Non-Alcoholic Fatty Liver Disease: Taif Populations' Perspective Based on Knowledge and Attitude Determinants

Abdulhakeem S. Alamri[1,2,*], Majid Alhomrani[1,2], Walaa F Alsanie[1,2], Maram O AlMerdas[1], Wafa A AlGhamdi[1], Waad F AlTwairqi[1], Najlaa M Alotaibi[1], Shahad S AlOsaimi[1], Syed Mohammed Basheeruddin Asdaq[3], Nagaraja Sreeharsha[4,5], Bassem M. Raafat[6]

[1]Department of Clinical Laboratories Sciences, College of Applied Medical Sciences, Taif University, Taif, SAUDI ARABIA.
[2]Centre of Biomedical Sciences Research (CBSR), Deanship of Scientific Research, Taif University, SAUDI ARABIA.
[3]Department of Pharmacy Practice, College of Pharmacy, AlMaarefa University, Dariyah, Riyadh, SAUDI ARABIA.
[4]Department of Pharmaceutical Sciences, College of Clinical Pharmacy, King Faisal University, Al-Ahsa, SAUDI ARABIA.
[5]Department of Pharmaceutics, Vidya Siri College of Pharmacy, Off Sarjapura Road, Bengaluru, Karnataka, INDIA.
[6]Department of Radiology Sciences, College of Applied Medical Sciences, Taif University, Taif, SAUDI ARABIA.

ABSTRACT

Background: In developed countries, non-alcoholic fatty liver disease (NAFLD) is the most common chronic liver condition. The disease raises the risk of liver-related morbidity and mortality, as well as associated comorbidities. The general public's knowledge and attitude are critical in developing countermeasures to prevent the spread of the disease. **Purpose:** This study was done to determine the knowledge and attitude of the general public of Taif city, Saudi Arabia. **Materials and Methods:** A validated self-administered questionnaire was used to collect data for the study, which covered knowledge (04 items) and attitude (04 items) (7 items). In addition, demographic questions were included to see how they influenced knowledge and attitude. The data was examined using descriptive statistics in SPSS-IBM 25. **Results:** Out of 454 participants, more than 72% were female and 55% were in an age group of 18-30 years and only 11% had known NAFLD cases in their family. The number of participants who had family members with NAFLD had a significantly higher level of knowledge ($P=0.012$). The vast majority of those polled in this study had a favorable or satisfactory attitude toward NAFLD. The age group of 31-40 years showed a significantly ($P=0.048$) higher proportion of participants with a positive attitude when compared to other age groups. It is also important to note that females with a good knowledge and positive attitude toward NAFLD outnumber male participants. **Conclusion:** Generally, Taif residents have less knowledge of NAFLD, but their attitude is encouraging. The link between chronic illnesses and NAFLD remains poorly understood. It is critical to find mechanisms and ways to halt the disease's rapid progression in the community.

Key words: Knowledge, Attitude, Taif, NAFLD, Saudi Arabia.

INTRODUCTION

Non-alcoholic fatty liver disease (NAFLD) is a broad term that comprises of group of diseases that ranges from basic adipose tissue deposit in the liver to more advanced steatosis with hepatitis, fibrosis, cirrhosis, and, in certain cases, hepatocellular carcinoma (HCC).[1] Non-alcoholic fatty liver (NAFL) and non-alcoholic steatohepatitis (NASH) are two well-known basic forms of NAFLD.[1] It is worth to mention that NAFL is referred for liver steatosis with inclusion of 5% of the parenchyma without any damage to hepatocyte injury, on the other hand, NASH is featured with necrosis and inflammation in steatosis with the involvement of liver cells.[2] While exact pathophysiology of NAFLD is still being studied, available

report notes that there is a risk of advancement to cirrhosis and HCC.[3-6]

The actual prevalence rate of NAFLD is not clearly known due to difference in the testing methods used in different studies as well as parameters that were studied.[1] However, global estimates suggest a range of 20-30% in the western world and around 5-18% in Asian countries.[1] An incidence rate of NAFLD over 30% reported from South America[7] and 24% from United States.[8] A review conducted recently has estimated an increasingly greater prevalence of NAFLD in Middle East and north Africa compared to the rest of the world.[9] Given current trends in dietary carelessness and the prominence of a sedentary lifestyle, it is predictable that the prevalence of NAFLD is increasing worldwide with each passing year.[1] In Saudi Arabia alone, a study predicted NAFLD occurrence rate of more than 30% by the end of 2030 from 10% in 2012 and 25% in 2017.[10]

