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Citation
Driessen, S., Jong, V. D. de, Son, K. C. van, Klompenhouwer, T., Colardelle, Y., Alings, M., ... Tushuizen, M. E. (2023). A global survey of health care workers' awareness of non-alcoholic fatty liver disease: the AwareNASH survey. *United European Gastroenterology Journal*. doi:10.1002/ueg2.12445

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Downloaded from:	https://hdl.handle.net/1887/3961342

Note: To cite this publication please use the final published version (if applicable).

Received: 12 April 2023 | Accepted: 4 June 2023

DOI: 10.1002/ueg2.12445

ORIGINAL ARTICLE

ueg journal WILEY

A global survey of health care workers' awareness of non-alcoholic fatty liver disease: The AwareNASH survey

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Funding information

Pfizer, Grant/Award Numbers: Independent Medical Education, 68660591

Abstract

Background: The estimated global prevalence and burden of non-alcoholic fatty liver disease (NAFLD) and its advanced stage, non-alcoholic steatohepatitis (NASH), is increasing. Yet, NAFLD remains largely underdiagnosed. In addition to hepatic morbidity and mortality, NAFLD is associated with increased cardiovascular complications, warranting a multidisciplinary approach. Despite its rapidly increasing prevalence, knowledge of NAFLD among healthcare workers is limited, especially with specialists outside the field of hepatology and gastroenterology.

Objectives: To investigate knowledge, practice and opinions/attitudes of healthcare workers towards diagnosis and management of NAFLD/NASH.

Methods: The survey was designed in collaboration with a multidisciplinary scientific committee established especially for this study. The survey was disseminated to healthcare workers from seven different disciplines through four collaborating societies, social media and at a cardiology-themed conference from February to June 2022. Median and interquartile range were mentioned for numeric responses and

Stan Driessen and Vivian D. de Jong contributed equally and should both be considered as the first authors.

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proportions for categorical responses or responses on a Likert scale. Likert scale responses were treated as ordinal data and analysed with the appropriate tests.

Results: The full dataset included 613 respondents from 88 different countries (including 488 physicians). 64% of the surveyed physicians underestimated the prevalence of NAFLD. General practitioners and cardiologists underestimated the prevalence most often (74% and 77%, respectively). Compared to the other disciplines, cardiologists were least familiar with the symptoms and diagnostic criteria and felt least confident in diagnosing and managing NAFLD. Overall, 65% of physicians reported regularly using evidence-based guidelines for managing NAFLD, yet 72% reported challenges in providing lifestyle recommendations. A lack of awareness was the most common reported reason for the lack of screening for NAFLD (68% respectively).

Conclusions: Despite the growing burden of NAFLD, there is a significant gap in awareness, knowledge, and management among physicians treating patients with cardiometabolic comorbidities, particularly cardiologists. Hepatologists and gastroenterologists could play a role in educating their fellow physicians.

KEYWORDS

awareness, cardiologists, cardiovascular complications, healthcare workers, multidisciplinary approach, NAFLD, NASH, non-alcoholic fatty liver disease, non-alcoholic steatohepatitis, survey

INTRODUCTION

Non-alcoholic fatty liver disease (NAFLD) is the most common chronic liver disease globally,[1] but remains largely underdiagnosed.[2] NAFLD encompasses a spectrum of diseases starting with isolated steatosis, which can advance to non-alcoholic steatohepatitis (NASH) with or without liver fibrosis and can ultimately result in liver cirrhosis and hepatocellular carcinoma (HCC).[3] The disease usually progresses silently until reaching advanced stages, hampering early diagnosis. This is worrisome as the estimated global NAFLD prevalence increased rapidly from 25% in 2016[4] to over 30% in 2019.[5] Obesity, type 2 diabetes mellitus (T2DM) and metabolic syndrome increase the risk of NAFLD. The estimated prevalence is up to 75% in patients with obesity[6] and over 55% in patients with T2DM.[7] Therefore, international guidelines recommend screening for NAFLD fibrosis in patients at increased risk.[8] Currently, there are no approved pharmacological treatments for NAFLD[9] and treatment options are limited to intensive lifestyle intervention and sometimes bariatric surgery.[8,10] However, early detection of NAFLD is important as the disease is reversible up to cirrhosis.[11]

The rising prevalence of NAFLD drives its impact on the global burden of disease. NAFLD is the most strongly increasing contributor to liver-related mortality,[1] the burden of NASH-associated HCC is rising[12] and NAFLD is predicted to become the leading cause of liver transplantation in the near future.[13] However, the main cause of death in NAFLD patients is cardiovascular disease (CVD).[14,15] As NAFLD and atherosclerotic CVD (asCVD) share multiple risk factors,

Key Summary

Summarise the established knowledge on this subject

- Large surveys on non-alcoholic fatty liver disease (NAFLD) knowledge and practice in healthcare workers are scarce and focus less on views and attitudes regarding NAFLD.
- In addition, cardiologists were underrepresented in previous surveys, despite the high prevalence of cardiovascular disease in patients with NAFLD.

