consistent with the global analysis by Lazarus *et al*., which showed that just one of the 14 MENA countries included in the study had incorporated MASLD into national guidance.[13] Furthermore, MASLD was mentioned in alcohol-related or obesity-related guidelines in only three and six countries, respectively, and appeared in dyslipidemia and hypertension guidelines in just two and three countries. By contrast, Latin America and North America have integrated MASLD into national guidelines in approximately half of their countries.[13] This disparity highlights varying levels of governmental recognition and may contribute to fragmented or incomplete care in underrepresented regions.

In the absence of national guidelines, many surveyed countries rely on international recommendations, most commonly those from EASL and the American Association for the Study of Liver Diseases. This trend mirrors findings by Lazarus *et al*., who reported that twelve nations globally substitute local strategies with international guidelines.[13] However, our results also revealed substantial variability in adherence to international recommendations, suggesting that evidence-based practices are inconsistently applied across the region. Reliance on external guidance without contextual adaptation reflects a fragmented approach to MASLD care and may compromise effectiveness within local healthcare systems.

Despite 60% of our respondents considering MDTs highly effective for MASLD management, they reported that implementation remains limited. This gap between recognized best practices and actual service delivery may be driven by institutional barriers such as inadequate coordination, workforce shortages, and financial constraints.

In most cases, MASLD care in our study begins in general internal medicine or primary care clinics but is subsequently confined to hepatology or gastroenterology services, with very few dedicated MASLD clinics reported. Even where expertise exists, access remains uneven: while 31.6% of respondents reported easy access to MASLD experts, 20.7% still found such access difficult. This disparity reflects the unequal distribution of specialists and varying levels of system readiness, contributing to delayed diagnosis and fragmented management.

Additional barriers cited by respondents include high patient volumes, fragmented care pathways, and limited awareness among both healthcare providers and patients. Together, these factors underscore the absence of integrated follow-up systems for MASLD, increasing the likelihood of uncoordinated care and poorer long-term outcomes.

Several international centers have demonstrated the effectiveness of integrated MDT models for managing MASLD. These models show how MDTs and risk-based referral systems can improve diagnostic precision, reduce unnecessary referrals, and enhance patient outcomes.[18–20] While implementation varies, these examples offer scalable frameworks adaptable to MENA healthcare systems. Such multidisciplinary clinics provide integrated access to hepatology, endocrinology, cardiology, nutrition, and primary care services at a single site, enabling comprehensive, streamlined management. Virtual co-location through multidisciplinary teleconsultations and remote lifestyle interventions presents a scalable solution for expanding MASLD care in MENA, particularly in urban settings where physical integration may be challenging.[21]

The European Pathway Association defines a clinical care pathway as a structured, multidisciplinary intervention designed to coordinate care for a specific patient population over a defined period.[22] A persistent barrier identified in our study is the lack of robust referral pathways, which are critical for effective MASLD care. Appropriate management depends on accurate risk stratification: patients with early-stage disease can often be managed in primary care, whereas those with advanced fibrosis or cirrhosis require specialist input at secondary or tertiary levels, potentially including transplant services.[23,24]

Primary care plays a pivotal role in identifying and managing non-advanced MASLD cases[18,20]; however, limited awareness among healthcare providers remains a major barrier.[25] Despite the centrality of structured pathways and effective triage systems, our data highlight significant shortcomings: only 39.2% of respondents reported the presence of formal referral systems linking primary to secondary or tertiary care. Even when such systems exist, they are often inconsistently applied or poorly defined, leading to delays in specialist access and treatment initiation. These findings mirror results from a European study reporting widespread deficits in referral algorithms and structured lifestyle programs, underscoring systemic gaps in MASLD care across diverse health systems.[14]

Structured, risk-based referral pathways that use clear thresholds to guide triage demonstrate tangible benefits in improving efficiency, disease stratification, and equitable, timely access to specialist care.[18,20,26] Nonetheless, implementation challenges persist, including inadequate GP training, limited financial resources, weak digital infrastructure, and poor integration of lifestyle services.

While liver biopsy remains the diagnostic gold standard, NITs such as FibroScan and FIB-4 are increasingly used for risk stratification owing to their practicality and strong negative predictive value.[27–29] Our findings reflect this global shift toward non-invasive diagnostics. Most respondents reported using tools such as FibroScan and FIB-4, in line with EASL and AGA recommendations for a two-tiered NIT-based stratification strategy.[30,31] However, access remains uneven: 26.2% of participants reported difficulty accessing FibroScan, highlighting the need to expand diagnostic capabilities, especially in resource-limited settings.

