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ORIGINAL ARTICLE

Prevalence of ischemic heart disease (IHD) patients in Non-alcoholic fatty liver disease (NAFLD) on ultrasonography (USG) in Tertiary Care Hospital Sargodha.

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ABSTRACT… Objective: To assess the prevalence of IHD in patients of NAFLD. **Study Design:** Cross-sectional. **Setting:** Tertiary Care Hospital, Sargodha. **Period:** June 2022 to June 2023. **Methods:** The present research included sample size of 190 patients, who were checked for presence of IHD. **Results:** Overall prevalence of IHD among NAFLD patients was found to be 84.2%. **Conclusion:** NAFLD is associated with higher risk of IHD occurrence.

Key words: Fatty Liver Disease, Ischemic Heart Disease, Non-alcoholic Fatty Liver Disease.

INTRODUCTION

Non-alcoholic fatty liver disease (NAFLD) is considered as an eminent cause of liver disease globally. It has world prevalence of 25.24%. It is a multisystem disorder affecting important organs and regulatory pathways.[1] It ranges from simple fatty liver to steatohepatitis resulting in fibrosis and cirrhosis in individuals that are non-alcoholic or intake minute quantities of alcohol. NAFLD is mainly linked with diabetes, cardiovascular diseases and chronic liver diseases.[2] However, it now been connected with obesity, sleep apnea, diabetes, Hypertension, Metabolic syndrome and polycystic ovary syndrome.[3] It is a common finding in the individuals with sedentary lifestyle.

Although liver biopsy is considered as the gold standard for diagnosis of steatosis, its invasive nature is linked with various side effects. Ultrasonography (USG) is a cost effective, risk free and widely available substitute method.[4] It is presently the most widely used modality for diagnosis of NAFLD. Other methods used for scanning NAFLD includes spectroscopy, computed tomography (CT), magnetic resonance imaging (MRI) and proton density fat fraction. According to sensitivity and specificity, MRI is indicated as most suitable followed by US and CT. This indicates suitability of US as being non-invasive, cost effective and widely available imaging modality for NAFLD.[5]

The patients having NAFLD has high mortality. The reason for increased morbidity and mortality has been the affiliation of heart diseases with NAFLD. Literature indicates a prominent relationship between NAFLD and ischemic heart disease (IHD).[6] IHD are the disorders linked with heart that are the outcome of non-sufficient blood supply and oxygen to part of myocardium. It occurs due to imbalance between supply and demand of myocardial oxygen, which takes place due to some blockage in one or more arteries taking blood towards the heart.[2] This relationship exists due to the role of liver in lipid and glucose metabolism. NAFLD is linked with generation of very low-density lipoprotein (VLDL), which enters circulation resulting in production of low-density lipoprotein (LDL) particles. IHD is produced as a result of proinflammatory factors, thrombogenic and vasoactive molecules. However, the results of previous studies are controversial.

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Some argued enhanced cardiovascular risk associated with NAFLD, whereas, others depicted anti-relationship. Therefore, the role of NAFLD in association with IHD is still debatable.[7] The present research work aims to fulfill this gap by assessing the prevalence of NAFLD in IHD.

METHODS

This cross-sectional study was performed at Tertiary Care Hospital Sargodha, from June 2022 to June 2023, after approval from Institutional Ethical Committee approval vide Letter no. 308/3/1/Trg dated 07 February, 2024. The present research included sample size of 190 patients calculated with Raosoft software by considering prevalence of NAFLD in Pakistan to be 51%[8] and prevalence of IHD among NAFLD patients to be 44.6%.[9] The patients were explained about the study and confirmed about the confidentiality of their information. After signing the consent forms, history of the willing patients was taken. This was followed by clinical examination such as weight, body mass index, and waist circumference and laboratory test such as blood sugar, liver profile and lipid profile. USG was performed to confirm NAFLD. ECG was performed for confirmation of IHD.

The inclusion criteria of the study comprised of patients belonging to any gender and age ranging from 18 to 65 years. Secondly, USG based proven NAFLD was regarded as the main criterion. The exclusion criteria comprised of any co-morbidity such as hepatocellular carcinoma and chronic liver disease.