What are the significant and/or new findings of this study?

- Using a survey with a global reach, we found that a substantial gap in awareness, knowledge and management of NAFLD remains with physicians treating patients with cardiometabolic comorbidities.
- Differences between different specialities followed the same trend consistently; gastroenterologists and hepatologists performed best, followed by internists, general practitioners, and lastly cardiologists.
- Our survey provides the first delineation of the cardiologists' views, knowledge and attitudes regarding NAFLD.
- There could play a role for hepatologists and gastroenterologists to educate their fellow health care workers who also encounter patients with NAFLD.

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they share multiple common drivers as well, which partly explains their epidemiological relation.[16]

Despite its rapidly increasing burden, healthcare workers' knowledge of NAFLD is limited and differs per medical speciality.[17,18] Previous surveys mostly focused on differences between general practitioners (GP) and gastroenterologists and hepatologists. GPs reportedly underestimate the prevalence of NAFLD,[18] while gastroenterologists and hepatologists are more aware of the difference between NAFLD and NASH than GPs.[17] Differences between knowledge on NAFLD epidemiology, diagnosis and treatment were assessed recently among four types of physicians.[19] The hepatologists or gastroenterologists surveyed were more knowledgeable about NAFLD than endocrinologists or GPs, respectively. However, as the most detrimental complications in patients with NAFLD are cardiovascular, the cardiologists' awareness, attitude and knowledge regarding NAFLD is an important factor for successful multidisciplinary management. The first steps in delineating the role of cardiologists in NAFLD care have been suggested by the scientific statement of the American Heart Association (AHA) early 2022.[20] The AHA states that for both asCVD prevention and treatment, NAFLD is an important factor and this warrants increased awareness. However, cardiologists were underrepresented in previous surveys and information on their attitudes towards NAFLD is lacking.

In addition to being underdiagnosed, the real-world management of NAFLD is not in line with the available guidelines[21] and no country worldwide is adequately prepared for the expected increase in patients with NAFLD.[22] Improving awareness of NAFLD among healthcare workers less familiar with the disease could help identify patients at high risk of disease progression. A multidisciplinary approach should aim at reducing both cardiometabolic and hepatic complications.[23] To be able to specifically target the medical specialities where the largest improvements in awareness and knowledge could be made, identifying the differences among different disciplines is essential. The current study assesses the awareness of NAFLD and its associated factors among healthcare workers on a global scale.

METHODS

Survey design

The AwareNASH survey was developed over the course of two meetings with a multidisciplinary scientific committee. The committee was led by the Leiden University Medical Center in the Netherlands and supported by partner organisations in the surveyed countries. The members of the scientific committee were S.D. Anker (cardiology), M. Alings (cardiology), M. Castro Cabezas (endocrinology), D.E. Grobbee (clinical epidemiology), A.G. Holleboom (endocrinology, vascular medicine), C. Moreno (hepatology). The scientific committee was chaired by M.E. Tushuizen (hepatology, gastroenterology). All committee members are involved in clinical care and research regarding NAFLD. The current state of care for patients with NAFLD was mapped and the committee's perspectives on professional practice gaps of physicians and healthcare teams in their respective geographical regions were gathered. Subsequently, a quantitative survey was drafted and critically reviewed by the committee. The final survey contained 21 multiple-choice, Likert scale or free response items (see Supporting Information S1). The first eight items concerned the demographics of the respondents (i.e. age, sex, years of experience, affiliation to a certain field, practice setting and location). The next 13 items cover knowledge, practice and opinions/attitudes of healthcare workers towards NAFLD diagnosis and management. The survey was designed in the English language and additionally translated into Spanish by a professional medical translator.

