Indian Journal of Fundamental and Applied Life Sciences ISSN: 2231-6345 (Online)
An Online International Journal Available at http://www.cibtech.org/jls.htm
2011 Vol. 1 (4) October- December, pp.68-72/Girgla et al.
Research Article

STUDY OF SERUM CHOLESTEROL AND LIPOPROTEINS IN RELATION TO ABO BLOOD GROUPS IN NORTH INDIAN POPULATION

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ABSTRACT
The aim of the study was to investigate the relationship of ABO blood groups with total serum cholesterol and lipoproteins in normal healthy Punjabi subjects .The lipid profile of 896 subjects aged 24-67years,was determined and their values were analyzed. Serum cholesterol, Low Density Lipoproteins (LDL), Very Low Density Lipoproteins (VLDL), High density Lipoproteins (HDL), LDL/HDL ratio and Serum cholesterol / HDL ratio were determined. This study indicated a significant association between blood group A and high levels of serum cholesterol and LDL as compared to other blood groups.

Key Words: *ABO Blood Groups, Total Serum Cholesterol, Lipoproteins, Healthy Population*

INTRODUCTION
The significance of ABO antigens and blood group typing has now been known to extend beyond the realms of transfusion of blood and blood products. Studies the world over have established the relation between blood groups and susceptibility of individuals to various diseases (Mehrazin, 2006; Jesch et al., 2007; Reddy et al., 2008). Likewise a high prevalence of a particular blood group in a community or geographical area may affect the incidence of diseases (Fard et al., 2003; Min Su et al., 2001; Bhuiyan et al., 2009). High Serum cholesterol and Serum LDL is strongly implicated in the development of atherosclerosis (NCEP, 1993; Fang et al.,2006) and is considered a risk factor in the development of Ischemic Heart Disease (IHD; Corti et al., 1997; Ebrahim et al., 1997; and Nixon 2004) and Cardio Vascular Accident (CVA; Masood 2002; Kurl et al.,2006).
During the last few decades many studies have demonstrated a link between ABO blood groups in particular non O blood groups and the risk of developing severe manifestations of atherosclerosis (Stakisaitis et al., 2002; Meade et al.,1994; Wong et al.,1992). Coronary Artery Disease (CAD) is said to be proportional to the levels of serum cholesterol, LDL and VLDL (Stamler et al., 2000) and is one of the leading causes of morbidity and mortality worldwide (Menotti et al., 2004; Fuster, 1999). Such studies in non white population of north India are very few. This study is an endeavor to find an association between ABO blood groups, Total serum cholesterol and Lipoproteins and in apparently healthy population.

MATERIALS AND METHODS
896 subjects, 538 males and 358 females participated in the study. The subjects were selected randomly from various districts of Punjab. Informed consent was sought individually after full explanation of the purpose and nature of the procedure used. The subjects with history of smoking, obesity, Diabetes Mellitus, Hypertension, Hypothyroidism, Hyperthyroidism, Nephrotic Syndrome, Renal Insufficiency, Liver diseases, Cushing's disease and any malignancy were

excluded. Subjects taking any of the following drugs: Steroids, Oral Contraceptives, Diuretics and Beta blockers were also excluded from the study.

Fasting serum cholesterol and serum Lipoproteins were determined by using Transasia kits & Transasia V2 Semi-Autoanalyser. The values obtained were rounded off till the first decimal place. The blood groups were determined by slide method using Anti-A and Anti-B sera by standard Agglutination techniques.

The relation of different blood groups to the level of S. cholesterol, LDL, VLDL, HDL, HDL/LDL ratio and S. Cholesterol/HDL ratio were found out and results tabulated. 'p' and t' values were determined by statistical analysis.

RESULTS

A total of 896 subjects were recruited for the study. The total number of subjects in the blood groups A, B, AB and O were 136, 389, 63 and 308 respectively (Table 1).The mean age of the person chosen for the study was 37.6 years with the youngest being 24 years and the oldest being 67 years. The 'p' value for serum cholesterol was highly significant on comparison between blood group A and O ($p<0.001$) and relatively less significant in blood group A vs AB and blood group B vs. AB.

On comparison of LDL levels among the blood groups A & B, A & O, and AB & O the 'p' value is <0.001 (Table 2 and 3).

