

A Survey on the Knowledge of Non-Alcoholic Fatty Liver Disease (NAFLD) among Pharmacy and Medical Students in a Public University

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ABSTRACT

Background: Non-alcoholic fatty liver disease is a spectrum of conditions ranging from steatosis (without inflammation or fibrosis) to non-alcoholic steatohepatitis which is steatosis with necroinflammation associated with liver fibrosis, cirrhosis, and hepatocellular carcinoma. The prevalence of a non-alcoholic fatty liver disease among health-screened patients in suburban medical facilities in Malaysia was reported at 22.7%. Non-alcoholic fatty liver disease is associated with several complications that can be fatal. **Objectives:** This study was conducted to assess the awareness of the non-alcoholic fatty liver disease among pharmacy and medical students in a public university in Malaysia. **Materials and Methods:** The study was conducted through an online cross-sectional survey of 68 third-year students of both programs. The data obtained were initially analyzed through the Shapiro-Wilk normality test and since the data was found to be not normally distributed, the Mann-Whitney U test was conducted to analyze the mean with the level of significance defined at $p < 0.050$. A chi-square test was also conducted to compare the variables involved. **Results:** The mean score obtained by participants in the third year of the pharmacy program was 9.28 CI 95% (8.60, 9.95) and the mean score recorded for participants in the third year of the medical program was 9.12 CI 95% (8.59, 9.65). Further analysis through Pearson's Chi-Square test indicated no significant difference between the mean score obtained to the gender and race of the participants. **Conclusion:** The findings indicated that the score for the awareness of the non-alcoholic fatty liver disease among the respondents was moderate and there was no significant difference between the scores of the two different programs.

Keywords: Non-alcoholic fatty liver disease, pharmacy, and medical students.

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INTRODUCTION

Non-alcoholic fatty liver disease (NAFLD) is characterized by the fat build-up in hepatocytes of more than 5% of wet liver weight in the absence of alcohol consumption.^{1,2} NAFLD has a histological resemblance to alcohol-induced liver injury, yet it happens to those who have never consumed alcohol.³ NAFLD is a range of conditions from simple steatosis (without inflammation or fibrosis) to non-alcoholic steatohepatitis (NASH) which is steatosis with necroinflammation and associated with liver fibrosis, cirrhosis, and hepatocellular carcinoma.² The global prevalence of NAFLD is recorded at 25%, affecting 1.8 billion people globally.⁴

Goh *et al.*, in the findings of their study, mentioned that the prevalence of NAFLD in the general population of Malaysia is 22.7%.⁵ The occurrence of NAFLD is more common among males and it is strongly correlated to the increase in age for both genders, peaking between the ages of 52 and 60 years old.² A study conducted in Klang Valley, Malaysia indicated Indians are highest affected by NAFLD followed by Malays and Chinese.² Khammas *et al.*, also stated that the likelihood to develop NAFLD is linked to an increase in body mass index (BMI).² Most NAFLD patients were identified as obese or diagnosed with metabolic syndrome.⁶ Overweight and obesity issues have increased dramatically in Malaysia throughout the years.⁹ Since the occurrence of NAFLD is shown to be strongly linked to metabolic syndrome and obesity, the treatment focuses on weight loss and risk factor reduction.⁷ Regular exercise and dietary changes may help to promote weight loss. A study identified a combination of diet and exercise may reduce Alanine Aminotransferase (ALT) levels in NAFLD patients more effectively than insulin sensitizers or other



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hypoglycemic drugs. Since NAFLD is linked to obesity and metabolic syndrome which causes insulin resistance, treatment plans always include insulin sensitizers such as thiazolidinedione.⁷

The progression of NASH to cirrhosis is the most severe complication of NAFLD. It is the most frequent cause of liver disease and the most common cause of cirrhosis.¹⁰ Cirrhosis is permanent scarring and hardening of the liver. A study reported that NAFLD or NASH is the leading cause of hepatocellular carcinoma after the Hepatitis B virus.⁹ Paik *et al.*, in their study, confirmed that cardiovascular disease (CVD) was one of the most common causes of death among NAFLD patients.¹⁰ Petroff *et al.*, indicated that 59% of physicians in Germany had no or limited understanding of the guidelines for the treatment of NAFLD despite the high severity of NAFLD complications.¹¹

Low awareness of NAFLD in the general community is also a major cause for concern for it may delay healthcare monitoring and prevention of NAFLD and its complications.⁴ It is crucial for everyone, especially future healthcare professionals, to know about NAFLD may contribute to undiagnosed and untreated cases.