Survey dissemination

The survey was disseminated electronically using Question Pro® by collaborating societies and organisations and by scientific committee members from February to June 2022. The following organisations were involved in the dissemination of the survey: European Association for the Study of Diabetes (EASD), the European Association for Preventive Cardiology (EAPC), Dutch Society of Endocrinology (NVE), Spanish Society of Diabetes, Translational Medicine Academy (TMA) and Julius Clinical (a contract research organisation). Dissemination methods included direct emailing to society members and posting on social media, as well as disseminating the survey at the Heart Failure congress of the European Society of Cardiology (ESC HFA) in Madrid from May 24 to 26, 2022. No incentives were provided for participation in the survey. Data were collected anonymously.

Data preparation

Survey data were downloaded from QuestionPro® Survey Software. The survey results included quantitative data and free text responses in both English and Spanish depending on the survey version. Translation of the Spanish free text was conducted by a professional medical translator. The data files from the English and Spanish versions were combined into one aggregate dataset.

Statistical analysis

The survey data was analysed using SPPS (version 28). Answers were summarised as median and interquartile range (IQR) for numeric responses (i.e., age and years of experience) and proportions for categorical responses or responses on a Likert scale. Likert scale responses were treated as ordinal data. Associations between Likert

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scale responses and other variables were determined using either the Spearman's Rho for correlations with continuous data or the Mantel–Haenszel test for trend for comparing nominal data. The Chi-square test was used for comparing nominal variables.

RESULTS

Respondent demographics

A total of 622 surveys were completed over a period of 4 months: English version (N = 549) and the Spanish version (N = 73). Nine respondents were removed from the aggregate data file as more than 75% of responses were missing; thus, the full dataset included 613 respondents from 88 different countries. The median number of missing responses was 0. None of the included respondents had more than 25% missing responses. The mean age of the respondents was 45 years: 56% were male, 43% were female and 1% selected the category 'other' or preferred not to answer. The profession that was reported most was physician (80%). Of the non-physicians, 3% were physician assistants, 6% were nurses, 2% were advanced practice nurses, 2% were dietitians/nutritionists, and 7% indicated they worked in another profession. Due to large heterogeneity in the group of non-physicians, most analyses focus on physicians only, except when comparing physicians to non-physicians.

Respondents could indicate multiple areas of expertise: general practice/primary care, internal medicine, cardiology, hepatology, endocrinology, gastroenterology, oncology, surgery and other. Of 488 physicians, 402 indicated a single area of expertise and 86 selected multiple areas of expertise. For the purpose of comparing physicians from different disciplines, a grouped dataset was developed containing the following 7 categories: GP; internist, which combines internal medicine, endocrinology and oncology; cardiologist; GE-specialist, which combines gastroenterology and hepatology; surgeon; other and lastly multidisciplinary, see Table 1. The multidisciplinary category contains the 86 respondents who selected multiple areas of expertise. The non-grouped areas of expertise can be found in Table S1.

Overall, 11% of the physicians reported being a GP, 33% internist, 27% cardiologist, 6% GE-specialist, 1% surgeon, 18% multidisciplinary and 4% worked in another discipline. Most physicians worked in an academic hospital (36%) or public hospital (33%), the remaining physicians worked in a private hospital (14%), grouped private practice (6%), solo private practice (7%), or had another practice location (3%). The primary region of employment was Europe including Russia (67%), followed by Southeast Asia (16%), Central and South America (8%), North Africa and Middle East (7%), Central and Southern Africa (2%) and lastly North America (1%). An overview of all physician characteristics can be found in Table 1.

We observed differences in views and attitudes towards NAFLD between regions and practice locations. However, due to the heterogeneous distribution of different specialisms among the different regions and practice locations, well-funded conclusions were precluded, see Tables S2 and S3.

Knowledge of NAFLD prevalence among physicians and non-physicians

Knowledge on the extent of the NAFLD prevalence was assessed by a multiple-choice question. Five possible answer options were provided, of which only one was correct: >20%.[5] 64% of all physicians underestimated the prevalence of NAFLD, whereas remaining 36% answered the question correctly. GE-specialists reported the correct prevalence most often (57% correctly), while GPs and cardiologists underestimated the prevalence most often (26% and 23% correctly). An overview of the different levels of underestimation among different disciplines can be found in Figure 1. Years of experience was not associated with reporting the correct estimation of the NAFLD prevalence (p = 0.097).

