Awareness of adult population toward non-alcoholic fatty liver disease in Riyadh, Saudi Arabia

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ABSTRACT

Background: Non-alcoholic fatty liver disease (NAFLD) is a medical condition which is commonly termed as fatty liver. NAFLD can start from mild (grade 1) stage and may progress toward severe (grade 3) disease stage. This study aimed to assess the level of awareness of the adult population toward NAFLD in Riyadh, Saudi Arabia, and to explore the relationship between the level of awareness and different socio-demographic factors.

Methodology: This cross-sectional study was conducted via an online pre-tested self-administered questionnaire on adult males and females in Riyadh, Saudi Arabia, from March to August 2020. A total of 400 participants were included.

Results: Out of the total, 240 (60%) participants were considered as aware about NAFLD. The mean score of the participant’s awareness was 26.8 ± 9.3 out of 36 points. No significant difference was observed between nationality and level of awareness (p = 1.00). On the contrary, there were significant differences between gender, age, level of education, and occupation in relation to the level of awareness (p = 0.00). The present results showed that a higher level of awareness was associated with male gender, bachelor degree holders, and employed participants. Also, the level of awareness improved with increasing age.

Conclusion: There was sufficient awareness among the adult population toward NAFLD in Riyadh, Saudi Arabia.

Keywords: NAFLD, Fatty liver disease, awareness, Saudi Arabia.

Introduction

Non-alcoholic fatty liver disease (NAFLD) is a medical condition which is commonly termed as fatty liver. It is characterized with the presence of macrovesicular changes due to abnormal accumulation of fat in the liver (also known as hepatic steatosis) without any apparent cause, including high alcohol consumption, genetic predisposition, or medication side effects [1].

NAFLD covers a variety of phenotypic spectrum, including the symptom of non-alcoholic fatty liver (NAFL) and non-alcoholic steatohepatitis (NASH). NAFL refers to the accumulation of fat in the liver without any observation of hepatic injury, swelling, or inflammation in hepatocytes. On the contrary, NASH is defined as the fat accumulation along with hepatic injury due to inflammation in hepatocytes [2].

NAFLD is often described as a silent liver disease, considering that the patient does not feel any evident symptoms. Histological examination can identify the condition, or some associated complication may lead to the need for a hospital visit. Major risk factors that may contribute to development of NAFLD include...
metabolic diseases, such as diabetes, insulin resistance, dyslipidemias, and other metabolic syndromes. Additionally, obesity and cardiovascular diseases can also play role in the progressive development of this disorder [3,4].

NAFLD is characterized by the accumulation of fat droplets in more than 10% of the hepatocytes. The liver is divided into three sections or zones based on oxygen supply, namely zone 1, zone 2, and zone 3, wherein zone 3 is least supplied with oxygen. Most apparent signs of NAFLD, such as macro-vascular changes, inflammation in lobules, and swelling of hepatocytes, are observed in zone 3. Fibrosis may also be present in the same zone with an appearance of chicken wire due to collagen deposition [5].

The mechanism of disease development is explained by a two-hit pathogenesis model. The first hit is caused by insulin resistance, which directs excessive transportation of triglycerides and fatty acids toward the liver. Consequently, fat droplets start accumulating in the cytoplasm of hepatocytes. The second hit is introduced by hepatic injury due to oxidative stress caused by fatty acid accumulation in hepatic cells [6].

The symptoms in NAFLD largely remain unnoticed as the patient stays asymptomatic. However, fatigue and lethargy are the most commonly presented symptoms in NAFLD patients. Moreover, sleeplessness, bloating, upper abdominal pain, and thirst are some of the prominent symptoms of the disease. In mild or moderate stages of NAFLD, liver enlargement is the most common sign. Conversely, end-stage disease symptoms are characterized with more serious conditions such as spider angiomas, gynecomastia, dupuytren contracture, petechiae, etc. [7-9].

