ASSOCIATION OF BODY MASS INDEX AND LIPID PROFILE WITH CHRONIC HEPATITIS C INFECTION

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ABSTRACT

Objective: To find out association of lipid profile and body mass index (BMI) profile among cases having chronic hepatitis C virus (CHC) infection.

Study Design: Cross sectional study.

Place and Duration of Study: Departments of Medicine and Pathology, Combined Military Hospital, Multan Pakistan, from Mar 2019 to Feb 2020.

Methodology: A total of 320 cases of both genders, aged 18-60 years, having chronic hepatitis C virus infection were enrolled. After taking relevant history and physical examination, venous blood sample of each patient was taken and sent to institutional laboratory for analysis of serum total cholesterol (TC) level, serum triglyceride (TG) level, low density lipoprotein (LDL), high density lipoprotein (HDL) were analyzed. Body mass index among all the study participants was also calculated.

Results: Out of a total of 320 cases, there were 152 (47.5%) male and 168 (52.5%) female. Mean age was 41.7 ± 8.1 years. Most of the cases, 97 (30.3%) were between 41-50 years of group. Dyslipidemia was noted in 144 (45%) cases. Increasing age and increasing Body mass index were found to have statistical significance with the presence of dyslipidemia (p-value <0.05).

Conclusion: Increasing age and body mass index have significant association with dyslipidemia in patients with chronic hepatitis C virus infection. Lipid profile altered among different age and body mass index groups.

Keywords: Body mass index, Chronic hepatitis C virus infection, Lipid profile.

How to Cite This Article: Younas A, Hanif W, Ali O, Jamal S, Nawaz A, Ain QU. Association of Body Mass Index and Lipid Profile with Chronic Hepatitis C Infection. Pak Armed Forces Med J 2021; 71(6): 1985-1988. Doi: https://doi.org/10.51253/pafmj.v6i6.5036

INTRODUCTION

Hepatitis is an important global health problem, especially among developing countries.1 Hepatitis is described as inflammation of the liver, mainly caused by hepatitis B virus (HBV) and hepatitis C virus (HCV) infection. Globally, around 185 million people are affected with HCV infection and it is a major cause of morbidity and mortality.2 In general population, prevalence of HCV varies among different geographies and countries, ranging from 1.3-2.9% while in Pakistan, it is estimated to be around 6.5%.3

Chronic hepatitis C virus (CHCV) infection is described as non-remission of the disease after testing positive for duration of more than 6 months. It is seen that 70-90% of the cases having HCV are not able to get spontaneous clearance of the virus in acute phase of the disease and they go on to be chronically infected cases of HCV.4 Around 150 million individuals around the world are thought to have CHCV infection while CHCV infection is seen to contribute a major chunk in progression to liver cirrhosis and hepatocellular carcinoma CHCV infection is found to be responsible for 27% cases of liver cirrhosis and 25% of liver cancer cases worldwide.5

Liver is the main place where formation as well as clearance of lipoproteins is occurring. Liver is receiving fatty acids and cholesterol from the peripheral tissues and diet and then packages those in the form of lipoprotein complexes.6 These formed lipoproteins complexes are then released in into circulation. Lipid metabolism is found disturbing when a person is affected by a major liver disease.7

A study from USA noted 70.5% of the patients with CHCV infection with hyperlipidemia.8 Some researchers have depicted that plasma cholesterol levels are declined in CHCV infection. In patients having CHCV infection, body mass index (BMI) has been noted to have a significant association with fibrosis index and cirrhosis at the time of presentation.9 Previous studies also noted that progression of CHCV infection is influenced by clinical manifestations of metabolic syndrome.10

We did this study with an aim to find out association of lipid profile and body mass index (BMI) profile among cases having CHCV infection. The results of

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Received: 18 Aug 2020; revision received: 27 Nov 2020; accepted: 10 Dec 2020
this study might prove useful giving us clue about monitoring and potential management of lipid profile and BMI when cases of CHCV infection are confronted.

**METHODOLOGY**

This cross sectional study was conducted at the departments of Pathology and Medicine, Combined Military Hospital, Multan from March 2019 to February 2020. Approval from Institutional Ethical Committee was taken for this study. Informed written consent was sought from all the participants of this study.

A sample size of 320 was calculated considering a confidence level of 95%, proportion of cases as 70.5% and 5% margin of error.\(^{(11)}\) Sample technique was non-probability consecutive sampling technique.

