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Relationship Between Body Mass Index, Liver Span And Lipid Profile in Madurai Women : A Preliminary Observational Study

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ABSTRACT

The development of cardiovascular disease (CVD) is complex and multifactorial; Our Hospital records show that women from the district of Madurai Tamil Nadu, India have an increased incidence of Coronary Heart Disease (CHD) requiring CABG. This study aims to observe and analyze the causal relationship of CVD between Blood lipid levels, Liver span and Body mass index in women from this geographic location. Methods: 312 females with no history of diabetes, Hypercholesterolemia, hepatobiliary diseases, myeloproliferative disorders, cardiac diseases and alcoholics were included in this study. After an overnight fast the following were measured Blood lipids, sonographic measurement of the liver span, weight and height. The patients were divided into four groups based on their age, Group 1 (age 16 to 30) Group 2 (age 31 to 45) Group 3 (age 46 to 60) Group 4 (more than 60 years). All data were analyzed using SPSS software package. Results: The maximum numbers of cases with abnormal lipid levels were found with Triglycerides (TGL) (39.70 %) and Low Density Lipoprotein (LDL) (40.40 %): Consistently higher number of cases with abnormal levels of Total Cholesterol (TC) (41.90%), TGL (43.40%), and LDL (43.40%) were found in group 3. Also Group 3 Body Mass Index (BMI) was found to have maximum number of significant positive correlation ($p = < 0.05$) with Liver Size, TC, TGL, and LDL. The liver size correlated significantly well ($p = < 0.05$) with BMI, TGL, LDL and VLDL in group 2. Group 3 showed a significant positive correlation ($p = < 0.05$) with BMI, TGL and VLDL. This preliminary observational analysis hypothesizes an increased association between hypertriglyceridemia and Cardiovascular disease risk in middle aged women from Madurai.

KEYWORDS Lipid Fractions, Liver Span, Body Mass Index and Correlation

INTRODUCTION

The development of cardiovascular disease (CVD) evolves much from the dynamics of cholesterol homeostasis which is complex and multifactorial, and the individual variability in the proportion of cholesterol from exogenous and endogenous sources. From our hospital records, women from the district of Madurai Tamil Nadu, India show an increased incidence of Coronary Heart Disease (CHD) requiring surgical intervention compared to studies reported elsewhere in India. Yadava et al. (1) reviewed 3500 patients who underwent CABG over 8 years from the northern part of India and reported 14.6% women who underwent CABG. Kasliwal et al.(2) reviewed 1000 consecutive patients who underwent elective CABG of which 88.4% were male and 11.6% were females elsewhere in India. Within a span of six months (July 2015 to Dec 2015) 81 CABGs were done in our hospital of which 66 were male (81.4%, mean age 58.9 ± 9.5 SD) and 15 were female (18.5%, mean age 54.8 ± 9.0 SD). The incidence of women who underwent CABG from this geographic location is 4% to 8% more compared to others CABG studies from India. CVD evolution is multifactorial, as a preliminary observation to an upcoming major CVD and CABG study from our institution this study aims to observe and analyze the causal relationship of CVD between Blood lipid levels, Liver span and Body mass index in women from this geographic location.

METHODS

Females who visited the master health checkup clinic were included in this study. All investigations included in this study were routine investigations for those visiting the master health checkup clinics. 312 females were included in this study over a period of eight months. Subjects with history of diabetes, Hypercholesterolemia, hepatobiliary diseases, myeloproliferative disorders, cardiac diseases and alcoholics were excluded. Medical history and personal data (blood pressure, weight, height and age) were recorded before the subjects were sent for ultrasound. After an overnight fast, blood samples were taken in the morning for estimation of lipid fraction in serum. For statistical analysis the patients were divided into four groups based on their age, Group 1 (age 16 to 30) Group 2 (age 31 to 45) Group 3 (age 46 to 60) Group 4 (more than 60 years). This study was approved by Institutional ethics committee.

The sonographic examinations were performed using diagnostic sonographic units (GE VOLUSON P8 Ultrasound and SIEMENS ACUSON X300) with a 2–5-MHz convex probe. As much as possible, identical settings were maintained for all units. The abdominal sonographic examinations were performed using the method of Boerner et al (3). by specially trained examiners. The greatest craniocaudal liver span in the Mid Clavicular Line was measured under conditions of maxi-

mum inspiration and supine position.