NAFLD is usually diagnosed by incidental findings in hospitals with abnormal liver biochemical profiles or physical abnormalities in the liver, including hepatomegaly or hepatic steatosis are detected by imaging techniques. Biochemical profiles can be obtained through measurement of the liver function enzymes, such as alanine aminotransferase (ALT), aspartate aminotransferase (AST), and serum alkaline phosphatase. However, liver biopsy is considered to be the gold standard diagnostic procedure for definite diagnosis of NAFLD. Treatment strategies for NAFLD management are dependent upon the stage of disease and associated causative factors [10,11]. NAFLD can start from mild (grade 1) stage and may progress toward moderate (grade 2) and severe (grade 3) disease stages. Further complications of the NAFLD may include cardiovascular disease, hepatic carcinoma, and end-stage liver disease [1,12]. In adults with obesity, the prevalence of NAFLD is as high as 80%-90% while in diabetic patient, the prevalence is estimated to be 30%-50%. Moreover, NAFLD is prevalent (90%) in hyperlipidemia patients. However, NAFLD is less prevalent in healthy children (3%-10%), yet obese children tend to present a higher prevalence of NAFLD, i.e., 40%-70% [13].

In a study conducted in Brooklyn, New York, USA, about NAFLD, it was observed that the awareness level of majority of the study participants was below average [14]. However, the awareness level of the US population was poor [15,16]. Awareness levels in European countries were also found to be low [17], whereas lack of knowledge of NAFLD was found in Hong Kong [18]. Insufficient and unsatisfactory awareness of the Korean public about chronic liver disease was revealed by one study [19]. A study from China showed improvement in knowledge after an educational seminar on NAFLD [20].

A study originating from Pakistan analyzed the risk of NAFLD in a set-up established for hepatitis awareness program. It was observed that 15.3% of the patients examined for hepatitis were found affected with silent NAFLD. Majority of the patients were females and house wives ($p = 0.005$). An important suggestion of the study pointed toward the NAFLD identified participants with a normal body mass index (BMI) [21].

The burden of NAFLD is increasing in the Middle East region. There is lack of epidemiological data from countries of this region and multidimensional educational campaigns through social media and other means must be initiated to increase awareness about NAFLD and its risk elements [22]. A descriptive study conducted in the United Arab Emirates showed that patients with obesity were identified with elevated level of transaminase, which may lead to risk of NAFLD [23].

Besides, the awareness of local population about liver disease was analyzed in a study where the outcomes suggested initiating efforts for awareness campaign via electronic, digital, and other forms of media all over the country [24].

The objective was to study the level of awareness of the adult population toward NAFLD in Riyadh, Saudi Arabia, and to explore the relationship between level of awareness and different socio-demographic factors.

Subjects and Methods

This cross-sectional study was conducted among the general public of Riyadh, Saudi Arabia, from March to August 2020.

Any adult male or female Saudi Arabia resident, who agreed to participate in the study, of any nationality, who could read, and had a social media account was included in this study. All non-Saudi Arabian residents, who did not have a social media account, or refused to share in the study, were excluded.

The sample size was calculated using the EPI Info program. Based on 95% confidence interval, 5% margin of error, and total population of Riyadh, Saudi Arabia, the estimated sample size was 384 and was adjusted to 422 to compensate for 10% of the non-response rate. The study was conducted using an online self-administered pre-tested questionnaire via Google Forms. The generated link was randomly shared on social media (i.e., Facebook
and WhatsApp). The aim of this study is clearly explained in the abstract. A validated questionnaire was used based on previous studies. The questionnaire contained socio-demographic characteristics of the participants, like age group, sex, nationality, and residence. A common grading method was used for each variable in this questionnaire as follows: 2 points was given to the correct option, 0 points for the incorrect answer, and 1 point for neutral. After data collection, a participant who correctly answered 75% or more of the questions (27 points out of 36) was considered as aware about NAFLD.

A convenient non-probability sampling technique was employed to collect the data from the participants. Data were coded, entered, and analyzed using the Statistical Package for Social Science version 23. Qualitative data were expressed in the form of number and percentage. Chi-square ($\chi^2$) test was used to examine the qualitative data between two groups.

**Results**

In this study, data were collected from 400 adult participants, and the socio-demographic characteristics are shown in Table 1.

In order to study the level of awareness of the adult population toward NAFLD, while focusing on the first aim of the study, data analysis is summarized in Table 2, which reveals that 219 (54.8%) of the participants had been diagnosed with NAFLD or know someone who had been diagnosed with it.