Another significant finding is the association between the NAFLD and endocrinal and metabolic disorders including diabetes mellitus (DM). The exponential rise in NAFLD is correlated with a progression of diabetes cases.[11] Up to 33% of NAFLD cases were reported in DM (type 2) patients and markers of insulin resistance were found in large number of these patients (66–83%).[11-13] Further, even a moderate increase in low-density lipoprotein cholesterol has shown significant increase in the number of NAFLD cases (19-42%).[14] Additionally, higher mortality rates were found in geriatric patients.[15,7] Around 10% increase in NAFLD incidence rate was noted in United States among overweight subjects.[16] Overall, NAFLD is expected to become the primary cause of liver-related morbidity and mortality, as well as a key reason for liver transplantation, within the next 20 years.[3] In the absence of a reliable medical treatment for NAFLD,[17] increased physical activity and weight loss have been demonstrated to be useful in reversing some of the illness's repercussions; thus, public awareness plays a significant role in disease control.

Although, the NAFLD cases are escalating in different parts of the world including Saudi Arabia, the knowledge and attitude of the general public is rarely explored. The knowledge and attitudes are critical factors to develop strategies and put mechanisms to curb the NAFLD spread. Also, since it is country with high number of DM and hyperlipidemia cases, it would be good to gauge the level of their knowledge and methods they follow to deal with NAFLD. Taif City represents a true sample of the population of the Kingdom of Saudi Arabia because it has people from various economic, educational, and racial origins. As a result, a cross-sectional study

design was done to measure the general population of Taif City, Saudi Arabia's knowledge level and patterns of attitudes concerning NAFLD.

MATERIALS AND METHODS

Experimental tool

This study was carried out using survey items that were developed by the researchers based on the most relevant information that needed to be solicited to categorize the participants into different knowledge levels and attitude patterns. Age and gender are the two demographic items that were included at the start of the questionnaire, along with an item to find out whether they have any known people within the family with NAFLD. Both logical and content validity were checked subject to the study objectives with the help of senior researchers and experts in the field. Subsequently, the questionnaire was translated into the Arabic language to ease the comprehension of the survey content for the surveyors. The Arabic translated form, along with the English form, was compared for logical and construction validity with the help of bilingual (Arabic-English) speakers. Further, a pilot study was done on the small number of population to ascertain if there were any missing points or if the respondent experienced difficulties in understanding the questionnaire item.

There were four items related to the knowledge domain. The items were to know whether they had heard about NAFLD. They know its high prevalence, its dangerous nature and the risk it carries. The options for all four items were either 'yes' and 'no'. The letter 'Yes' denotes the correct response, while the letter 'No' denotes an incorrect response. The 'yes' and 'no' options are shuffled between first and second positions. Those who correctly answered all four questions were considered to have 'good knowledge.' Whereas 2 and 3 correct answers resulted in them being labeled as fair knowledge carriers, 1 correct answer or no correct answer resulted in them being labeled as poor knowledge participants.

Seven items were included to evaluate the pattern of attitudes among the participants. Similar to knowledge, the options were 'yes' and 'no' with shuffling. The attitude was determined by their possible role if the screening was required for NAFLD. Obesity, diabetes, low density lipoprotein, and hypertension also contribute to the spread of NAFLD. Also, items were included to check their attitude towards exercise's role in avoiding NAFLD and the risk of cancer with NAFLD. If the number of correct answers was 6, or 7, participants were considered to have a positive attitude. Those between

Table 1: Percentage description of trend of answers to the Knowledge items.

Sl. No	Items	Yes (Percentage)	No (Percentage)
1	Have you heard about NAFLD before today?	36.6%	63.4%
2	Do you think prevalence rate of NAFLD in Saudi Arabia is high?	50.5%	49.5%
3	Do you think NAFLD can have dangerous conditions?	85.9%	14.1%
4	Do you think you are at risk of NAFLD?	36.2%	63.8%

Table 2: Comparison of knowledge level with demographics of the participants.