Equity in MASLD care also emerged as an implicit theme in our findings. Participants reported notable variations in access to diagnostic tools, multidisciplinary services, and referral pathways between urban and rural settings, as well as between public and private healthcare sectors. These disparities likely reflect broader systemic inequities in healthcare infrastructure, workforce distribution, and funding allocation across the MENA region. Addressing these gaps will require targeted strategies to ensure that advancements in MASLD care reach under-resourced settings, particularly by strengthening primary care capabilities and expanding access to non-invasive diagnostics beyond major urban centers. Socioeconomic, gender, and ethnic disparities further compound the

challenges of MASLD care across the MENA region. While our study did not directly collect disaggregated data on these dimensions, prior research indicates that lower socioeconomic status is associated with increased MASLD prevalence and reduced access to non-invasive diagnostics and specialty care, particularly in rural and underserved areas.[13] Women in certain MENA countries may face additional barriers due to gender-based healthcare access norms, underdiagnosis, and limited representation in clinical research.[32] Moreover, ethnic minorities and migrant populations often lack access to comprehensive insurance coverage and culturally adapted health education, which may contribute to diagnostic delays and suboptimal adherence.[33] These disparities highlight the need for more inclusive health system policies and the integration of equity indicators into future MASLD MoCs and regional surveillance efforts.

Lifestyle modification remains the cornerstone of MASLD treatment, and in our study, it was the most commonly utilized intervention. Non-FDA-approved pharmacotherapies, such as vitamin E and pioglitazone, were also frequently employed, while access to recently approved agents like resmetirom remained unavailable. However, the region's limited participation in global clinical trials presents a major barrier to adopting evidence-based therapies tailored to local needs. This underrepresentation constrains the applicability of international treatment recommendations in MENA, where metabolic, genetic, and lifestyle factors may differ significantly.[34] To bridge this gap, concerted efforts are needed to strengthen regional research networks, streamline regulatory pathways, and increase clinician and patient engagement in research. These actions would not only improve access to emerging therapies but also ensure that future treatment strategies are informed by, and responsive to, regional realities.

Our findings reveal substantial deficiencies in current MASLD MoCs. Nearly half of surveyed healthcare professionals reported poor patient adherence, frequently attributing this to low disease awareness, underrecognition by non-specialists, and the high cost of diagnostic evaluation. These observations align with existing studies showing widespread underdiagnosis of MASLD by non-hepatology providers and limited public awareness of the disease.[35,36]

Additionally, 87.7% of respondents noted the lack of PRO research, and only 31.5% believed that current MoCs adequately address MASLD. While validated PRO tools, such as the CLDQ-NAFLD and NASH-CHECK, are available to assess symptoms and health-related quality of life,[37,38] their limited integration into routine practice reflects missed opportunities for patient-centered care.

Public education efforts also appear insufficient. Websites are the most commonly reported educational resource; however, brochures, awareness campaigns, and outreach materials remain scarce, with over 22% of respondents indicating no patient education tools at all. These findings call for stronger public health strategies, enhanced provider training, and improved communication pathways. Echoing this, a study by Lazarus *et al*. reported that only 24% of countries had funded liver disease awareness campaigns, and few had active advocacy groups for MASLD, contributing to delayed diagnosis and suboptimal adherence.[13]

Beyond awareness, reducing stigma within clinical environments can promote shared decision-making and greater patient engagement.[21] Digital innovations, such as the NAFLD Simulator, can aid in visualizing disease progression and guiding treatment choices. Integration of such tools into healthcare systems could improve health literacy, empower patients, and support evidence-based decision-making by clinicians.[39]

This study provides important insights into MASLD care across the MENA region, underpinned by strong participation and broad geographic representation spanning 17 countries. It reflects the perspectives of clinicians from MASLD-related specialties and sheds light on key diagnostic, policy, and treatment challenges confronting health systems in the region. While the number of participants varied by country, this heterogeneity does not compromise the value of the data. The study's primary objective was to gather informed, context-specific insights into national MASLD care structures and barriers. In this regard, even a single knowledgeable respondent can yield meaningful information about policy frameworks, system capacity, and clinical pathways. Accordingly, the study prioritized broad geographic inclusion over equal numerical representation, enabling the identification of both inter-country differences and region-wide trends.

Nevertheless, some limitations should be acknowledged. The reliance on self-reported data introduces the possibility of perceptual bias, and the exclusive focus on clinical stakeholders omits the views of other key factors such as patients, policymakers, and allied health professionals. Furthermore, the cross-sectional design provides only a temporal snapshot, limiting the ability to assess longitudinal trends. Despite these constraints, the findings provide a robust and timely foundation for developing targeted, context-sensitive strategies to enhance MASLD care delivery and system preparedness across the region.

