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LP (A) AND ATHEROGENIC INDICES (CRI-I, CRI-II AND AIP) IN OBESE POSTMENOPAUSAL WOMEN: A COMPARATIVE STUDY

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ABSTRACT

Introduction: Lipoprotein (a) [Lp (a)] is a risk factor for cardiovascular disease (CVD) due to its prothrombotic and atherogenic properties. Atherogenic indices, such as Castelli's risk index-I (CRI-I), CRI-II, and the atherogenic index of plasma (AIP), have been shown to be better predictors of CVD risk than individual lipid parameters. This study aims to compare the levels of Lp (a) and atherogenic indices in obese and non-obese postmenopausal women. **Material And Method:** A comparative study was conducted on 300 postmenopausal women, categorized as obese or non-obese. Blood samples were collected, and lipid profile parameters, Lp (a), and atherogenic indices were measured. Statistical analysis was performed to determine the significance of the differences between the groups. **Result And Discussion:** Obese postmenopausal women exhibited higher levels of total cholesterol, LDL cholesterol, triglycerides, and Lp (a), as well as lower levels of HDL cholesterol compared to non-obese postmenopausal women. Atherogenic indices (CRI-I, CRI-II, and AIP) were also higher in the obese group. These differences were statistically significant. These findings suggest that obesity contributes to unfavorable changes in lipid profile parameters and increases the risk of CVD in postmenopausal women. Lifestyle modifications and medical interventions may be beneficial in managing weight and improving lipid profiles to reduce the risk of CVD. **CONCLUSION:** Lp (a), CRI-I, CRI-II, and AIP are superior parameters for assessing cardiovascular risk in obese postmenopausal women compared to conventional lipid profile parameters. Incorporating these parameters into routine lipid profiling can provide better risk stratification and aid in the prevention of CVD in this population. Identifying at-risk patients earlier and tailoring preventative interventions based on these parameters may improve cardiovascular outcomes. Further studies are needed to explore the underlying mechanisms and effectiveness of interventions in this population.

KEYWORDS : Lipoprotein (a), atherogenic indices, CRI-I, CRI-II, AIP, obesity, postmenopausal women, cardiovascular disease.

INTRODUCTION

Lipoprotein (a) [Lp (a)] is a type of lipoprotein that is similar in structure to LDL cholesterol, but it also contains an additional protein called apolipoprotein (a) [apo (a)]. High levels of Lp (a) in the blood have been associated with an increased risk of cardiovascular disease, including heart attacks, strokes, and peripheral artery disease, independent of other traditional risk factors such as age, smoking, high blood pressure, and high cholesterol levels [1, 2].

One of the reasons Lp (a) is considered a risk factor for CVD is that it has prothrombotic properties, meaning it can contribute to the formation of blood clots that can block arteries and cause heart attacks or strokes. In addition, Lp (a) can also promote the buildup of plaque in the arteries, leading to atherosclerosis, which is a major contributor to CVD [3].

A lipid profile is a group of blood tests used to evaluate an individual's risk of developing lipid-related disorders, such as atherosclerosis, which is a major cause of coronary artery disease (CAD). The lipid profile typically includes measurements of total cholesterol, triglycerides (TG), high-density lipoprotein cholesterol (HDL-C), low-density lipoprotein cholesterol (LDL-C), and very-low-density lipoprotein cholesterol (VLDL-C).(4)

The conventional lipid parameters, such as TG, HDL-C, LDL-C, and TC, are widely used to assess an individual's risk of developing cardiovascular disease (CVD), studies have shown that lipid ratios such as Castelli's risk index-I (CRI-I), CRI-II, and the atherogenic index of plasma (AIP) may be better predictors of CVD risk, particularly when conventional lipid parameters are within normal ranges.

CRI-I, also known as the cardiac risk ratio (CRR), is calculated as the ratio of LDL-C to HDL-C. A high CRI-I indicates a higher risk of developing CVD, particularly coronary plaque formation, compared to a low CRI-I. Studies have also suggested that CRI-I may be a better predictor of CVD risk than individual lipid parameters alone. (5, 6)

Similarly, CRI-II is calculated as the ratio of TC to HDL-C, and AIP is calculated as the logarithm of the ratio of TG to HDL-C. High values of CRI-II and AIP are also associated with an increased risk of developing CVD (7, 8).

The estimation of lipid ratios such as Castelli's risk index-I (CRI-I), CRI-II, and the atherogenic index of plasma (AIP) can be particularly useful in obese postmenopausal women, as this population is at an increased risk of developing cardiovascular disease (CVD). CRI-I has been shown to predict the risk of coronary plaque formation in postmenopausal women with obesity, independent of conventional lipid parameters. Similarly, CRI-II and AIP have been identified as significant predictors of CVD risk in obese individuals, including postmenopausal women.

Therefore, the estimation of Lp (a) and lipid ratios such as CRI-I, CRI-II, and AIP can be useful in assessing CVD risk in obese postmenopausal women, and may provide a more accurate assessment of their CVD risk compared to conventional lipid parameters alone. This information can be used to develop targeted prevention and treatment strategies to reduce their risk of developing CVD.

AIMS & OBJECTIVES

To compare the levels of Lp (a) and atherogenic indices (CRI-I, CRI-II, and AIP) in obese and non-obese postmenopausal women.

MATERIAL AND METHODS

The present study was conducted on 300 postmenopausal

women, aged between 45-60 years, at the Department of Biochemistry, Dr. S. N. Medical College in Jodhpur, Rajasthan. Prior to sample collection, informed consent was obtained from all participating patients or their attendants, after they were provided with a detailed explanation of the study's nature and objectives.