The number of correct answers was significantly higher among physicians compared to the pooled group of non-physicians (physician assistants, nurses, dietitians and paramedics), p = 0.02. However, the prevalence estimation from GPs and cardiologists separately did not differ significantly from that of non-physicians.

NAFLD awareness among physicians

Overall, 90% of physicians reported to be either somewhat or very familiar with the signs and symptoms of NAFLD, and 82% were somewhat or very familiar with the criteria to define NAFLD. GE-specialists felt most familiar with the both the signs and symptoms as well as the criteria to define NAFLD (93% and 93% respectively) and cardiologists felt least familiar (79% and 64% respectively). An overview of the self-reported awareness regarding signs and symptoms, and criteria to diagnose NAFLD for physicians can be found in Figure 2a,b. Experienced physicians were significantly more familiar with both the signs and symptoms and criteria to define NAFLD (p = 0.004 and 0.022).

Diagnosis and management of NAFLD

Overall, 63% of physicians reported feeling comfortable (either very- or somewhat comfortable) diagnosing NAFLD and 68% reported feeling confident (either very- or somewhat confident) in managing the disease. GE-specialists reported the highest confidence levels in both diagnosing and managing NAFLD (84% and 84% respectively) and cardiologists were least confident (54% and 52% respectively), see Figure S1. When comparing physicians from different disciplines, a trend was apparent when looking at the self-reported awareness and self-confidence in diagnosis and management. GE-specialists reported the highest levels of awareness and self-confidence, followed by internists, GPs and lastly cardiologists. These differences were not always significant, but the trend was consistent. Experienced physicians reportedly were more confident in their management of NAFLD but not more comfortable diagnosing it. Males tended to have slightly more confidence in diagnosing NAFLD compared with females (p = 0.026).

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TABLE 1 Physician demographics.

Survey item	Provided answer options	Responses
Age[a]		45 (36–55)
Total years of experience[a]		14 (4–24)
Gender/sex distribution	Female	38%
	Male	61%
	Other/don't want to say	1%
Area of expertise (N = 488)	General practice	11% (n = 53)
	Internal medicine[b]	33% (n = 159)
	Cardiology	27% (n = 131)
	GE-specialist[c]	6% (n = 31)
	Surgery	1% (n = 7)
	Other	4% (n = 21)
	Multidisciplinary[d]	18% (n = 86)
Primary practice location (N = 485)	Academic hospital	36% (n = 175)
	Public hospital	33% (n = 163)
	Private hospital	14% (n = 68)
	Private practice—group	6% (n = 27)
	Private practice—solo	7% (n = 36)
	Other	3% (n = 16)
Region of employment	North America	1% (n = 5)
	Central and South America	8% (n = 35)
	Europe (and Russia)	67% (n = 328)
	North Africa and Middle East	7% (n = 34)
	Central and Southern Africa	2% (n = 8)
	East and Southeast Asia	16% (n = 78)

[a]Depicted as mean with interquartile range.
[b]Including the areas of internal medicine, endocrinology and oncology.
[c]Including the areas: gastroenterology and hepatology.
[d]Multiple reported areas of expertise.

Participants were also inquired about the use of practice guidelines to diagnose and manage patients with NAFLD. 19% of the physicians reported to always use practice guidelines, 46% to use them most of the time, 13% to use them rarely, 4% preferred their own clinical judgement, 11% were not aware of the existence of any guidelines, 2% reported not to have access to such guidelines and 5% reported the question not being applicable to their professional role or responsibility. Physicians who did use guidelines most often used the EASL-EASD-EASO Clinical Practice Guidelines for the management of NAFLD from 2016 (43%), followed by the Practice Guideline by the American Association for the Study of Liver Diseases, American College of Gastroenterology, and the American Gastroenterological Association of 2012 (22%), and the World Gastroenterology Organisation Global Guidelines: Nonalcoholic fatty liver disease and nonalcoholic steatohepatitis of 2014 (10%).[8,24,25] Weight loss and exercise are the preferred current treatment strategies according to physicians of all disciplines. All GE-specialists reported exercise as a possible treatment option, and over 80% of GPs and cardiologists reported this. Bariatric surgery, pioglitazone and vitamin-E were mentioned less often as treatment options. Bariatric surgery was mentioned by 26% and 38% of GPs and cardiologists, respectively (Figure S2). Although weight loss is the preferred treatment option, 72% of all physicians reported having difficulties providing lifestyle recommendations for patients with NAFLD (Figure S3). Among the non-physicians, 65% of dietitians/nutritionists find it challenging to provide lifestyle recommendations for patients with NAFLD.