Table 1: Distrubution of subjects according to their sex and blood group A, B, AB, and O

Sex	Antigen A	Antigen B`	Antigen AB	Antigen O	Total
MALE	87	226	35	190	538
FEMALE	49	163	28	118	358
TOTAL	136	389	63	308	896

Table 2 : Distrbution of the parameters among bloodgroup A, B, AB, AND O

Sr no.	Parameter	Blood Group A	Blood group B	Blood group AB	Blood group O
1	S.cholesterol(mg/dl)	223.97±41.58	204.84±67.83	217.84±38.90	190.70±49.89
2	LDL (mg/dl)	117.61±19.97	104.84±26.88	113.98±22.04	99.78±24.49
3	VLDL (mg/dl)	38.60±3.48	34.70±6.79	37.50±2.90	29.4±4.11
4	HDL (mg/dl)	36.72±2.98	39.44±6.32	37.71±3.23	43.22±2.44
5	LDL/HDL ratio	3.20	2.66	3.02	2.31
6	S.cholesterol/HDL	6.10	1.59	5.78	4.41

DISCUSSION

Hypercholesterolemia is considered a risk factor in the development of IHD (Wafi 2007). Besides elevated levels of total cholesterol (TC), epidemiologists have identified elevated Low density lipoprotein cholesterol (LDL-C) and depressed high density lipoprotein cholesterol (HDL-C) as other important risk factors for CAD(Grover et al.,1995). The relation holds true for men, women and all age groups. Studies have established that atherosclerosis starts very early in life and is discernable even during fetal development (Napoli et al., 2005). In our study blood type A subjects had high S. Cholesterol and LDL levels and low S .HDL levels, followed closely by type AB. Blood group O showed lowest values of S. Cholesterol and S.LDL and high S. HDL values. Our study agrees with findings by Stakisaitis et al (2002) that blood type O may serve as a

Table 3: 'p' and 't' Values of major risk factors i.e. cholesterol and LDL on comparison among different blood groups

Comparison for S. Cholesterol

Comparison	't' value	'p' value	Significance
Blood Group A Vs B	3.091	0.0021	Significant at 1% Significance level
Blood Group A vs. AB	0.987	0.3249	Not Significant
Blood Group A vs. O	6.802	<0.001	Highly Significant
Blood Group B vs. AB	1.481	0.1392	Not Significant
Blood Group B vs. O	3.061	0.0023	Significant at 1% Significance level
Blood Group AB vs. O	4.071	0.0001	Highly Significant

Comparison for S. LDL

Comparison	't' value	'p' value	Significance
Blood Group A vs. B	5.0713	< 0.001	Highly Significant
Blood Group A vs. AB	1.154	0.2500	Not Significant
Blood Group A vs. O	7.464	< 0.001	Highly Significant
Blood Group B vs. AB	2.562	0.0107	Significant at 5% Significance level
Blood Group B vs O	2.566	0.0105	Significant at 5% Significance level
Blood Group AB vs O	4.262	< 0.001	Highly Significant

protective anti-atherogenic factor in women. Wong et al (1992) also demonstrated elevated total cholesterol (TC) in phenotype A in Japanese cohort claiming such individuals to be more predisposed to cardiovascular disease. Gillium (1991) reported a similar association of type A with high TC and high LDL in white adults and adolescents. However, this study contradicts findings of Whincup *et al.*, (1990) on British men who linked hypercholesterolemia in both group A and group O.

In our study the S. LDL levels were significantly elevated ($p<0.001$) in individuals of blood group A as compared to blood group B or O hence blood group A individuals may be more predisposed to CVD through one of its risk factors. Total cholesterol levels were elevated in blood group A & this relationship is maintained from early to late adulthood, independent of sex. Unlike our study, Meade et al., (1994) reported significantly higher incidence of IHD in blood group AB as compared to those of B & O. Inconsistent results from cross-sectional studies of various racial groups with varying ages raised an age effect as a possible explanatory factor (Murray *et al.*, 1997).

We conclude that blood group A or AB have high S. cholesterol and high LDL and VLDL levels and low HDL levels, indicating that these blood types are clearly an important risk factor for heart and artery disease and should be offered screening. Further genetic and population research is needed to determine the nature of association of ABO blood groups with S. cholesterol and

Lipoproteins. Studies of ABO blood groups would be of interest in familial hypercholesterolemia and other inherited disorders of lipoprotein metabolism for which the likely mode of transmission has been established. The data generated by our study can be useful for health planners while making efforts to face the future health challenges in this region. In short, this data serves as a forewarner of future burden of disease in this region of the country. Such studies need to be carried out more elaborately at regional level. Further, of the various risk factors for atherosclerosis, blood lipid levels are modifiable and amenable to treatment. Hence, the lowering of the elevated levels of serum cholesterol in persons susceptible to atherosclerosis may provide a useful tool to ward off the coronary artery disease.

ACKNOWLEDGEMENTS
The authors thank Aarzee Pathology Laboratory and Mata Kaulan Bandi Chhod Charitable Hospital, Amritsar for providing laboratory facilities to complete the project.

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