Conclusions

This study reveals substantial gaps in MASLD care across the MENA region, including limited national strategies, weak guideline implementation, underutilized multidisciplinary collaboration, and fragmented referral systems. Despite these deficiencies, the insights gathered from regional experts highlight both systemic challenges and actionable opportunities for improvement. Advancing MASLD care in the region will require more than medical interventions; it demands a paradigm shift that strengthens health system capacity, fosters responsive policy development, and builds human resource capabilities. The collective voices of frontline clinicians reflect a strong readiness for system transformation. Their call to action underscores the urgency of integrated national strategies, patient-centered multidisciplinary care, expanded public education, and robust health system preparedness. A shift from reactive measures to proactive, structured approaches is essential to ensure timely diagnosis, long-term management, and equitable access to care for MASLD patients across MENA.

Acknowledgments

The authors acknowledge the contributions of the SLMENA collaborators. The complete list of contributors and their institutional affiliations is provided below. Contributors list – Steatotic Liver Disease Study Foundation in Middle East and North Africa (SLMENA) Collaborators: Faisal Abaalkhail (Gastroenterology Department, King Faisal Specialist Hospital and Research Centre (KFSH&RC), Riyadh, Saudi Arabia), Nermeen Abdeen (Tropical Medicine Department, Faculty of Medicine, Alexandria University, Alexandria, Egypt), Aliaa Abdel Wahed (Hepatology and Gastroenterology Department, National Liver Institute, Shebin Elkom, Egypt), Ehab Abdelatti (Internal Medicine Department, Faculty of Medicine, Menoufia University, Menoufia, Egypt), Sara Abdelhakam (Tropical Medicine Department, Ain Shams University, Cairo, Egypt), Walaa Abdelhamed (Tropical Medicine and