The mean score of the participants’ awareness was 26.8 ($\pm$ 9.3) out of 36 points. There was sufficient awareness among the adult population toward NAFLD in Riyadh, Saudi Arabia, wherein 240 (60%) participants were considered as aware about NAFLD, while 160 (40%) were not aware (as shown in Figure 1).

Chi-square test was used to determine the significance of differences between level of awareness and the socio-demographic data of the participants presented in Table 3. No significant difference was observed between nationality and level of awareness ($p = 1.00$). On the contrary, there were significant differences between gender, age, level of education, and occupation in relation to the level of awareness, as the calculated $p$-values for all these parameters were recorded as 0.00. The present results showed that the higher level of awareness was associated with male gender, bachelor degree holders, and employed participants. Also, the level of awareness improved with increasing age as depicted by the highest level of awareness observed in participants who were aged 45-54 years, while lowest level of awareness was observed in participants who were 18-24 years of age.

**Discussion**

In this study, the current awareness of the adult population toward NAFLD in Riyadh, Saudi Arabia, was investigated and the relationship between the level of awareness and different socio-demographic factors was explored. In this study, the mean score of participants’ awareness was 26.8 ($\pm$ 9.3) out of 36 points. There was sufficient awareness among the adult population toward NAFLD, wherein 60% of the participants were considered as aware, while 40% were not aware.

A lower percentage was reported in a study that was conducted by Wieland et al. [16], which was carried out to assess the awareness of NAFLD as a disease entity among individuals with and without metabolic risk factors, wherein 18% of all respondents reported awareness of NAFLD. Even among patients with self-reported major risk factors for NAFLD (overweight/obese, insulin resistant, or both overweight/obese and insulin resistant), the rates of awareness of NAFLD were low (19%, 23%, and 24%, respectively). Also, in study that was carried out by Zhang et al. [20], to analyze the knowledge and awareness about NAFLD in office employees, the outcomes of the study revealed that only 31.2% of participating individuals were somewhat aware about NAFLD. An Egyptian study found that 52.17% of obese polycystic ovarian syndrome (PCOS) patients were also affected with NAFLD, whereas 17.6% of non-obese PCOS patients were simultaneously affected with NAFLD [25].
In Saudi Arabia, several studies have been conducted to present various aspects of NAFLD. Studies have reported obesity and type-2 diabetes as risk factors for NAFLD [26-29].

The present results reveal that 45% of the study population stated that their physicians mentioned the name NAFLD to them. Ghevariya et al. [14] found that 98% of the study population stated that their physicians did not have a discussion regarding NAFLD and majority of the subjects were not aware of NAFLD.