**Inclusion Criteria:** Cases of both genders, aged 18-60 years, having CHCV infection (continuously detectable HCV RNA on qualitative polymerase chain reaction for at least 1 year, as per medical record and investigation reports) and willing to be part of this research were included.

**Exclusion Criteria:** Patients having acute hepatitis, hypertension, diabetes mellitus, ischaemic heart disease or chronic renal failure were excluded. Patients taking lipid lowering or hepatotoxic drugs were also excluded. Cases having positive hepatitis B surface antigen, hepatocellular carcinoma or with liver transplantation were excluded.

After taking relevant history and physical examination, venous blood sample of each patient was taken and sent to institutional laboratory for analysis of serum total cholesterol (TC) level, serum TG level, LDL, HDL. Dyslipidemia was considered if any one of the following noted: TC >5.2 mmol/L, TG >1.7 mmol/L, HDL <1.1 mmol/L in males and <1.3 mmol/L in females or LDL >3.4 mmol/L\(^{(12)}\). BMI was calculated by weight in kg divided by height in meter\(^{13}\) of all the study participants. A specialized proforma was designed to handle all the study information.

Statistical Package for the Social Sciences (SPSS) version 23 was used for data analysis. Frequencies and percentages were noted for gender and frequency of dyslipidemia. Mean and standard deviation were estimated regarding age, BMI, duration of CHCV infection, TC, TG, LDL and HDL levels. Student t-test was used to compare the quantitative variables while chi square test was applied to compare qualitative variables considering \(p\leq0.05\) as statistically significant.

**RESULTS**

Out of a total of 320 cases, there were 152 (47.5%) male and 168 (52.5%) female. Age range was 18-60 years of age whereas overall mean age was 41.7 ± 8.1 years. Most of the cases, 97 (30.3%) were between 41-50 years' age group. Overall, mean BMI was 30.5 kg/m\(^2\) while most of the cases, 167 (52.2%) had BMI between 25-30 kg/m\(^2\). Dyslipidemia was noted in 144 (45%) cases shown in Table-I.

Table-II shows association of study characteristics. Age and BMI were noted to have statistical significance with dyslipidemia as increasing age \(p=0.005\) as well BMI were found to have statistical significance with the presence of dyslipidemia \(p<0.001\).

**Table-I: Characteristics of Study participants \(n=320\).**

| Characteristics | Frequency (%) |
|-----------------|--------------|
| Gender          |              |
| Male            | 152 (47.5)   |
| Female          | 168 (52.5)   |
| Age (Years)     |              |
| 18-30           | 58 (18.1)    |
| 31-40           | 79 (24.7)    |
| 41-50           | 97 (30.3)    |
| 51-60           | 86 (26.9)    |
| Body Mass Index |              |
| <25             | 65 (20.3)    |
| 25-30           | 167 (52.2)   |
| >30             | 88 (27.5)    |
| Dyslipidemia    |              |
| Yes             | 144 (46.5)   |
| No              | 176 (53.5)   |

**Table-II: Association of dyslipidemia with respect to study variables.**

| Age (years) | Dyslipidemia n (%) | \(p\)-value |
|-------------|--------------------|-------------|
| Gender      | Present (n=144)    | Absent (n=176) |
| Male        | 66 (45.8)          | 86 (54.2)    | 0.589 |
| Female      | 78 (54.2)          | 90 (45.8)    |
| Age (years) |                    |              |
| 18-30       | 18 (12.5)          | 38 (27.7)    | 0.005 |
| 31-40       | 28 (19.4)          | 51 (20.9)    |
| 41-50       | 54 (37.5)          | 43 (23.9)    |
| 51-60       | 44 (30.6)          | 42 (23.9)    |
| Body Mass Index |            | Absent (n=176) |
| <25         | 26 (18.1)          | 39 (22.2)    | <0.001 |
| 25-30       | 60 (41.7)          | 107 (60.8)   |
| >30         | 58 (40.3)          | 30 (17.0)    |

Table-III shows association of mean lipid profile respect to age and gender. Total cholesterol and triglycerides were significantly high in cases between 41-60 years of age group \(p\)-value \(<0.001\). HDL was significantly low among 41-60 years of age group \(p\)-value \(<0.001\). Female gender was noted to have significantly higher triglyceride levels \(p\)-value \(<0.02\).