Gastroenterology Department, Sohag University, Sohag, Egypt), Mohamed Abdel-Samiee (Hepatology and Gastroenterology Department, National Liver Institute, Shebin Elkom, Egypt), Nakhli Abdelwahab (Gastroenterology Department, Mongi Slim Hospital, Faculté de médecine de Tunis, Tunis, Tunisia), Mosaab Abdulkarim (Gastroenterology Department, BGC Clinic, Tripoli, Libya), Abdalraouf Abdulsalam (Gastroenterology Department, Central Hospital, Tripoli, Libya), Raed Abughosh (Outpatient Clinic, Raed Abughosh Clinic, Amman, Jordan), Imad Abumallouh (Medical Department, Medical City for Military and Security Services, Muscat, Oman), Gupse Adali (Gastroenterology and Hepatology Department, University of Health Sciences, Umraniye Training and Research Hospital, Istanbul, Türkiye), Meral Akdogan Kayhan (Gastroenterology Department, Bilkent City Hospital, Health Science University, Ankara, Türkiye), Murat Akyildiz (Gastroenterology and Hepatology Department, Koc University School of Medicine, Istanbul, Türkiye), Al Warith Al Hashmi (Hepatobiliary and Liver Transplant Department, Royal Hospital, Muscat, Oman), Maimouna Al Mandhari (Hepatobiliary and Liver Transplant Department, Royal Hospital, Muscat, Oman), Halima Al Shuaili (Medical Department, Medical City for Military and Security Services, Muscat, Oman), Siham Al Sinani (Pediatrics Department, University Medical City, Muscat, Oman), Abduljaleel Alalwan (Hepatobiliary and Liver Transplant Department, King Abdulaziz Medical City, Riyadh, Saudi Arabia), Hamad Alashgar (Gastroenterology Department, King Faisal Specialist Hospital and Research Centre (KFSH&RC), Riyadh, Saudi Arabia), Saad Aldosari (Gastroenterology Department, King Abdulaziz Medical City, Jeddah, Saudi Arabia), Zaid Alezzi (Gastroenterology Department, Sana'a University, Sana'a, Yemen), Abdullah Alghamdi (Gastroenterology Unit, Medical Department, King Fahad Hospital, Jeddah, Saudi Arabia), Waleed Alghamdi (Department of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia), Mansour Alghanem (Gastroenterology Department, Jaber Hospital, Alzahra, Kuwait), Abeer Al-Gharabally (Thunayan Al Ghanim Gastroenterology Centre, Amiri Hospital, Kuwait City, Kuwait), Waleed Al-hamoudi (Medicine Department, King Saud University, Riyadh, Saudi Arabia), Mohammed Aljawad (Gastroenterology Department, Johns Hopkins Aramco Healthcare, Dhahran, Saudi Arabia), Bandar Aljudaibi (Gastroenterology Department, King Faisal Specialist Hospital and Research Centre (KFSH&RC), Riyadh, Saudi Arabia), Abdulrahman Aljumah (Gastroenterology Department, Dr. Sulaiman Al-Habib Medical Group - Al Rayan Hospital, Riyadh, Saudi Arabia), Abdullah Alkalbani (Medical Department, Medical City for Military and Security Services, Muscat, Oman), Majed Almaghrabi (Gastroenterology Section, Department of Medicine, National Guard Hospital, Jeddah, Saudi Arabia), Fahd Almalki (Medicine Department, Umm Al-Qura University, Makkah, Saudi Arabia), Faisal Alotaibi (Gastroenterology and Hepatology Department, King Fahad Medical City, Riyadh, Saudi Arabia), Ashraf Alsahafi (Pediatric Department, King Saud Bin Abdulaziz University for Health Sciences, Jeddah, Saudi Arabia), Marwan Alsari (Gastroenterology Department, Central Hospital, Tripoli, Libya), Omar Alsiyabi (Hepatobiliary and Liver Transplant Department, Royal Hospital, Muscat, Oman), Ibrahim Altraif (Gastroenterology and Hepatology Department, Sulaiman Fakeeh Hospital, Riyadh, Saudi Arabia), Adnan Alzanbagi (Gastroenterology Department, King Abdullah Medical City, Makkah, Saudi Arabia), Derya Arı (Gastroenterology Department, Bilkent City Hospital, Health Science University, Ankara, Türkiye), Cigdem Arikan (Gastroenterology and Hepatology Department, Koc University School of Medicine, Istanbul, Türkiye), Fehmi Ateş (Gastroenterology Department, Mersin