NAFLD screening

Physicians report a lack of awareness as the main reason why patients are not regularly being screened for NAFLD/NASH (68%), with

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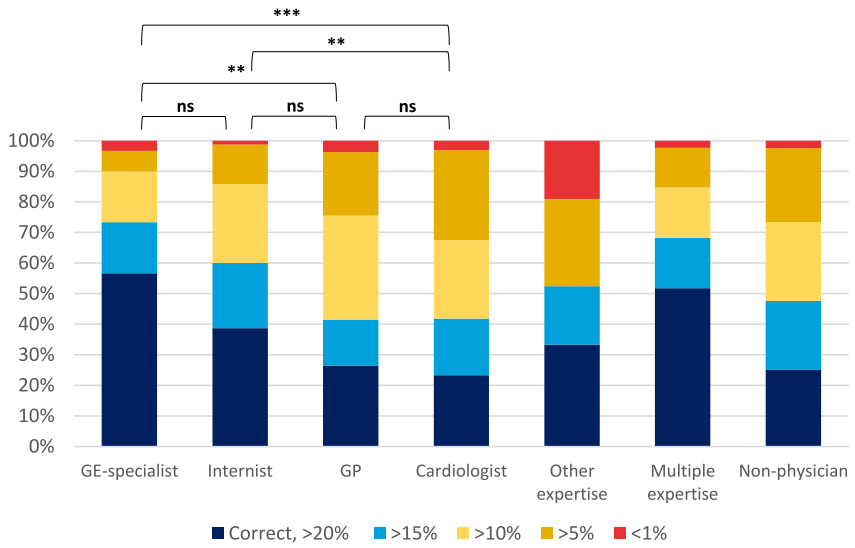

FIGURE 1 Estimation of non-alcoholic fatty liver disease prevalence among physicians working in different disciplines and non-physicians.

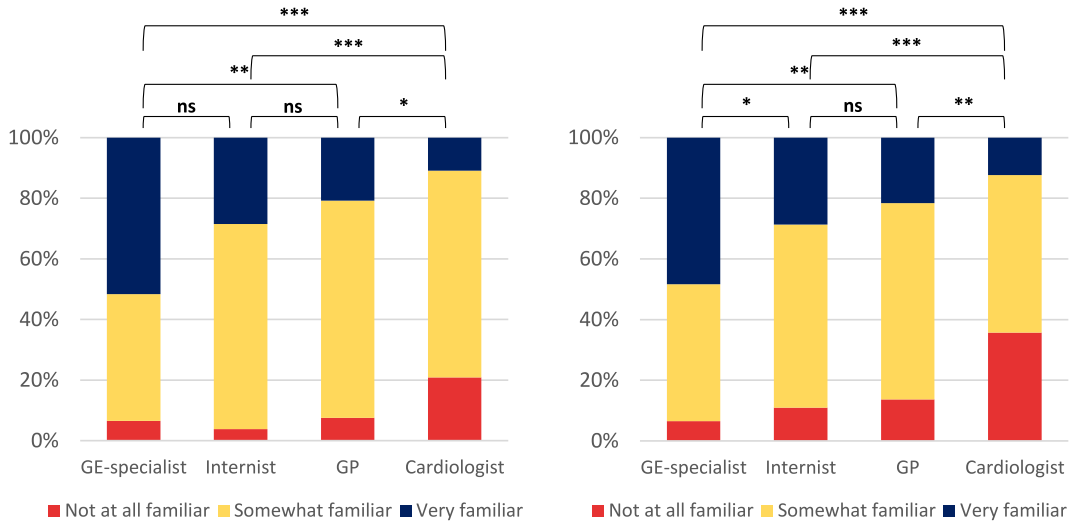

FIGURE 2 (a) Familiarity of physicians with the signs and symptoms of NAFLD/NASH and (b) familiarity of physicians with the criteria to define NAFLD. NAFLD, non-alcoholic fatty liver disease; NASH, non-alcoholic steatohepatitis.

GE-specialists (78%) reporting this reason most often and cardiologists (63%) least often. GE-specialists report the lack of treatment as the next most important reason, followed by unawareness of NASH reversal and lastly suboptimal diagnostic methods. In contrast, cardiologists, internists, and GPs all report suboptimal diagnostic methods as the next most important reason followed by unawareness of NASH reversal and lack of treatments (Figure 3).