NAFLD may lead to more severe diseases and complications that can be dangerous such as liver fibrosis, NASH, cirrhosis, and CVD.¹² Such complications will result in more treatment needs and some of them may be costly. Patients with NAFLD are 64% riskier for fatal and non-fatal cardiovascular events than patients without NAFLD.¹² All of these complications can be prevented or reduced with effective preventive measures such as better diagnosis and treatment which can be achieved with high awareness of NAFLD among primary healthcare professionals.¹⁰ However, several studies indicated that the awareness of NAFLD among healthcare providers is rather insufficient. Primary care physicians and hospital specialists were reported to have a lack of knowledge of NAFLD.⁴ Poor knowledge at the undergraduate level may lead to poor knowledge in career life thus affecting the quality of treatment for NAFLD. Awareness of the issue should be inculcated at the undergraduate level. Studies conducted previously were more focused on the awareness of the healthcare providers on NAFLD but there is no study to assess the awareness of NAFLD among undergraduate students. Therefore, this study was conducted to examine the awareness level of third-year pharmacy and medical students from Universiti Sultan Zainal Abidin (UniSZA), Malaysia.

MATERIALS AND METHODS

Study Design and Distribution

This study was conducted in the Faculty of Medicine and Faculty of Pharmacy at Universiti Sultan Zainal Abidin (UniSZA), Malaysia. The questionnaires were distributed to the participants through Google Forms. The participants consisted of 25 third-year pharmacy students and 43 medical students from UniSZA.

The participants were selected at the convenience of the writers. All participants were asked to confirm their participation in the study and were informed that they were to expect questions on NAFLD. Participation is based on the willingness of the participants.

Inclusion and Exclusion Criteria

The inclusion criteria are the third-year pharmacy and medical students who were willing to participate in the research. The third-year pharmacy student who was one of the study investigators was excluded.

Study Instrument

The questionnaire was designed and adapted based on the survey used in previous studies including the studies conducted by Matthias *et al.* and Vidal-Cevallos *et al.*^{8,13}

The questionnaire contains two sections with a total of 8 questions. The first section focuses on the demographic information of the participants and the second section focuses on assessing the knowledge of the participants about NAFLD, its risk factors, and its complications. The questions in the second section consist of 3 multiple-choice questions (MCQ) which require one answer respectively, 4 MCQs with multiple-answer (more than 1), and 1 true/false question. The time required to answer the questionnaire is less than 30 minutes. Content and face validity of the questionnaire was conducted by two Clinical Pharmacy lecturers from the Faculty of Pharmacy, UniSZA. The score of the participants was ranked as poor, moderate, and good based on their correct answers to the questions about NAFLD. Each correct answer was scored one mark. Questions 1-4 each contribute 1 mark each. Questions 5,6,7 and 8 respectively contribute 2, 2, 4 and 3 marks. The total score was 15 and was later ranked good (at least 80% of 15 marks obtained), moderate (between 60%-79% of 15 marks obtained), and poor (less than 60% of 15 marks obtained).

Data Collection and Analysis

The collected data was transferred in a Microsoft Excel worksheet and statistical analyses were computed by using the Statistical Package for Social Sciences (SPSS) version 21 software. A normality test was carried out using the Shapiro-Wilk test to determine the normality of the data distribution for the score on NAFLD. That test proved that the data was not normally distributed hence a non-parametric test, the Mann-Whitney U test was conducted to compare the mean of the score obtained by the participants. A chi-square test was also conducted to analyze the association between the score on NAFLD with the age and race of the participants.