University, Mersin, Turkey), Myriam Ayari (Gastroenterology Department, Internal Security Forces Hospital, La Marsa, Tunis, Tunisia), Mohamed Babatin (Medicine Department, King Fahad Hospital, Jeddah, Saudi Arabia), Razan Bader (Liver Transplant Department, King Fahad Specialist Hospital, Dammam, Saudi Arabia), Gamal Badra (Hepatology and Gastroenterology Department, National Liver Institute, Shebin Elkom, Egypt), Yasemin Balaban (Gastroenterology Department, Hacettepe University, Ankara, Turkey), Metin Basaranoglu (Gastroenterology Department, Bezmialem Vakif University, Istanbul, Turkey), Nadia Ben Mustapha (Gastroenterology Department A, La Rabta Hospital, Tunis, Tunisia), Syrine Ben rhouma (Gastroenterology Department, Regional Hospital, Kef, Tunisia), Khalid Bzeizi (Gastroenterology Department, King Faisal Specialist Hospital and Research Centre (KFSH&RC), Riyadh, Saudi Arabia), Ali Çalışkan (Department of Gastroenterology, Adıyaman University, Adıyaman, Turkey), Arif Cosar (Gastroenterology Department, Karadeniz Technical University, Trabzon, Türkiye), Coskun Demirtas (Gastroenterology Department, Marmara University, Istanbul, Turkey), Dinc Dincer (Gastroenterology Department, Akdeniz University, Antalya, Turkey), Tamer Elbaz (Endemic Medicine Department, Cairo University, Cairo/Giza, Egypt), Yahya Elhamdi (Gastroenterology Department, Central Hospital, Tripoli, Libya), Eman Elkhateeb (Hepatology and Gastroenterology Department, National Liver Institute, Shebin Elkom, Egypt), Hamdy Elsobky (Hepatology and Gastroenterology Department, National Liver Institute, Shebin Elkom, Egypt), Aşkın Erdoğan (Department of Internal Medicine, Gastroenterology, Alanya Alaaddin Keykubat University, Alanya, Türkiye), Fatih Eren (Gastroenterology Department, Marmara University, Istanbul, Turkey), Hasan Eruzun (Gastroenterology Department, Samsun Training and Research Hospital, Samsun, Türkiye), Hanaa Fathelbab (Endemic Medicine Department, Minia University, Minia, Egypt), Magdy Fouad (Endemic Medicine Department, Minia University, Minia, Egypt), Hale Gökcan (Gastroenterology Department, Ankara University, Ankara, Turkey), Donia Gouiaa (Gastroenterology Department A, La Rabta Hospital, Tunis, Tunisia), Fulya Gunsar (Gastroenterology Department, Ege University, İzmir, Turkey), Wafa Haddad (Private Gastroenterology Practice, Tunis, Tunisia), Aya Hammami (Gastroenterology Department, University Hospital of Sahloul, Sousse, Tunisia), Lamine Hamzaoui (Gastroenterology Department, Mohamed Taher Maamouri Hospital, Nabeul, Tunisia), zekiye harput (Gastroenterology Department, Mersin University, Mersin, Turkey), Fuad Hasan (Department of Medicine, Kuwait University, Kuwait), Gdoura Hela (Gastroenterology Department, Université of Sfax, Sfax, Tunisia), Amal Helmy (Endemic Medicine Department, Cairo University, Cairo/Giza, Egypt), Boussourra Houda (Gastroenterology Department, Ghazela Medical Center, Ariana, Tunisia), Mona Ismail (Division of Gastroenterology, Department of Internal Medicine, Imam Abdulrahman bin Faisal University, Dammam, Saudi Arabia), Zülal İstemihan (Gastroenterology Department, Niğde Ömer Halisdemir University Training and Research Hospital, Niğde, Türkiye), Hanene Jeddi (Private Practice, Djerba, Tunisia), Mohamed Ali Jouini (Private Practice, Kélibia, Tunisia), Enas Kamal (Endemic Medicine Department, Minia University, Minia, Egypt), Bola Kamath (Medical Department, Medical City for Military and Security Services, Muscat, Oman), Banu Kara (Gastroenterology Clinic, Adana City Research and Education Hospital, Adana, Turkey), Caglayan Keklikkiran (Department of Gastroenterology, Recep Tayyip Erdogan University, Rize, Türkiye), Abdullah Khathlan (Gastroenterology and Hepatology Department, King Fahad Medical City, Riyadh, Saudi Arabia), Amal Khsiba