All GE-specialists and more than 85% of GPs and cardiologists mentioned insulin resistance and T2DM as comorbidities related to NAFLD. CVD and hypertension were recognised slightly less often (64% and 61% by cardiologists and 76% and 71% by GPs, respectively) (Figure S4). When asked whether patients with CVD should be screened for NAFLD/NASH, most physicians agreed, with cardiologists noting the lowest rate (79%) and GPs the highest (90%) see Figure S5.

DISCUSSION

In this study, 613 healthcare workers from 88 different countries completed a survey encompassing awareness, knowledge and management, providing a global insight into NAFLD care. An important finding of this study is the large underestimation of the burden of NAFLD. Less than 40% of all physicians correctly estimated the prevalence of NAFLD. This is in line with the worldwide lack of preparedness described by Lazarus et al.[22] Our survey demonstrated that when comparing NAFLD knowledge or management between different specialities, differences follow the same trend consistently; GE-specialists perform best, followed by internists, GPs and lastly cardiologists. Furthermore, all physicians unanimously indicated the lack of awareness as the most important reason for the lack of

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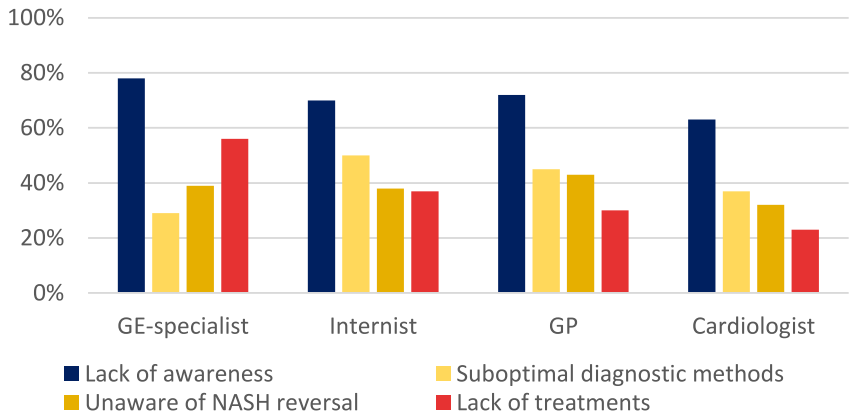

FIGURE 3 Physicians view on reasons why physicians do not regularly screen patients for NAFLD/NASH. NAFLD, non-alcoholic fatty liver disease; NASH, non-alcoholic steatohepatitis.

screening for NAFLD. The underestimation of the disease burden and lack of awareness are important problems to tackle in the near future. First steps have been made, resulting in several multidisciplinary guidelines.[20,26] However, in order to ensure that physicians who are not specialised in NAFLD also get engaged, more efforts should be made in including them in events such as satellite symposia.

Cardiologists have been underrepresented in previous surveys addressing NAFLD management, though they play an important role in the management of NAFLD-associated metabolic risk factors. Knowing their current views and knowledge on NAFLD can be a basis from which to enhance their engagement in NAFLD care. Compared to the other disciplines, cardiologists underestimated the prevalence of NAFLD most frequently and are least familiar with its symptoms and diagnostic criteria. Additionally, almost 40% of the cardiologists are unaware that CVD and hypertension are comorbidities related to NAFLD and they were least aware of CVD as a comorbidity. In contrast, almost 80% of the cardiologists agree that NAFLD patients should be screened for CVD, showing a striking discrepancy. Overall, internists performed better than cardiologists, but still lower than GE-specialists. In line with our results, a survey by Younossi et al. showed a significant knowledge gap between different specialities, especially among GPs and to a smaller extent endocrinologists.[19] Our survey adds to the notion that this knowledge gap also extends to cardiologists, and they should be included in educational efforts as well.

International guidelines increasingly advocate multidisciplinary approaches for patients with NAFLD.[8,20,26] However, there are still large differences in the management of NAFLD both internationally and between different specialities.[19,27] Guidelines advocate lifestyle intervention as the cornerstone of NAFLD treatment, increasing physical activity and adherence to the Mediterranean diet to achieve 5%–10% weight reduction.[11,28,29] In line with the guidelines, weight loss and exercise (i.e. intensive lifestyle intervention) were largely recognised as available treatment options. Bariatric surgery was less recognised as a possible treatment for NAFLD, whilst it is one of the few medical interventions included in guidelines yet.[30,31] Although 65% of physicians use available practice guidelines to manage NAFLD patients, 11% were unaware of the existence of these guidelines at all. This survey highlights the importance of spreading the already available practice guidelines amongst healthcare workers.