Ethical Approval

Ethical approval was obtained from UniSZA Human Resources and Ethical Committee (UHREC) before data collection. The study protocol was approved by UniSZA Human Research Ethics Committee (UHREC) with protocol approval code UniSZA/UHREC/2022/381. The confidentiality of respondents' data was strictly maintained.

RESULTS

There were 59 third-year UniSZA medical students and 26 third-year UniSZA pharmacy students. However, only 43 (63.2%) medical students participated in the survey while 25 (36.8%) pharmacy students participated. There were 8 questions with the right answers included in the second section of the survey. These questions were adopted with the purpose to assess the awareness level of the participants specifically on NAFLD and its complications within the time limit. Three of the questions were multiple-choice questions with one correct answer respectively, and four of them were multiple-choice questions with multiple right answers and one true/false question.

Questions 1-4

The first question generally asked the participants about the prevalence of NAFLD in Malaysia. This question was in multiple-choice format. 18(26.5%) of the participants provided the right answer with 8 of them being pharmacy students and 10 being medical students. The second question was a true/false question that posed the participants with a statement that NAFLD is not inherited. Although it was a correct statement, 63.2% (43 out of 68) participants gave the right answer, meanwhile, the rest did not. Question 3 asked the participants about the best diet for patients with NAFLD. Similar to the first question, this question is in multiple-choice format and the options given were hypocaloric diet, low carbohydrate content diet, lipid content diet, and high protein content diet with hypocaloric diet as the right answer. 33.8% (23 out of 68) participants provided the right answer with 9 of them being pharmacy students and 14 being medical students. The fourth question asked the participants when patients with NAFLD should receive pharmacological treatment. This question was in multiple-choice format with two options. However, only 19 (27.9%) of the participants provided the right answer with 8 of them being pharmacy students and 11 being medical students (Table 1).

Questions 5-8

The remaining questions were in a multiple-choice format requiring more than one answer from the participants. The fifth question was requiring the participants to indicate the steps included in the management of NAFLD. The options provided were dietary modifications and weight loss as the correct answer

and the inclusion of UDCA, metformin, and statins as additional options. Out of all the options provided, 23 participants from the pharmacy program opted for dietary modifications, and 18 selected weight loss options. Meanwhile, 34 participants from the medical program selected the right options respectively. The following question asked the participants to pick the drugs that were contraindicated for NAFLD patients. The options provided include high doses of paracetamol, valproate, NSAIDs, and statins.

The first two options were the right answer expected to select. However, only 7 of the participants from the pharmacy program selected a high dose of paracetamol and 14 selected valproate. 24 participants from the medical program selected the first option and 15 selected valproate. A high percentage of participants (57.4%; 68% of pharmacy students and 51% of medical students) selected NSAIDs as at least one of their options. Question 7 offered six options requiring the participants to select the risk factors of NAFLD. The right options were hypertension, diabetes mellitus, obesity, and dyslipidemia meanwhile cardiovascular disease and end-stage renal failure were also included as the options for the question. 54.4% (11 pharmacy participants and 26 medical participants) selected hypertension, 86.8% (19 pharmacy participants and 40 medical participants) selected diabetes mellitus, 97.1% (23 pharmacy participants and all medical participants) selected obesity, and 94.1% (23 pharmacy participants and 41 medical participants) selected dyslipidemia. Only a small percentage of the participants combined selected the wrong options which were cardiovascular disease (23.5%) and end-stage renal failure (17.6%). The final question asked the participants about future complications of NAFLD. Cirrhosis, cardiovascular disease, fibrosis, and insulin resistance were included as the options for the question. All of the options were correct except insulin resistance.

A high percentage of the participants (91.2%; 22 pharmacy participants and 40 medical participants) selected cirrhosis. 9 out of 25 participants from the pharmacy program and 13 from the medical program selected cardiovascular disease, meanwhile, 13 out of the pharmacy program and 25 from the medical program selected fibrosis. However, 44.1% of the participants included insulin resistance as their option.