(Gastroenterology Department, Mohamed Taher Maamouri Hospital, Nabeul, Tunisia), Murat Kiyici (Gastroenterology Department, Uludag University, Bursa, Türkiye), Hana Kodia (Private Practice, Ariana, Tunisia), Sarra Laabidi (Gastroenterology Department A, La Rabta Hospital, Tunis, Tunisia), Abdulnabi Masoud (Medicine Department, Sabha Central Hospital, Sabha, Libya), Khaled Matar (Gastroenterology Unit, European Gaza Hospital, Gaza, Palestine), Mohammad Mawardi (Gastroenterology Department, King Faisal Specialist Hospital and Research Centre (KFSH&RC), Riyadh, Saudi Arabia), Ashik Sainu (Gastroenterology Department, Aster Royal Hospital, Muscat, Oman), Asma Salah (Private Gastroenterology and Hepatology Practice, Kébili, Tunisia), İlker Şen (Gastroenterology Department, Şişli Hamidiye Etfal Education and Research Hospital, Istanbul, Türkiye), Meriem serghini (Gastroenterology Department A, La Rabta Hospital, Tunis, Tunisia), Hend Shousha (Endemic Medicine Department, Cairo University, Cairo/Giza, Egypt), Ben Hamida Sonia (Gastroenterology Department, Habib Bougatfa Hospital, Bizerte, Tunisia), Mina Tharwat (Tropical Medicine and Gastroenterology Department, Aswan University, Aswan, Egypt), Nurdan Tozun (GastroenterologyDepartment, Acibadem Mehmet Ali Aydınlar University, Istanbul, Türkiye), Ilker Turan (Gastroenterology Department, Ege University, İzmir, Turkey), Dilara Turan Gökçe (Department of Gastroenterology, Sincan Training and Research Hospital, Ankara, Türkiye), Haythem Yacoub (Gastroenterology Department A, La Rabta Hospital, Tunis, Tunisia), Mohamed Yacoub (Gastroenterology and Hepatology Department, Farwaneya Hospital, Farwaneya, Kuwait), Suna Yapali (Gastroenterology Department, Acibadem Mehmet Ali Aydınlar University, Istanbul, Türkiye), Hasan Yılmaz (Gastroenterology and Hepatology Institute, Kocaeli University, İzmit, Türkiye), Khalid Zaalook (Medicine Department, Sabha Central Hospital, Sabha, Libya), Doaa Zakaria (Tropical Medicine Department, Ain Shams University, Cairo, Egypt), Samy Zaky (Hepatogastroenterology and Infectious Diseases Department, Al-Azhar University, Cairo, Egypt), Essam Zayed (Hepatology and Gastroenterology Department, National Liver Institute, Shebin Elkom, Egypt), AbdElaali Zein El Imene (Private Practice, Tunis, Tunisia), Shahrazed Zemmouchi (Internal Medicine Department, Bainem's Hospital, Algiers, Algeria), Mustapha Benazzouz (Hepatogastroenterology Department, Rabat International University, Rabat, Morocco)

Funding

None to declare.