Table-IV shows association of BMI with age and gender, higher BMI was found to be significantly associated with increasing age \(p\)-value \(<0.001\) while
Liver is known to be the main place hosting synthesis, storage as well as oxidations of lipids and many other types of macromolecules. Lipid metabolism in liver is vital to maintain systemic nutrient’s hemostasis. Disturbance in usual lipid metabolism in the liver is a key characteristic of various diseases like diabetes mellitus, alcoholic and non-alcoholic fatty liver disease and viral infections like HCV infection. Chronic liver disease is known to alter the natural lipid metabolism and some researchers have pointed out an association between CHCV infection and lipid metabolism.¹⁴

We noted that age and BMI to have significant association with dyslipidemia as increasing age as well BMI were found to have statistical significance with the presence of dyslipidemia (p-value <0.05). It was also seen in the present work that total cholesterol and triglycerides were significantly high in cases between 41-60 years of age group (p-value <0.05). HDL was significantly low among 41-60 years of age group (p-value <0.05). A study done by Agbecha et al,¹⁵ from Nigeria noted significantly low HDL among cases with CHCV infection. Maggi et al,¹⁶ Serfaty et al,¹⁷ and Fabris et al,¹⁸ noted patients with CHCV infection to have abnormally low LDL levels. Floris-Moore et al,¹⁹ as well as Corey noted patients of CHVC infection to significantly alter cholesterol levels in comparison to controls. Findings of Li et al,²⁰ were also aligned to what we found where they noted lower HDL levels among cases with CHVC infection. Nogueira et al,²¹ and Nashaat,²² noted regardless of the genotypes, cases with CHCV were found to have lower serum HDL levels.

In the present work, we also noted significant association between dyslipidemia and increasing age. These findings are consistent with the local published data where the authors noted age more than 41 years to be linked with increased prevalence and disturbances in lipid profile. Same local data also found HCV infection to be positively linked with increasing BMI which again correlates well with the present findings. Kallwitz et al,¹¹ observed BMI more than 30 to be linked with histologic progression and cirrhosis among cases having CHVC infection.

Quite a few underlying mechanisms have been presented for these abnormal lipid metabolisms among cases with CHCV infection while genotypes do not seem to alter these findings.² Some researchers have described CHVC infection and its related inflammatory role to contribute to alterations in LDL metabolism, thus affecting atherogenesis.²² Earlier researchers have also shown LDL receptor (LDL-R) to have a role to play in the cellular entry of HCV while some others have postulated that some key components of lipoprotein and cholesterol metabolism are thought to be involved in the initial entry and infection of HCV. HCV life cycle in the liver is also marked to depend upon hepatic cholesterol as well as lipogenesis pathways. Abnormalities in the lipid profile of CHVC patients can also contribute to hepatic steatosis and deposition of hepatocellular lipid droplets.²³

**LIMITATION OF STUDY**

Our study has few limitations as well. We could not record the viral load of HCV among our study participants. We were also unable to record fasting samples of our study participants. None of the participants and controls were smokers or under the influence of alcohol or other substances that could have affected the results. This could be a possible reason for the findings. The study also suffers from certain potential biases such as self-reported BMI and lipid profile, which might lead to underreporting or overreporting of the values. Future studies should aim to overcome these limitations by incorporating objective measures and controlling for other confounding factors.
participants. Alanine transaminase (ALT) levels were also not noted among the participants of this study. As we did not note findings about treatment or management protocols, we are unable to suggest how much impact management of lipid disorders in patients having CHCV infection has on the overall outcome of these set of patients.

**RECOMMENDATIONS**

Further studies with longer follow ups and better study designs will further help us improving our current understanding of CHCV infection with lipid profile and related health issues.

**CONCLUSION**

Increasing age and body mass index have significant association with dyslipidemia in patients with chronic hepatitis C virus infection. Lipid profile alters among different age and body mass index groups.

**Conflict of Interest:** None.

**Authors’ Contribution**

AY: Sample calculation, WH: Manuscript writing, OA: Data collection, SJ: Data analysis, AN: Sample analysis, QUA: Study design.

**REFERENCES**

1. Mahajan R, Midha V, Goyal O, Mehta V, Narang V, Kaur K, et al. Clinical profile of hepatitis C virus infection in a developing country: India. J Gastroenterol Hepatol 2018; 33(1): 926-933.

2. Shanmugam RP, Balakrishnan S, Varadhan H, Shanmugam V. Prevalence of hepatitis B and hepatitis C infection from a population-based study in Southern India. Eur J Gastroen Hepat 2018; 30(11): 1344-1351.

3. Hanafiah S, Mushaffi, Iqbal, Sajid, et al. Viral hepatitis and the aetiology of CHCV infection with lipid profile and related health issues.

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