Demographics	Good N (%)	Fair N (%)	Poor N (%)	Total	P-value*
Age (years)					
18-30	20 (8)	146 (58)	85 (34)	251	0.048
31-40	7 (8)	45 (54)	32 (38)	84	
41-50	26 (30)	49 (56)	13 (15)	88	
51-60	9 (33)	12 (44)	6 (22)	27	
>60	1 (25)	1 (25)	2 (50)	4	
Gender					
Male	16 (13)	56 (44)	54 (43)	126	0.035
Female	33 (10)	197 (60)	98 (30)	328	
Someone in the family with NAFLD					
No	34 (8)	226 (56)	146 (36)	406	0.012
Yes	22 (46)	24 (50)	2 (4)	48	

*Pearson Chi-Square test; Knowledge Score: 0,1-poor, 2,3-fair, 4-good

3-5 and 0-2 were termed as surveyors with satisfactory or negative attitudes, respectively.

Collection of response

Based on the confidence interval of 95% and a precision index of 5%, in consideration of the population of Taif City, the sample size was supposed to be 400. The institutional ethical committee approval was obtained for the project proposal prior to its execution. The questionnaire form was transferred to an electronic sheet and researchers visited the study locations near hospitals, health care centers, malls and plazas during September to December 2020 and the potential partici-

pants were recruited by a random, purposive sampling technique. To avoid non-response bias, those who agreed to participate were given a link to the survey form and asked to provide feedback on the items on the spot. The respondents were free to share their feedback without any coercion or interference from the researcher.

Statistical analysis

The data was collected and processed using SPSS statistical software. Based on age, gender, and having a known NAFLD family member, descriptive analysis was used to identify the level of knowledge and pattern of attitude. It is considered significant if the *P* value is less than 0.05.

RESULTS

NAFLD Knowledge analysis

This study had a total of 454 participants. Most of them were female (> 72%), in an age group of 18-30 years (251, 55%), and had no known NAFLD cases (89%) in the family. As shown in Table 1, most of the surveyors (63.4%) had not heard of NAFLD prior to this interview. However, when they were told about NAFLD during a brief description prior to administering the questionnaire, approximately 90% of them realized the dangerous outcome of NAFLD. Further, only 36% of the respondents think that they are at higher risk of developing NAFLD. Slightly more than half of the participants agree that there is a high prevalence rate of NAFLD in Saudi Arabia.

Comparison of knowledge level with demographics

A significant relationship was noticed between the age group of the participants and their level of knowledge. Approximately 66% of surveyors in the 18-30 (year) age group had either good or fair knowledge of NAFLD, which is nearly identical (62%) in the 31-40 (years) age group (Table 2). A group of people over the age of 41 had a significantly (*P*=0.048) higher proportion of participants with fair or good knowledge.

When compared to their male counterparts, a higher percentage of female participants had a fair understanding of NAFLD (*P*=0.035). More than 95% of the surveyors who had known family members with NAFLD had either good or fair knowledge of the disease. The number of participants who had family members with NAFLD had a significantly higher level of knowledge (*P*=0.012).

NAFLD attitude Pattern

Table 3 gives details about the number of correct answers obtained to determine the pattern of attitudes among

SL. No	Items	Yes (Percentage)	No (Percentage)
1	Would you undergo for medical screening for NAFLD?	72.7%	27.3%
2	Do you think obesity cause NAFLD?	90.7%	9.3%
3	Do you think diabetes causes NAFLD?	57.8%	42.2%
4	Do you think high level of blood cholesterol cause NAFLD?	85.7%	14.3%
5	Do you think hypertension affects NAFLD?	40.7%	59.3%
6	Do you think exercise affect the avoidance of NAFLD?	91.6%	8.4%
7	Do you think NAFLD can cause liver cancer?	72.7%	27.3%

Table 3: Percentage description of trend of answers to the Attitude items.

Demographics	Pattern of Attitude			Total	P-value*
	Positive N (%)	Satisfactory N (%)	Negative N (%)		
Age (years)					
18-30	99 (39)	140 (56)	12 (5)	251	0.048
31-40	44 (52)	36 (43)	4 (5)	84	
41-50	39 (44)	43 (49)	6 (7)	88	
51-60	12 (44)	13 (48)	2 (7)	27	
>60	3 (75)	1 (25)	0	4	
Gender					
Male	47 (37)	70 (56)	9 (7)	126	0.039
Female	150 (46)	163 (50)	15 (5)	328	
Someone in the family with NAFLD					
No	175 (43)	209 (51)	22 (5)	406	0.532
Yes	14 (29)	27 (56)	7 (15)	48	

Table 4: Attitude Pattern of participants on NAFLD.