The criteria for confirmation of NAFLD included enhanced echogenicity related to kidney, loss of intra hepatic architectural details and distal attenuation. Diagnosis of NAFLD was done after omitting other reasons of chronic liver disease such as alcohol intake, and drug use.

The data was assessed with the help of SPSS v.17. Quantitative variables were presented as means and standard deviation followed by student's t test. Qualitative variables were presented as number and percentage followed by Chi square test. The level of significance was set as p value less than 0.05.

RESULTS

The basic characteristics of the patients are shown in the Table-I. The NAFLD patients were divided into two groups. One comprising of IHD patients and the other consisting of non-IHD patients. Although significant results were not obtained for any of the characteristic, many interferences can be made on the collected data.

In total, 160 (84.2 %) NAFLD patients were found to have co-morbidity of IHD. Thus, it can be said that majority of the NAFLD patients were suffering from IHD. The mean age for IHD patients was 39.38 ± 13.5 years, whereas, for non-IHD group it was 39.03 ± 16.05. It was observed that IHD was apparent in individuals with more age.

In the present study, it was found that female individuals (n = 84; 52.5%) suffered from IHD, whereas, 76 (47.5%) males were having the disease. Thus, female patients were in majority. The characteristic of smoking was more apparent in non-IHD group. On the other hand, family history (n = 115; 71.8%) was more prominent in IHD group. This shows that family history plays vital role in appearance of the disease. Overall, the BMI was greater for IHD group. Therefore, obesity can be linked with the occurrence of IHD. Similarly, height and waist circumference were also greater in IHD group.

DISCUSSION

The literature indicates that presence of NAFLD leads towards cardiovascular diseases apart from risk factors of such disorders.[2] On the other hand, research works have also shown that high mortality associated with NAFLD is the resultant of heart diseases, as compared to other co-morbidities. The mechanism behind such an association is complicated. It may include factors such as dyslipidemia, oxidative stress, genetic influence, insulin resistance, changed generation of anti-coagulant factors and chronic inflammation.[3] However, this linkage between NAFLD and IHD is important as it increases the mortality and morbidity rate. Moreover, it makes the chances of cure also difficult. Thus, from

many years interest of researchers have diverted towards relation of these two diseases. By understanding their relation, a better approach towards diagnosis and treatment of them can be determined.[6] Thus, the present study aimed at assessing the association of NAFLD and IHD.

Characteristics	IHD Group N = 160	Non-IHD Group N = 30	P-Value
Age (years)	39.38±13.5	39.03±16.05	0.133
Gender Male Female	 76 (47.5) 84 (52.5)	 14 (46.6) 16 (53.3)	0.933
Smoking	13 (8.12)	3 (10)	0.734
BMI Normal Overweight Obese	 82 (51.25) 47 (29.3) 31 (19.3)	 13 (43.3) 10 (33.3) 7 (23.3)	0.724
DM	73 (45.6)	12 (40)	0.570
Height (cm)	155.83±3.3	155.73 ± 2.8	0.202
Waist circumference (cm)	97.18±6.7	97.13±7	0.870
Family history of IHD	115 (71.8)	21 (70)	0.834

Table-I. Characteristics of patients in both the groups

In present study, 52.7% female patients and 47.3% male patients were found to have NAFLD. Thus, the present study indicated that female patients were in majority as compared to male patients. This is in accordance with the study of Ali et al[13], in which 66% females were affected with the disease as compared to 34% male population. However, the work of Ranjan et al[14] claimed that 68.5% male population was affected by NAFLD as compared to 31.4% females. Similarly, study of Elkady et al[10] included 77 NAFLD males as compared to 63 females for comparison. On the other hand, 76 (47.5%) males and 84 (52.5%) females were affected by IHD out of 160 NAFLD patients. Again, it is indicated that female population was more affected by the co-morbidity of IHD as compared to male population.