A further analysis was also conducted to evaluate the difference in the scores obtained between the medical and pharmacy students. The Shapiro-Wilk test was conducted to determine the normality of the data. The test indicated that the data for pharmacy participants were not normally distributed while the data for the participants from the medical department was normally distributed. A non-parametric test, the Mann-Whitney U test, was adopted to compare the means of the scores obtained by the participants between both groups. The mean score obtained by the participants who were pharmacy students was 9.28 CI 95% (8.60, 9.95), meanwhile, the medical

Table 1: Knowledge of Non-Alcoholic Fatty Liver Disease (NAFLD) among Pharmacy and Medical Students

Questions	Faculty	
	Pharmacy (%)	Medical (%)
What is the prevalence of NAFLD in Malaysia?		
Correct answer:		
20 - 29 %	8 (32)	10 (23)
Wrong answers:		
10 - 19%	3 (12)	2 (5)
30 - 39%	10 (40)	26 (60)
40 - 49%	4 (16)	5 (12)
2. NAFLD is not inherited.		
Correct answer:		
True	16 (64)	27 (63)
Wrong answer:		
False	9 (36)	16 (37)
3. Which is the best diet for a patient with NAFLD?		
Correct answer:		
Hypocaloric diet	9 (36)	14 (33)
Wrong answers:		
Low carbohydrate content diet	10 (40)	16 (37)
	3 (12)	7 (16)
Lipid content diet	3 (12)	6 (14)
High protein content diet		
4. When patients with NAFLD should receive pharmacological treatment?		
Correct answer:		
After liver biopsy	8 (32)	11 (26)
Wrong answer:		
High AST/ALT	17 (68)	32 (74)
5. Management of NAFLD involves:		
Correct answers:		
Dietary Modifications	23 (92)	34 (79)
Weight loss	18 (72)	34 (79)
Wrong answers:		
UDCA	10 (40)	6 (14)
Metformin	6 (24)	10 (23)
Statins	7 (28)	17 (40)
6. Drugs that are contraindicated for patients with NAFLD.		
Correct answers:		
High dose of paracetamol	7 (28)	24 (56)
Valproate	14 (56)	15 (35)
Wrong answers:		
NSAIDs	17 (68)	22 (51)
Statins	5 (20)	8 (19)

7. Which is/are the risk factor(s) of NAFLD?		
Correct answers:		
Hypertension	11 (44)	26 (60)
Diabetes Mellitus	19 (76)	40 (93)
Obesity	23 (92)	43 (100)
Dyslipidaemia	23 (92)	41 (95)
Wrong answers:		
Cardiovascular Disease	9 (36)	7 (16)
End Stage Renal Failure	6 (24)	6 (14)
8. NAFLD can progress into:		
Correct answers:		
Cirrhosis	22 (88)	40 (93)
CVD	9 (36)	13(30)
Fibrosis	13 (52)	25(58)
Wrong answer:		
Insulin resistance	12 (48)	18 (42)

students obtained a 9.12 CI 95% (8.59, 9.65). The mean scores of both groups hence indicated that pharmacy students are higher than the mean of medical students. The results of the Mann-Whitney U test computed the *p*-value of the data at 0.422 which was greater than 0.050 hence indicating that there was no significant difference between the mean score on the knowledge of NAFLD between third-year pharmacy and medical students in UniSZA.

Additionally, the mean scores obtained were also compared to the gender and race of the participants to find any relationship between them. A total of 24 male and 44 female respondents were involved in this study. Based on the answer provided, the score of 9 male participants was ranked low, 14 were moderate, and 1 was ranked high.