Although the search for pharmacological treatments of NAFLD is one of the key topics of current research, a lack of treatments was mentioned least often as a reason not to screen for NAFLD by physicians who are not specialised in NAFLD. Nevertheless, characteristics of all possible interventions and their implications should be a topic of future research in order to facilitate the implementation of these interventions.

The majority of physicians reported difficulties in providing lifestyle recommendations for patients with NAFLD. This is in accordance with a survey by Ratziu et al., which focused on modalities of patient referral and patterns of practice. In this study, 56% of surveyed hepatologists and gastroenterologists reported that less than half of the referred NAFLD patients had tried lifestyle changes before being referred to a hepatologist.[27] In order to support physicians who are not specialised in NAFLD, it is important to update guidelines with specific lifestyle interventions and include these in educational programs. 65% of the surveyed dietitians found it challenging to provide lifestyle recommendations for NAFLD as well. This implies that implementation in practice and educational modules can be improved. However, making lifestyle behavioural changes proves challenging for most NAFLD patients.[32] It would be of interest for future research to examine not only the role of dietitians but also other lifestyle experts such as psychologists and behavioural experts, given the fact that lifestyle change is dependent on multiple different factors.

In contrast to several earlier NAFLD surveys,[17,19,21,27] the current study focused largely on healthcare workers from specialities other than hepatologists and gastroenterologists, in particular cardiologists, internists and GPs. Moreover, the current survey also addressed attitudes towards NAFLD management, in addition to testing the knowledge of participating physicians. Strengths of our study were the large number of respondents, the global reach of the

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survey and the number of responses by cardiologists in particular, which were lacking in previous surveys. The survey was relatively short, which limited the number of conclusions that could be drawn from the results. Several of our conclusions concerning NAFLD awareness would have been strengthened by additional questions regarding the knowledge of NAFLD. Furthermore, the study provided data on screening NAFLD patients in a broader sense but lacked information on referral patterns or severe hepatic disease in specific. Respondents of this survey were possibly more knowledgeable about NAFLD than other physicians, which might have introduced bias. However, our results concerning knowledge of NAFLD are in line with other surveys. Additionally, the survey was largely disseminated via not-NAFLD specific events, reducing the possible selection bias of an overrepresentation of physicians who are interested in NAFLD. Since the survey was partially distributed electronically by collaborating organisations, we were not able to record a response rate and estimate the magnitude of this bias. Because the survey was addressed to healthcare workers in general, respondents could indicate multiple areas of expertise. This barred us from knowing whether a responding physician was an actual specialist or just affiliated with the field. Nevertheless, a sufficient number of respondents only indicated a single affiliation, enabling us to determine differences between disciplines.

Despite the growing disease burden of NAFLD, a significant gap in awareness, knowledge and management of NAFLD remains between physicians in different fields. Given their knowledge and experience, GE-specialists can take a prime role in involving fellow health care workers who also encounter patients with NAFLD, primarily those in general practice and cardiology, through outreach events and teaching modules. Simultaneously, these fields can be included in the management of this disease, preferably supported by multidisciplinary protocols.

ACKNOWLEDGEMENTS

We thank Medical Education Global Solutions for creating and conducting the survey. We thank Elevate Health for providing the platform for disseminating the survey. We thank the EASD, the EAPC, the NVE, Spanish Society of Diabetes, TMA, and Julius Clinical for disseminating the survey. The development, conduct and dissemination of the AwareNASH survey was supported by an independent educational grant from Pfizer inc. The authors received no specific funding to undertake the statistical analyses and preparation of this manuscript.

CONFLICT OF INTEREST STATEMENT

The authors declare that there are no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICS APPROVAL

No approval from an ethical board was necessary according to local laws.

PATIENT CONSENT STATEMENT

Not applicable.

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How to cite this article: Driessen S, de Jong VD, van Son KC, Klompenhouwer T, Colardelle Y, Alings M, et al. A global survey of health care workers' awareness of non-alcoholic fatty liver disease: the AwareNASH survey. United European Gastroenterol J. 2023;11(7):654–62. https://doi.org/10.1002/ueg2.12445

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