*Pearson Chi-Square test; Attitude Score: 0,1,2-negative, 3,4,5-satisfactory and 6,7-positive

the participants in the study. More than 72% of the surveyors had the right attitude to be ready for a medical examination for the screening of NAFLD. Most of the participants believe that obesity (> 90%) and high blood cholesterol (> 85%) are directly associated with NAFLD. However, the role of DM and hypertension in causing NAFLD was endorsed by only 57.8% and 40.7% of the participants, respectively. A large number of respondents (> 91%) had the right attitude about the role of exercise in avoiding NAFLD. Finally, almost 73% agree that NAFLD may lead to liver cancer.

Comparison of Attitude pattern with demographics

Table 4 describes the comparison pattern of the attitudes of the participants with the demographic variables. The vast majority of those polled in this study had a favorable or satisfactory attitude toward NAFLD. The age group of 31-40 years showed a significantly (*P*=0.048) higher proportion of participants with a positive attitude when compared to other age groups. It is also important to note that females with a positive attitude toward NAFLD outnumber male participants. Overall, a significantly (*P*=0.039) high number of surveyors had either satisfactory or positive attitudes in both male and female cohorts. No significant relationship was noticed between the attitudes of people who had NAFLD cases in their family and those who had no such cases.

DISCUSSION

This study was an attempt to explore the knowledge and attitude of the common people of Taif City of Saudi Arabia to Non-alcoholic fatty liver disease (NAFLD). To our knowledge, this was the first attempt made in the region. The outcome of the study shows the average level of knowledge in the study cohort with a satisfactory attitude. However, there is a need for widespread campaigning and dissemination of information on NAFLD to control its rapid spread in the region.

The first important observation of this study is the lack of knowledge of the general population about the existence of NAFLD and its risk factors. Only 36% know that there is a disease by this name which has a close correlation with a number of metabolic, endocrinal and cardiovascular diseases. Since NAFLD is the most frequent chronic liver disease in clinical practice[18] and poses a serious public health issue around the world, there is a need to inform the general public about this disease. In the absence of definite treatment methods, lifestyle changes and correction of modifiable risk factors[19] are keys to curtailing the rapid progression of NAFLD. Therefore, public awareness of the disease and its risk factors will make them realize how to avoid or include certain approaches in their lives to prevent their entry into the NAFLD category.

Our study sample, who had relatives or known NAFLD cases, showed high knowledge scores compared to those who were not exposed to the NAFLD cases. It goes without saying that having someone in the family with a disease will pique their interest and, as a result, increase their knowledge.

The attitude toward the link between NAFLD and metabolic diseases was mixed, with only half of the participants agreeing on the link. On the other hand, studies show the existence of NAFLD in up to 70% of type 2 DM patients.[18] The co-existence of NAFLD, insulin resistance, obesity and type 2 DM is commonly found in patients. They eventually lead to both liver and non-liver diseases, including cardiovascular manifestations, which are the major reason for mortality in NAFLD patients.[20-23] Since Saudi Arabia has a high prevalence rate of diabetes[24] and the latest study[10] predicted a high incidence rate of NAFLD, it is important to determine its co-existence in the population. Therefore, it is important to screen NAFLD patients for metabolic disorders, including diabetes mellitus and hyperlipidemia, as recommended by some of the guidelines.[25]

Overall, this study emphasizes that the understanding of NAFLD among the general public needs to be improved and the best way forward is to run continuous campaign programs through social media or other interactive means.

Although our study accomplished its objective, it has some limitations that can help improve the outcomes in future research. The study tool was shared with participants and requested them to reply to the items in the presence of researchers that possibly might not have been given time to comprehend the question independently without getting influenced by the environment. Although the study was done in one of the cosmopolitan cities in the country, the outcome is not generalizable to the whole population of Saudi Arabia. We need a comprehensive and national level survey to determine the actual level of knowledge and attitudes with samples from different regions of the Kingdom.

CONCLUSION

Overall, people of Taif have low knowledge of NAFLD, but their attitude pattern is satisfactory. The understanding of the association of chronic diseases with NAFLD was poor. There is an urgent need to develop mechanisms and strategies to stop the rapid progression of the disease in society.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

ABBREVIATIONS

NAFLD: Non-alcoholic Fatty Liver Disease; **NASH:** Non-alcoholic fatty liver (NAFL) and non-alcoholic steatohepatitis; **HCC:** Hepatocellular Carcinoma; **SPSS:** Statistical Package for the Social Sciences; **DM:** Diabetes Mellitus.