Conflict of interest

MEK has been an Editorial Board Member of *Journal of Clinical and Translational Hepatology* since 2021. The other authors have no conflict of interests related to this publication.

Author contributions

Study design (MEK, ME, ZMY, KMA); creating, piloting, and disseminating the survey (YY, AL, MAL, FMS, MWIA, ND, AT, IW, HEK, MOM, AIS, AEH, MAS, MT); writing the first draft of the manuscript (RK, MAM, KAA, ANE, MEK). All authors revised and approved the final version of the manuscript.

Ethical statement

The study was approved by the Research Ethics Committee of the Faculty of Medicine, Helwan University, Cairo, Egypt (Serial 152-2024). Before beginning the survey, participants were informed of the study's purpose, their eligibility, and the voluntary nature of participation. Informed consent was obtained electronically prior to survey access.

Data sharing statement

Deidentified participant-level data, the questionnaire, the codebook, and analysis code are available from the corresponding author on reasonable request for non-commercial academic use, subject to SLMENA Data Access Committee review and a data use agreement. Aggregate results are provided in the article and Supplementary material.

References

[1] Feng G, Targher G, Byrne CD, Yilmaz Y, Wai-Sun Wong V, Adithya Lesmana CR, *et al*. Global burden of metabolic dysfunction-associated steatotic liver disease, 2010 to 2021. JHEP Rep 2025;7(3):101271. doi:10.1016/j.jhepr.2024.101271, PMID:39980749.
[2] 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. Hepatology 2023;78(6):1966–1986. doi:10.1097/HEP.0000000000000520, PMID:37363821.
[3] El-Kassas M, Cabezas J, Coz PI, Zheng MH, Arab JP, Awad A. Nonalcoholic Fatty Liver Disease: Current Global Burden. Semin Liver Dis 2022;42(3):401–412. doi:10.1055/a-1862-9088, PMID:35617968.
[4] 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):1335–1347. doi:10.1097/HEP.0000000000000004, PMID:36626630.
[5] El-Kassas M, Othman HA, Elbadry M, Alswat K, Yilmaz Y. Risk stratification of patients with metabolic dysfunction-associated steatotic liver disease: Steatohepatitis, fibrosis, and hepatocellular carcinoma. J Clin Exp Hepatol 2025;15(1):102415. doi:10.1016/j.jceh.2024.102415.
[6] Younossi ZM, Golabi P, Paik J, Owrangi S, Yilmaz Y, El-Kassas M, *et al*. Prevalence of metabolic dysfunction-associated steatotic liver disease in the Middle East and North Africa. Liver Int 2024;44(4):1061–1070. doi:10.1111/liv.15852, PMID:38305642.
[7] Saeedi P, Petersohn I, Salpea P, Malanda B, Karuranga S, Unwin N, *et al*. Global and regional diabetes prevalence estimates for 2019 and projections for 2030 and 2045: Results from the International Diabetes Federation Diabetes Atlas, 9th edition. Diabetes Res Clin Pract 2019;157:107843. doi:10.1016/j.diabres.2019.107843, PMID:31518657.
[8] Guthold R, Stevens GA, Riley LM, Bull FC. Worldwide trends in insufficient physical activity from 2001 to 2016: a pooled analysis of 358 population-based surveys with 1·9 million participants. Lancet Glob Health 2018;6(10):e1077–e1086. doi:10.1016/S2214-109X(18)30357-7, PMID:30193830.
[9] Golabi P, Paik JM, AlQahtani S, Younossi Y, Tuncer G, Younossi ZM. Burden of non-alcoholic fatty liver disease in Asia, the Middle East and North Africa: Data from Global Burden of Disease 2009-2019. J Hepatol 2021;75(4):795–809. doi:10.1016/j.jhep.2021.05.022, PMID:34081959.
[10] El-Kassas M, Awad A, Elbadry M, Arab JP. Tailored Model of Care for Patients with Metabolic Dysfunction-Associated Steatotic Liver Disease. Semin Liver Dis 2024;44(1):54–68. doi:10.1055/a-2253-9181, PMID:38272067.
[11] Allen AM, Younossi ZM, Tsochatzis EA, Alazawi W, Zelber-Sagi S, Arab JP, *et al*. Measuring NAFLD models of care. Nat Rev Gastroenterol Hepatol 2023;20(10):626–627. doi:10.1038/s41575-023-00798-9, PMID:37291278.
[12] El-Kassas M, Villota-Rivas M, Alswat KA, AlNaamani KM, Yilmaz Y, Labidi A, *et al*. Metabolic Dysfunction-Associated Steatotic Liver Disease in the MENA Region: Setting a Research and Action Priority Agenda. Liver Int 2025;45(6):e70108. doi:10.1111/liv.70108, PMID:40411196.
[13] Lazarus JV, Mark HE, Villota-Rivas M, Palayew A, Carrieri P, Colombo M, *et al*. The global NAFLD policy review and preparedness index: Are countries ready to address this silent public health challenge? J Hepatol 2022;76(4):771–780. doi:10.1016/j.jhep.2021.10.025, PMID:34895743.
[14] Lazarus JV, Ekstedt M, Marchesini G, Mullen J, Novak K, Pericàs JM, *et al*. A cross-sectional study of the public health response to non-alcoholic fatty liver disease in Europe. J Hepatol 2020;72(1):14–24. doi:10.1016/j.jhep.2019.08.027, PMID:31518646.
[15] World Health Organization (WHO). Together on the road to universal health coverage: a call to action. [Cited 20 April, 2025]. Available from: https://iris.who.int/handle/10665/258962.
[16] GBD 2017 SDG Collaborators. Measuring progress from 1990 to 2017 and projecting attainment to 2030 of the health-related Sustainable Development Goals for 195 countries and territories: a systematic analysis for the Global Burden of Disease Study 2017. Lancet 2018;392(10159):2091–2138. doi:10.1016/S0140-6736(18)32281-5, PMID:30496107.
[17] World Health Organization (WHO). WHO package of essential noncommunicable (PEN) disease interventions for primary health care. [Cited 20 April, 2025]. Available from: https://www.who.int/publications/i/item/who-package-of-essential-noncommunicable-(pen)-disease-interventions-