Subsequently, 5 mL of blood was collected from each subject in a red plain vacutainer tube without anticoagulant, under aseptic conditions, following an overnight fast of 12 to 14 hours. The samples were then centrifuged at 3,000 rpm for 1 hour to separate the serum. The following lipid profile parameters were analyzed using standard methods:

1. Serum total cholesterol (TC) was estimated using the enzymatic Cholesterol oxidase- Phenol and 4 Aminoantipyrine method.
2. Serum triglycerides (TG) were measured using the enzymatic Glycerol phosphate oxidase- 4 chlorophenol and 4-Aminophenazone method.
3. Serum high-density lipoprotein cholesterol (HDL-C) was directly measured.
4. Serum low-density lipoprotein cholesterol (LDL-C) was calculated using Friedewald's formula: [(TC - HDL-C) TG/5].
5. Serum Lipoprotein (a) - Immunoturbidimetric method (13).
6. Lipid indices were calculated using the following formulas:

- CRI-I = TC/HDL (9-11)
- CRI-II = LDL/HDL (9-11)
- AIP = log(TG/HDL) (12)

Descriptive statistical analysis has been carried out in the present study. Results on continuous measurements are presented as mean ± standard deviation (SD) and Student's t-test (two-tailed, independent) has been used to find the significance of study parameters on continuous scale between the two groups.

OBSERVATIONS

Table: 01 Mean Values Of Conventional Lipid Profile, Lp (a) & Atherogenic Lipid Indices Among The Group Studied

S.No.	Parameter compared	Non-obese postmenopausal women	Obese postmenopausal women
1.	TC	251.96±14.27	257.20±16.81
2.	TG	136.06±10.18	165.23±14.67
3.	HDL	46.33±3.33	33.83±5.25
4.	LDL	178.84±14.29	201.20±16.98
5.	Lp (a)	24.06±11.47	37.27±15.92
6.	CRI-I	5.459±0.502	7.8±1.301
7.	CRI-II	3.881±0.468	6.267±1.067
8.	AIP	0.496±0.192	0.706±0.077

Table: 02 Statistical Analysis Of Conventional Lipid Profile, Lp (a) & Atherogenic Lipid Indices Among The Group Studied

S.No.	Parameter compared	Non-obese postmenopausal women vs Obese postmenopausal women	
		t-value	p-value
1.	TC	2.910	0.0038(S)
2.	TG	20.007	P<0.0001(HS)
3.	HDL	24.60	P<0.0001(HS)
4.	LDL	12.33	P<0.0001(HS)
5.	Lp(a)	8.2454	P<0.0001(HS)
6.	CRI-I	20.560	P<0.0001(HS)
7.	CRI-II	25.081	P<0.0001(HS)
8.	AIP	12.4331	P<0.0001(HS)

RESULTS AND DISCUSSION

Table 01 shows that obese postmenopausal women have higher levels of TC, LDL cholesterol, TG, and Lp (a) and lower levels of HDL cholesterol compared to non-obese postmenopausal women. In addition, newer atherogenic lipid indices, such as CRI-I, CRI-II, and AIP, are also higher in obese postmenopausal women than non-obese postmenopausal women. These differences in lipid profile parameters and newer atherogenic lipid indices are statistically significant, as demonstrated in Table 02.

These findings suggest that obesity may contribute to unfavorable changes in lipid profile parameters and increase the risk of cardiovascular disease in postmenopausal women. It is important for obese postmenopausal women to adopt healthy lifestyle habits, including a balanced diet and regular physical activity, to manage their weight and improve their lipid profile parameters. They may also benefit from medical interventions such as lipid-lowering medications to reduce their risk of cardiovascular disease.

The research conducted by Kumari P et al (14), Usoro et al (15), and Mathew et al (16) discovered that postmenopausal women and those aged over 40 had significantly higher levels of total cholesterol, LDL-C, and AIP, and lower levels of HDL-C when compared to perimenopausal and women aged between 19-35 years.

Another study conducted by Kim et al (17) found that Lp (a) levels were notably higher in postmenopausal women than premenopausal women. In addition, Aljawani N et al (18), Anagnostis P et al (19), and Liu S L et al (20) reported that there was a significant increase in Lp(a) concentration after menopause, and there were significant variations between menopausal groups in terms of Lp(a) concentration ($p < 0.001$).

These findings highlight the increased cardiovascular risk associated with obesity in postmenopausal women and emphasize the importance of managing weight and adopting healthy lifestyle habits to improve lipid profile parameters and reduce the risk of cardiovascular disease. Healthcare professionals should consider these findings when developing personalized prevention strategies and treatment plans for postmenopausal women who are overweight or obese. Further studies are needed to explore the underlying mechanisms that contribute to these lipid profile changes and to investigate the effectiveness of different interventions in improving lipid profile parameters and cardiovascular outcomes in this population.

CONCLUSION

Our study has found that Lp (a), CRI-I, CRI-II, and AIP are superior parameters than the conventional lipid profile in assessing cardiovascular risk in obese postmenopausal women. This demographic is particularly susceptible to cardiovascular disease due to age-related hormonal changes and obesity-related metabolic disturbances. Our findings suggest that the incorporation of these parameters into routine lipid profiling in this population can provide better risk stratification and aid in the prevention of cardiovascular disease. Specifically, Lp (a) has been associated with increased cardiovascular risk in postmenopausal women, while CRI-I, CRI-II and AIP ratios have been found to be better predictors of coronary artery disease in obese individuals. Incorporating these parameters into lipid profiling may help identify at-risk patients earlier and tailor preventative interventions accordingly.

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