REFERENCES

1. Sayiner M, Koenig A, Henry L, Younossi ZM. Epidemiology of nonalcoholic fatty liver disease and nonalcoholic steatohepatitis in the United States and the rest of the world. Clin Liver Dis. 2016 May 1;20(2):205-14. doi: 10.1016/j.cld.2015.10.001, PMID 27063264.

2. Kanwar P, Kowdley KV. The metabolic syndrome and its influence on nonalcoholic steatohepatitis. Clin Liver Dis. 2016 May 1;20(2):225-43. doi: 10.1016/j.cld.2015.10.002, PMID 27063266.

3. Calzadilla Bertot L, Adams LA. The natural course of non-alcoholic fatty liver disease. Int J Mol Sci. 2016 May;17(5):774. doi: 10.3390/ijms17050774, PMID 27213358.

4. Powell EE, Cooksley WG, Hanson R, Searle J, Halliday JW, Powell LW. The natural history of nonalcoholic steatohepatitis: a follow-up study of forty-two patients for up to 21 years. Hepatology. 1990 Jan;11(1):74-80. doi: 10.1002/hep.1840110114, PMID 2295475.

5. Caldwell SH, Oelsner DH, Iezzoni JC, Hespenheide EE, Battle EH, Driscoll CJ. Cryptogenic cirrhosis: clinical characterization and risk factors for underlying disease. Hepatology. 1999 Mar;29(3):664-9. doi: 10.1002/hep.510290347, PMID 10051466.

6. Teli MR, James OF, Burt AD, Bennett MK, Day CP. The natural history of nonalcoholic fatty liver: a follow-up study. Hepatology. 1995 Dec;22(6):1714-9. doi: 10.1002/hep.1840220616, PMID 7489979.

7. Bellentani S. The epidemiology of non-alcoholic fatty liver disease. Liver Int. 2017 Jan;37;Suppl 1:81-4. doi: 10.1111/liv.13299, PMID 28052624.

8. Younossi ZM, Koenig AB, Abdelatif D, Fazel Y, Henry L, Wymer M. Global epidemiology of nonalcoholic fatty liver disease-Meta-analytic assessment of prevalence, incidence, and outcomes. Hepatology. 2016 Jul;64(1):73-84. doi: 10.1002/hep.28431, PMID 26707365.

9. Shiha G, Alswat K, Al Khatry M, Sharara AI, Örmeci N, Waked I, Benazzouz M, Al-Ali F, Hamed AE, Hamoudi W, Attia D, Derbala M, Sharaf-Eldin M, Al-Busafi SA, Zaky S, Bamakhrama K, Ibrahim N, Ajlouni Y, Sabbah M, Salama M, Anushiravani A, Afredj N, Barakat S, Hashim A, Fouad Y, Soliman R. Nomenclature and definition of metabolic-associated fatty liver disease: a consensus from the Middle East and north Africa. Lancet Gastroenterol Hepatol. 2021;6(1):57-64. doi: 10.1016/S2468-1253(20)30213-2. PMID 33181119.

10. Alswat K, Aljumah AA, Sanai FM, Abaalkhail F, Alghamdi M, Al Hamoudi WK, Al Khathlan A, Al Quraishi H, Al Rifai A, Al Zaabi M, Babatin MA, Estes C, Hashim A, Razavi H. Nonalcoholic fatty liver disease burden - Saudi Arabia and United Arab Emirates, 2017-2030. Saudi J Gastroenterol. 2018 Jul;24(4):211-9. doi: 10.4103/sjg.SJG_122_18, PMID 29956688.

11. Browning JD, Szczepaniak LS, Dobbins R, Nuremberg P, Horton JD, Cohen JC, Grundy SM, Hobbs HH. Prevalence of hepatic steatosis in an urban population in the United States: impact of ethnicity. Hepatology. 2004;40(6):1387-95. doi: 10.1002/hep.20466, PMID 15565570.

12. Jimba S, Nakagami T, Takahashi M, Wakamatsu T, Hirota Y, Iwamoto Y, Wasada TJ. Prevalence of non-alcoholic fatty liver disease and its association with impaired glucose metabolism in Japanese adults. Diabet Med. 2005 Sep;22(9):1141-5. doi: 10.1111/j.1464-5491.2005.01582.x, PMID 16108839.

13. López-Velázquez JA, Silva-Vidal KV, Ponciano-Rodríguez G, Chávez-Tapia NC, Arrese M, Uribe M, Méndez-Sánchez N. The prevalence of nonalcoholic fatty liver disease in the Americas. Ann Hepatol. 2014 Mar 1;13(2):166-78. doi: 10.1016/S1665-2681(19)30879-8, PMID 24552858.