Blood Lipid profile was estimated using enzymatic methods in Beckmans coulters auto analyzer. Pearson's correlation was used for statistical analysis. All data were analyzed using SPSS, version 21 (SPSS Inc., Chicago, IL.). The data was analyzed using "t test" and were presented using mean ±SD

RESULTS

From among the total of 312 females included in this study, the maximum numbers of cases with abnormal lipid levels were found with TGL (39.70 %) and LDL (40.40 %): table 1. Consistently higher number of cases with abnormal levels of TC (41.90%), TGL (43.40%), and LDL (43.40%) were found in group 3 (46-60 yrs.) Table 1, graph 1. Group 3 (46-60 yrs.) BMI was found to have maximum number of significant positive correlation ($p = < 0.05$) with Liver Size, TC, TGL, and LDL when compared to other age groups. Table 2. The liver size correlated significantly well ($p = < 0.05$) with BMI, TGL, LDL and VLDL in group 2 (31-45 yrs.). Group 3 (45-60 yrs.) showed a significant positive correlation ($p = < 0.05$) with BMI, TGL and VLDL.

DISCUSSION

The observation from this present study indicates that females (aged 16 to 65 years) from this geographic location show abnormally high levels of TGL and LDL compared to other lipid fractions. Group 3 (age 45 to 60) show consistently high abnormal values with TC, TGL and LDL when compared to other age groups. Also in group 3 (age 45 to 60 yrs.) there is a strong positive correlation observed between BMI- Liver size, TC, TGL and LDL when compared to other groups. This suggests that during this age period in life there is hyperactivity of the liver with enhanced production of TC, TGL and LDL which could be the possible cause for the increase in BMI.

Group 2 exhibited a significant positive correlation between Liver size with TGL, LDL and VLDL. However group3 showed a significant positive correlation between Liver size with TGL, and VLDL and not with LDL. This denotes that during the age period of group 2 (31 to 45 yrs.) there is hyperactivity in the liver in the production of lipid fractions TC, TGL, LDL and VLDL however the production LDL is stepped down during the age period of group 3 (age 45 to 60). Group 3 also showed a significant positive correlation between TGL – Liver size, BMI, TC and VLDL, Table 4. This may suggest that there is excessive production of TGL in liver in the age period of group 3 (age 45 to 60) which is packed into VLDL. Very-low-density lipoproteins (VLDL) complexes are assembled in the liver in response to nutrients and hormones. The secreted VLDL carries almost all of the triglyceride in the blood-stream from the liver, to the peripheral tissues for storage in adipose tissue or for use in skeletal muscle. When there is positive caloric balance, insulin resistance, or development of diabetes, the liver secretes more VLDL with more triglycerides predisposing to atherogenesis.

There is very little known about the precise role of hypertriglyceridemia in atherogenesis in women and older patients consequently the role of triglycerides in CVD risk remains controversial. However observational studies suggest that TGL may be particularly an important risk factor in the elderly, the majority of whom are women. (4) Another observational study (5), has indicated that TGL is a risk factor for mortality arising from CVD in women > 65 years; in contrast our observation in this study indicates increased levels of TGL to be a risk factor particularly in the age group between 46-60 years in women. We hypothesize that hypertriglyceridemia during this particular age period of group 3 (age 45 to 60 yrs.) in females may be the cause for the increased incidence of CVD in this geographic location requiring CABG.

Table 1

Normal Abnormal			Total cholesterol		TGL		LDL		VLDL		HDL	
			Normal	Abnormal	Normal	Abnormal	Normal	Abnormal	Normal	Abnormal		
Age Group 16-30	25	Count	21	4	21	4	22	3	23	2	21	4
		% within Age	84.00%	16.00%	84.00%	16.00%	88.00%	12.00%	92.00%	8.00%	84.00%	16.00%
Age Group 31-45	98	Count	66	32	64	34	56	42	93	5	83	15
		% within Age	67.30%	32.70%	65.30%	34.70%	57.10%	42.90%	94.90%	5.10%	84.70%	15.30%
Age Group 46-60	136	Count	79	57	77	59	77	59	121	15	114	22
		% within Age	58.10%	41.90%	56.60%	43.40%	56.60%	43.40%	89.00%	11.00%	83.80%	16.20%
Age Group Above 60	53	Count	32	21	26	27	31	22	46	7	46	7
		% within Age	60.40%	39.60%	49.10%	50.90%	58.50%	41.50%	86.80%	13.20%	86.80%	13.20%
Total	312	Count	198	114	188	124	186	126	283	29	264	48
		% within Age	63.50%	36.50%	60.30%	39.70%	59.60%	40.40%	90.70%	9.30%	84.60%	15.40%

Total cholesterol and various lipid fractions in women from Madurai expressed as percentage.