for-primary-health-care.
[18] Mantovani A, Goyale A, Roccarina D, Prat LI, Guerrero M, Patel R, *et al*. A multidisciplinary approach to non-alcoholic fatty liver disease (NAFLD) improves cardiovascular risk factors. J Hepatol 2020;73:S110. doi:10.1016/S0168-8278(20)30741-8.
[19] Moolla A, Motohashi K, Marjot T, Shard A, Ainsworth M, Gray A, *et al*. A multidisciplinary approach to the management of NAFLD is associated with improvement in markers of liver and cardio-metabolic health. Frontline Gastroenterol 2019;10(4):337–346. doi:10.1136/flgastro-2018-101155, PMID:31682643.
[20] Lazarus JV, Anstee QM, Hagström H, Cusi K, Cortez-Pinto H, Mark HE, *et al*. Defining comprehensive models of care for NAFLD. Nat Rev Gastroenterol Hepatol 2021;18(10):717–729. doi:10.1038/s41575-021-00477-7, PMID:34172937.
[21] Kelly JT, Reidlinger DP, Hoffmann TC, Campbell KL. Telehealth methods to deliver dietary interventions in adults with chronic disease: a systematic review and meta-analysis. Am J Clin Nutr 2016;104(6):1693–1702. doi:10.3945/ajcn.116.136333, PMID:27935523.
[22] The European Pathway Association. About care pathways: E-P-A Definition of care pathway. [Cited 20 April, 2025]. Available from: https://e-p-a.org/care-pathways/.
[23] Grgurevic I, Podrug K, Mikolasevic I, Kukla M, Madir A, Tsochatzis EA. Natural History of Nonalcoholic Fatty Liver Disease: Implications for Clinical Practice and an Individualized Approach. Can J Gastroenterol Hepatol 2020;2020:9181368. doi:10.1155/2020/9181368, PMID:32051820.
[24] Haldar D, Kern B, Hodson J, Armstrong MJ, Adam R, Berlakovich G, *et al*. Outcomes of liver transplantation for non-alcoholic steatohepatitis: A European Liver Transplant Registry study. J Hepatol 2019;71(2):313–322. doi:10.1016/j.jhep.2019.04.011, PMID:31071367.
[25] Alqahtani SA, Yilmaz Y, El-Kassas M, Alswat K, Mawardi M, Sanai FM, *et al*. Knowledge about metabolic dysfunction-associated steatotic liver disease among the medical professionals from countries in the MENA region. Ann Hepatol 2025;30(1):101569. doi:10.1016/j.aohep.2024.101569, PMID:39276988.
[26] Allen MJ, Tulleners R, Brain D, O'Beirne J, Powell EE, Barnett A, *et al*. Implementation of a nurse-delivered, community-based liver screening and assessment program for people with metabolic dysfunction-associated steatotic liver disease (LOCATE-NAFLD trial). BMC Health Serv Res 2025;25(1):421. doi:10.1186/s12913-025-12580-5, PMID:40121480.
[27] Younossi ZM, Zelber-Sagi S, Lazarus JV, Wong VW, Yilmaz Y, Duseja A, *et al*. Global Consensus Recommendations for Metabolic Dysfunction-Associated Steatotic Liver Disease and Steatohepatitis. Gastroenterology 2025. doi:10.1053/j.gastro.2025.02.044, PMID:40222485.
[28] European Association for the Study of the Liver (EASL). European Association for the Study of Diabetes (EASD), European Association for the Study of Obesity (EASO), European Association for the Study of the Liver (EASL). EASL-EASD-EASO Clinical Practice Guidelines on the management of metabolic dysfunction-associated steatotic liver disease (MASLD). J Hepatol 2024;81(3):492–542. doi:10.1016/j.jhep.2024.04.031, PMID:38851997.
[29] Kanwal F, Neuschwander-Tetri BA, Loomba R, Rinella ME. Metabolic dysfunction-associated steatotic liver disease: Update and impact of new nomenclature on the American Association for the Study of Liver Diseases practice guidance on nonalcoholic fatty liver disease. Hepatology 2024;79(5):1212–1219. doi:10.1097/HEP.0000000000000670, PMID:38445559.
[30] European Association for the Study of the Liver, Clinical Practice Guideline Panel, Chair, EASL Governing Board representative, Panel members. EASL Clinical Practice Guidelines on non-invasive tests for evaluation of liver disease severity and prognosis - 2021 update. J Hepatol 2021;75(3):659–689. doi:10.1016/j.jhep.2021.05.025, PMID:34166721.
[31] Kanwal F, Shubrook JH, Adams LA, Pfotenhauer K, Wai-Sun Wong V, Wright E, *et al*. Clinical Care Pathway for the Risk Stratification and Management of Patients With Nonalcoholic Fatty Liver Disease. Gastroenterology 2021;161(5):1657–1669. doi:10.1053/j.gastro.2021.07.049, PMID:34602251.
[32] Bowser D, Marqusee H, El Koussa M, Atun R. Health system barriers and enablers to early access to breast cancer screening, detection, and diagnosis: a global analysis applied to the MENA region. Public Health 2017;152:58–74. doi:10.1016/j.puhe.2017.07.020, PMID:28843410.
[33] Faugno E, Galbraith AA, Walsh K, Maglione PJ, Farmer JR, Ong MS. Experiences with diagnostic delay among underserved racial and ethnic patients: a systematic review of the qualitative literature. BMJ Qual Saf 2025;34(3):190–200. doi:10.1136/bmjqs-2024-017506, PMID:39496473.
[34] El-Kassas M. Bridging the gap: increasing MENA representation in MASLD clinical trials. Nat Rev Gastroenterol Hepatol 2025;22(7):457–458. doi:10.1038/s41575-025-01081-9, PMID:40410567.
[35] Blais P, Husain N, Kramer JR, Kowalkowski M, El-Serag H, Kanwal F. Nonalcoholic fatty liver disease is underrecognized in the primary care setting. Am J Gastroenterol 2015;110(1):10–14. doi:10.1038/ajg.2014.134, PMID:24890441.
[36] Alexander M, Loomis AK, Fairburn-Beech J, van der Lei J, Duarte-Salles T, Prieto-Alhambra D, *et al*. Real-world data reveal a diagnostic gap in non-alcoholic fatty liver disease. BMC Med 2018;16(1):130. doi:10.1186/s12916-018-1103-x, PMID:30099968.
[37] Doward LC, Balp MM, Twiss J, Slota C, Cryer D, Brass CA, *et al*. Development of a Patient-Reported Outcome Measure for Non-Alcoholic Steatohepatitis (NASH-CHECK): Results of a Qualitative Study. Patient 2021;14(5):533–543. doi:10.1007/s40271-020-00485-w, PMID:33336323.
[38] Alqahtani SA, Yilmaz Y, El-Kassas M, Alswat K, Sanai F, AlZahrani M, *et al*. Clinical and patient-reported outcomes in patients with chronic hepatitis B and C and non-alcoholic fatty liver disease from real-world practices in Saudi Arabia, Turkey and Egypt. J Viral Hepat 2024;31(6):300–308. doi:10.1111/jvh.13935, PMID:38622910.
[39] Chhatwal J, Dalgic OO, Chen W, Samur S, Bethea ED, Xiao J, *et al*. Analysis of a Simulation Model to Estimate Long-term Outcomes in Patients with Nonalcoholic Fatty Liver Disease. JAMA Netw Open 2022;5(9):e2230426. doi:10.1001/jamanetworkopen.2022.30426, PMID:36098969.