14. Sun DQ, Liu WY, Wu SJ, Zhu GQ, Braddock M, Zhang DC, Shi KQ, Song D, Zheng MH. Increased levels of low-density lipoprotein cholesterol within the normal range as a risk factor for nonalcoholic fatty liver disease. Oncotarget. 2016 Feb 2;7(5):5728-37. doi: 10.18632/oncotarget.6799, PMID 26735337.

15. Kabbany MN, Conjeevaram Selvakumar PK, Watt K, Lopez R, Akras Z, Zein N, Carey W, Alkhouri N. Prevalence of nonalcoholic steatohepatitis-associated cirrhosis in the United States: an analysis of national health and nutrition examination survey data. Official journal of the American College of Gastroenterology| ACG. 2017 Apr 1;112(4):581-7. doi: 10.1038/ajg.2017.5, PMID 28195177.

16. Younossi ZM, Stepanova M, Negro F, Hallaji S, Younossi Y, Lam B, Srishord M. Nonalcoholic fatty liver disease in lean individuals in the United States. Medicine. 2012 Nov 1;91(6):319-27. doi: 10.1097/MD.0b013e3182779d49, PMID 23117851.

17. Gouthamchandra K, Sudeep HV, Raj A, Ramanaih I, Siddappa C, Shyamprasad K. Bioactive compound Bisacurone in the turmeric extract (Turcuron) prevents non-alcoholic fatty liver disease by reduction of lipogenesis. Indian J Pharm Educ Res. 2021 Jan 1;55(1):S48-55.

18. Mantovani A, Scorletti E, Mosca A, Alisi A, Byrne CD, Targher G. Complications, morbidity and mortality of nonalcoholic fatty liver disease. Metabolism. 2020 Oct 1;111S;111. doi: 10.1016/j.metabol.2020.154170.

19. Mantovani A, Dalbeni A. Treatments for NAFLD: state of Art. Int J Mol Sci. 2021 Jan;22(5):2350. doi: 10.3390/ijms22052350, PMID 33652942.

20. Lonardo A, Nascimbeni F, Mantovani A, Targher G. Hypertension, diabetes, atherosclerosis and NASH: cause or consequence? J Hepatol. 2018 Feb 1;68(2):335-52. doi: 10.1016/j.jhep.2017.09.021, PMID 29122390.

21. Targher G, Lonardo A, Byrne CD. Nonalcoholic fatty liver disease and chronic vascular complications of diabetes mellitus. Nat Rev Endocrinol. 2018 Feb;14(2):99-114. doi: 10.1038/nrendo.2017.173, PMID 29286050.

22. Anstee QM, Targher G, Day CP. Progression of NAFLD to diabetes mellitus, cardiovascular disease or cirrhosis. Nat Rev Gastroenterol Hepatol. 2013 Jun;10(6):330-44. doi: 10.1038/nrgastro.2013.41, PMID 23507799.

23. Mantovani A, Byrne CD, Bonora E, Targher G. Nonalcoholic fatty liver disease and risk of incident type 2 diabetes: a meta-analysis. Diabetes Care. 2018 Feb 1;41(2):372-82. doi: 10.2337/dc17-1902, PMID 29358469.

24. Al Dawish MA, Robert AA, Braham R, Al Hayek AA, Al Saeed A, Ahmed RA, Al Sabaan FS. Diabetes mellitus in Saudi Arabia: a review of the recent literature. Curr Diabetes Rev. 2016;12(4):359-68. doi: 10.2174/1573399811 666150724095130, PMID 26206092.

25. Grattagliano I, Palmieri VO, Portincasa P, Moschetta A, Palasciano G. Oxidative stress-induced risk factors associated with the metabolic syndrome: a unifying hypothesis. J Nutr Biochem. 2008 Aug 1;19(8):491-504. doi: 10.1016/j.jnutbio.2007.06.011, PMID 17855068.

SUMMARY

This study was done to determine the knowledge and attitude of Taif city resident on non-alcoholic fatty liver disease (NAFLD) by a cross sectional questionnaire-based design. The result of the data was analyzed using descriptive statistical method. Overall, the level of knowledge among the participants were low while the attitude was good towards managing NAFLD. The association of NAFLD with other chronic ailments are not generally known. There is a need to develop strategy on disseminating the information about NAFLD.