TC= Total cholesterol, TGL= Triglycerides, LDL = Low Density Lipoproteins, VLDL = Very low density Lipoproteins, HDL = High Density Lipoproteins

Figure 1: The percentage of abnormal cases of Lipid fractions in various

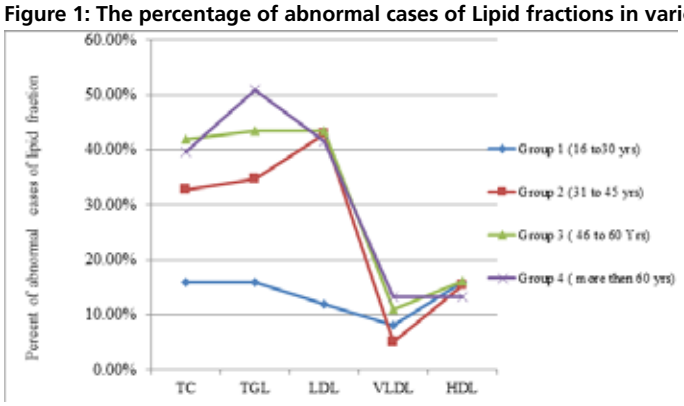

Table 2: Correlation between BMI among various age groups and Liver size and various Lipid

Female		Liver Size	TC	TGL	LDL	VLDL	HDL
AGE 16- 30 BMI	Pearson Correlation	0.268	0.009	-0.129	0.068	-0.015	-0.040
	Sig.	0.426	0.828	0.302	0.786	0.272	0.561
AGE 31- 45 BMI	Pearson Correlation	0.296*	0.251*	0.153	0.186*	0.098	0.184
	Sig.	0.037	0.028	0.265	0.033	0.137	0.613
AGE 46- 60 BMI	Pearson Correlation	0.323**	0.213*	0.194*	0.189*	0.132	0.031
	Sig.	0.003	0.028	0.043	0.052	0.571	0.654
AGE >60 BMI	Pearson Correlation	0.504**	0.341	-0.133	-0.404*	0.234	0.235
	Sig.	0.003	0.062	0.944	0.019	0.765	0.252

Table 3: Correlation between Liver size among various age groups and BMI and Lipid Fractions

Female		BMI	TC	TGL	LDL	VLDL	HDL
AGE 16- 30 Liver Size	Pearson Correlation	.268	.093	.144	.133	.133	-.018
	Sig.	.426	.657	.494	.525	.525	.933
AGE 31- 45 Liver Size	Pearson Correlation	.296*	-.132	.356**	.266*	.266*	-.143
	Sig.	.037	.195	.000	.050	.009	.159
AGE 46- 60 Liver Size	Pearson Correlation	.323**	.037	.214*	.000	.079**	-.103
	Sig.	.003	.667	.012	.998	.036	.233
AGE >60 Liver Size	Pearson Correlation	.504**	-.059	.208	-.226	.202**	-.353**
	Sig.	.003	.672	.136	.110	.015	.010

Table 4: Correlation between TGL among various age groups and Liver size and BMI and Lipid Fractions

Female		Liver Size	BMI	TC	LDL	VLDL	HDL
AGE 16- 30 TGL	Pearson Correlation	.144	-.363	.412*	.097	.801	-.055
	Sig.	.494	.302	.041	.644	.000	.795
AGE 31- 45 TGL	Pearson Correlation	.356**	.161**	.284**	.129	.911	-.150
	Sig.	.000	.0265	.005	.209	.000	.141
AGE 46- 60 TGL	Pearson Correlation	.214*	-.087*	.538**	.164	.753*	.031
	Sig.	.012	.0436	.000	.062	.000	.720
AGE >60 TGL	Pearson Correlation	.208	-.013	.613**	-.077	.974	.011
	Sig.	.136	.944	.000	.593	.000	.940

CONCLUSIONS

In conclusion, this preliminary observational analysis hypothesizes an increased association between hypertriglyceridemia and Cardiovascular disease risk in women and it seems to occur early in middle aged women from the geographic region of Madurai. These findings may have clinical implications for life style modification or drug therapy, but requires confirmation in larger studies considering other cardiovascular parameters.

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