### Table 2. Detailed awareness of the adult population toward NAFLD in Riyadh, Saudi Arabia.

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes (%)</th>
<th>No (%)</th>
<th>I don’t remember (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Have you or someone you know ever been diagnosed with NAFLD?</td>
<td>219 (54.8)</td>
<td>137 (34.2)</td>
<td>44 (11)</td>
</tr>
<tr>
<td>2. Did your doctor ever mention the name NAFLD to you?</td>
<td>180 (45)</td>
<td>176 (44)</td>
<td>44 (11)</td>
</tr>
<tr>
<td>3. NAFLD is characterized with accumulation of ——</td>
<td>Fats in liver (64%)</td>
<td>Oil in liver (15.2%)</td>
<td>Fats in heart (9.8%)</td>
</tr>
<tr>
<td>4. Do you think NAFLD can only occur if it is running in family history?</td>
<td>43 (10.8)</td>
<td>297 (74.2)</td>
<td>60 (15)</td>
</tr>
<tr>
<td>5. Do you think healthy eating habits can prevent the disease?</td>
<td>279 (69.8)</td>
<td>69 (17.2)</td>
<td>52 (13)</td>
</tr>
<tr>
<td>6. People with low blood pressure are at higher risk of NAFLD?</td>
<td>40 (10)</td>
<td>308 (77)</td>
<td>52 (13)</td>
</tr>
<tr>
<td>7. Do you think diabetic has any relation with NAFLD?</td>
<td>275 (68.8)</td>
<td>69 (17.2)</td>
<td>56 (14)</td>
</tr>
<tr>
<td>8. Only adults are prone to development of NAFLD?</td>
<td>44 (11)</td>
<td>305 (76.2)</td>
<td>51 (12.8)</td>
</tr>
<tr>
<td>9. Is it possible for a NAFLD patient not to feel any apparent symptom?</td>
<td>282 (70.5)</td>
<td>62 (15.5)</td>
<td>56 (14)</td>
</tr>
<tr>
<td>10. How many stages can occur in Non-alcoholic fatty liver disease?</td>
<td>35 (8.8)</td>
<td>298 (74.4)</td>
<td>35 (8.8)</td>
</tr>
<tr>
<td>11. What is the most commonly presented symptom of NAFLD?</td>
<td>Nausea &amp; vomiting (11.7%)</td>
<td>Headache (8.8%)</td>
<td></td>
</tr>
<tr>
<td>12. Which methods are helpful for doctors to diagnose NAFLD?</td>
<td>BMI (14.5%)</td>
<td>Imaging techniques (17.5%)</td>
<td>I don’t know (13.8)</td>
</tr>
<tr>
<td>Blood tests (18.5%)</td>
<td>All of these (72.3%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13. What is standard method for definite diagnosis of NAFLD?</td>
<td>Liver biopsy (72.3%)</td>
<td>CT (18.5%)</td>
<td>I don’t know (10)</td>
</tr>
<tr>
<td>MRR (20.5%)</td>
<td>USG (18.8%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14. NAFLD can cause —— in liver?</td>
<td>All of these (73.5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inflammation (17.5%)</td>
<td>Injury (21%)</td>
<td>Swelling (15%)</td>
<td></td>
</tr>
<tr>
<td>15. What is standard method for definite treatment of NAFLD?</td>
<td>Angioplasty (18.8%)</td>
<td>Laparoscopy (22.3%)</td>
<td>I don’t know (13.5)</td>
</tr>
<tr>
<td>Surgical intervention (17.5%)</td>
<td>None (68.5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16. What can be associated complications of NAFLD?</td>
<td>Cardiovascular disease (60%)</td>
<td>Brain tumor (14.8%)</td>
<td></td>
</tr>
<tr>
<td>End-stage liver disease (56.5%)</td>
<td>Skeletal dysfunction (10.5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Liver cancer (58.5%)</td>
<td>I don’t know (11)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17. What are the common risk factors associated with NAFLD?</td>
<td>Obesity (55%)</td>
<td>Metabolic disorders (51.8%)</td>
<td>Dermatitis (19.3%)</td>
</tr>
<tr>
<td>Diabetes (54.3%)</td>
<td>Parkinson’s disease 14.5%</td>
<td>I don’t know (13.5)</td>
<td></td>
</tr>
<tr>
<td>18. Can NAFLD be life threatening?</td>
<td>275 (68.8)</td>
<td>85 (21.2)</td>
<td>40 (10)</td>
</tr>
</tbody>
</table>
There were significant differences between gender, age, level of education, and occupation in relation to the level of awareness, as the calculated $p$-values for all these parameters were recorded as 0.00, which was contrary to the findings of the study that carried out by Wieland et al. [16], who reported that there were no significant differences among individuals with and without the awareness of NAFLD with respect to age, sex, or education level ($p > 0.05$ for all). Similarly, in a study that was conducted by Ghevariya et al. [14] it was observed that there was no statistically significant difference between males and females regarding the awareness of NAFLD.

**Conclusion**

There was sufficient awareness among the adult population toward NAFLD in Riyadh, Saudi Arabia. Significant differences were observed between gender, age, level of education, and occupation in relation to the level of awareness. Educational tools including mass media should be utilized to increase the awareness of NAFLD especially in high-risk individuals for prevention, early detection, and treatment. Comprehensive advice by physicians can be of paramount importance in NAFLD preventive strategy.

**List of Abbreviations**

NAFLD Non-alcoholic fatty liver disease

**Conflict of interest**

The authors declare that there is no conflict of interest regarding the publication of this article.

**Funding**

None.

**Consent for publication**

Informed consent was obtained from all participants.

**Ethical approval**

Considering the study design, ethical approval was waived off.

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**References**

NAFLD awareness