The mean age for IHD group was 39.38 ± 13.5 years, whereas, for non-IHD group it was 39.03 ± 16.05 years. The overall mean age for NAFLD patients was 39.2 ± 14.7 years. The findings indicate that age in NAFLD group was higher. Similarly, it was higher for IHD group as compared to the non-IHD group. Although NAFLD can occur in any age but its occurrence in late age is evident in previous work of Ali et al[13], in which the NAFLD patients were found to have age more than 40 years. However, the prevalence of the disease declines for individuals of age more than 70 years. Therefore, the most effected age range is indicated to be 40-70 years. Literature indicates that NAFLD has risen tremendously in the previous three decades. Adding to the fact is that majority of the patients are from age range 15 to 49 years.[5]

Overall prevalence of IHD among NAFLD patients was found to be 84.2%. The high association between NAFLD and IHD was indicated by previous research works of El-Kady et al[6], Stols-Gonçalves et al[11] and Parvez et al.[12] The work of Ranjan et al[14] indicated prevalence of 68.5% for IHD among NAFLD patients. Literature indicates that there is an association between grades of NAFLD and atherosclerotic process. This makes NAFLD an eminent risk factor for IHD. The work of Stols-Goncalves et al[11] claimed that NAFLD appears after decade of obesity and DM. Secondly, it is an independent risk factor for IHD. Thus, it can be said that DM, obesity and dyslipidemia evolve to result in NAFLD, that leads to IHD. Same has been elaborated by work of Ali et al[13], in which 91.7% of grade 3 fatty liver disease patients and 34.3% of grade 2 fatty liver disease patients were suffering from IHD.

The findings of present research shows that DM and family history were higher for IHD group as compared to non-IHD group. On the other hand, the work of Rajan et al[14] indicated that 53.7% of the NAFLD patients were smokers. Similarly, DM was present in 62.9% of the NAFLD patients. However, the findings of present study indicates that 44.7% of NAFLD patients had DM, whereas, 8.4% of the NAFLD patients were smokers.

In the study conducted by Parvez et al[12], higher BMI and waist circumference was found in NAFLD group. This indicated that NAFLD occurs more in obese people and increase morbidity

and mortality rate in people with high weight. Thus, it can be said that reduction in weight and avoidance of weight gain can be a preventive measure for the diseases of NAFLD and IHD. The same study also indicated that DM has high association with NAFLD. This is in accordance with the current study. However, controversial results were found by the meta-analysis of Lauridsen et al[14], which claimed that NAFLD and IHD association is coincidental. On the other hand, the work of Ali et al[13] showed that 42.4% of obese patients had NAFLD. The work of Elkady et al[10] has also indicated that BMI, waist circumference and weight are significant factors for the co-occurrence of NAFLD and IHD.

The present research work has certain limitations. The most important limitation is small population as the study includes patients from only one region of the country. The future research works should undertake larger population by considering wider regions of the country. Similar studies need to be conducted in other countries as well. On the other hand, only US have been considered in the present research work. The future research works should focus on liver biopsy, which is considered as a gold standard for diagnosis of NAFLD.

The clinical implication of present work is that with reduction in liver fat content, the disease of IHD can be avoided. Consequently, it can be said that lifestyle interventions recommended for prevention and treatment of NAFLD can also be effective in preventing risk of IHD. The risk of NAFLD and IHD increases due to obesity and sedentary lifestyle. The association of NAFLD and IHD can be undermined on the fact that most of the NAFLD patients are obese having higher levels of lipoproteins in plasma, which increases cholesterol resulting in IHD. Thus, it is very important to lower cholesterol content of an individual to overcome chances of NAFLD and IHD. This can only be done through increased physical activity and better lifestyle choices.

CONCLUSION

It can be concluded that NAFLD is associated with higher risk of IHD occurrence. The appearance of NAFLD is more prominent in elderly age. The factors such as high BMI, smoking and family history contributes to increased chances of NAFLD and IHD occurrence. On the other hand, DM is also an important contributor to NAFLD prevalence.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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3	Muhammad Tarique	Drafting, Literature search.	
4	Wajeeha Ahad	Drafting, Literature search.	
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