On the other hand, 12 female participants obtained low overall scores, 29 moderate, and 3 were ranked high. The chi-square value computed between the score and gender was 0.853 with a *p*-value of 0.653 (*p*>0.050) hence indicating that there was no significant difference between the score obtained and the gender of the participants and proving that there was no association between the two variables. The participants consisted of 61 Malay participants of which 20 scores were ranked low, 37 moderate, and 4 were ranked high. There were 5 Indian participants involved in the study with 1 obtaining low scores and 4 being ranked moderate. On the other hand, there were 2 Chinese participants and both of them scored moderately on the questionnaires. The Chi-square value between the score obtained and the race of the participants was 2.054 with a *p*-value at 0.726 (*p*>0.050) hence indicating that there was no significant difference between the score and race of the respondents and proving that there was no association between the two variables (Table 1).

DISCUSSION

Several studies have noted the prevalence of NAFLD in Asia. Wong and Chan, in their study indicated that the overall prevalence of NAFLD among Asians was 29.6%.¹⁴ The prevalence of NAFLD was reported to vary across Asian countries where Japan was reported at 22.2%, Indonesia at 30%, and 29.2% in China.¹⁵⁻¹⁷ Goh *et al.*, conducted a study in a suburban medical facility in Malaysia.⁵ It was the first study on the prevalence of NAFLD and it was conducted through a cross-sectional survey from January 2000 to December 2009 at a private medical institution. Through the study, they identified that the prevalence of NAFLD in suburban settings in Malaysia was 22.7%.⁵

NAFLD coexists with metabolic syndrome components such as insulin resistance, hyperglycemia, hypertension, and dyslipidemia.¹⁸ The most common causes of NAFLD were excessive caloric intake and insufficient physical activity. Alwahsh and Gerbhardt, in their study, revealed that the increase in high-calorie food and fructose intake was linked to the increased risk for NAFLD.¹⁹ Several other studies linked high BMI and obesity with NAFLD.^{8,9,14} Other than that, other studies associated NAFLD with polycystic ovarian syndrome (PCOS), hypertension, and diabetes mellitus.^{9, 18, 20}

Due to the complications of NAFLD, it was suggested through previous studies that it would be advantageous to identify NAFLD cases early. This may help in reducing cardiometabolic risks, as most patients with NAFLD were reported to die from cardiovascular disease.^{10,21-22} Additionally, cirrhosis was also listed as one of the primary causes of death among patients with NAFLD.¹⁰ Studies conducted by Van Der Windt *et al.*, Abd El-Kader and El-Den Ashmawy, Hsu and Kao, and Prasetya *et al.*, stated that NAFLD can also progress into NASH and putting patients at risk of end-stage liver diseases such as cirrhosis and hepatocellular carcinoma.^{3,15,23-24} The findings of this study indicated that the awareness or knowledge level of third-year pharmacy and medical students was moderate. This finding was in tune with the findings of other studies in different settings involving healthcare professionals indicating that the knowledge of NAFLD among healthcare professionals is rather low. These studies were conducted in various hospital settings and on professionals from various departments including medical officers, trainee doctors, physicians, gastroenterologists, and nurses. Polanco-Briceno *et al.*, in their study, revealed that gastroenterologists and hepatologists were better equipped with knowledge of NAFLD, yet not all of them follow the diagnosis and treatment guidelines.²⁵ Patients with NAFLD are often diagnosed, managed, and treated outside the recommendations of the current guidelines.¹⁴ Limited awareness of NAFLD may result in cases released without detection or poor management of the patients.

CONCLUSION

The score for the knowledge of NAFLD among the respondents was moderate and there was no significant difference between the scores of the pharmacy and medical students.

LIMITATIONS

All of the previous studies on this matter were conducted on working healthcare professionals with none focusing on the soon-to-be-released professionals during their studying years. Therefore, the findings of this study may not be comparable to the findings of the previous studies as this study was focusing solely on third-year students of pharmacy and medicine in a specific university. The findings of this study may not be generalized to the general populations of pharmacy and medical students as this study were focusing only on a specific population in a specific location. There was a lack of heterogeneity in this study as there were only a small amount of participants who were Indian and Chinese, hence the findings may not be generalized to the multiracial population of the nation.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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