

A study of blood groups and their association with coronary artery disease risk factors and comparison of cardio metabolic profile of young adults among various districts in Kerala and Tamilnadu

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Abstract

Objectives: This study aims to detect the distribution of Blood groups in students attending Karpagam educational institutions. Also we aim to identify the cardiovascular and diabetic risk among them based on blood groups and demography.

Methods: 977 students aged 17-20 years from various districts of Tamilnadu and Palakkad district of Kerala studying in Karpagam Educational institutions were taken for study in our Hospital in September 2015. Their Blood was collected in fasting state and analyzed for Blood grouping and Rh typing, Fasting Blood Sugar (FBS), Total Cholesterol, Triglycerides (TG), Low density lipoprotein (LDL), High Density Lipoprotein (HDL) and Very low density lipoprotein (VLDL).

Results: Out of 977 students, 658 are males and 319 are females. The Blood group distributions are O-37.6%, B-31%, A-23.1% and AB-8.2%. Males had higher VLDL in the study population. Our study shows that "A" Positive population has higher risk of developing Coronary heart Disease (CVD) in the future among blood groups. Also we found that students from Palakkad district of Kerala are having poor lipid levels and more prone for future coronary artery disease.

Keywords: Blood group, coronary artery disease, cardio metabolic.

1. Introduction

Carl Landsteiner, in 1901 discovered blood groups. Until now around 400 types of blood group antigens were identified. Blood is a permanent and individual identity of a person. Relationship between Blood groups and disease occurrence is a question of bigger amplitude but only a less amount of research has been done in that area. Significant association between blood groups and diseases like duodenal ulcer, Gastric cancer, urinary tract infection, heart disease and Periodontal diseases has been found by a few small studies. The major one being the Framingham Heart study which shows that the 'A' phenotype Blood group are more susceptible for CVD [1], which is further proved by similar studies [2-5]. CVD is a multifactorial disease.

Both genetic and environmental factors play major roles in development of CVD. Many studies are in favour of a positive causal relationship between Blood groups and risk of CVD, but the underlying pathophysiology is yet to be explained. Very few studies were carried out in India to study the prevalence of blood groups [6-9]. Also different parts of

India has different food habits, stress levels and working patterns which may contribute to differential levels of incidence of these lifestyle diseases. Few studies confirm that mortality due to coronary artery disease is more in south India than north [10].

The INTERHEART study [11] was performed in 27,000 patients of acute myocardial infarction and controls in 52 countries of the world and were assessed for multiple cardiovascular psychosocial and biological risk factors in both the groups. This study reported that risk factors such as smoking, abnormal lipids, hypertension, diabetes, high waist-hip ratio, sedentary lifestyle, psychosocial stress, and a lack of consumption of fruit and vegetables are more in south Asians than on other regions of the world and explained more than 90% of acute CVD events in them. Even though we have done an extensive search in the existing literature, we are unable to find many studies comparing lipid profiles and blood sugar of people of various districts in South India. Preventive Health programs for various non communicable

diseases are available in India. But the maximal benefit can be only be obtained when the prevalence of diseases can be found out based on demography, so that specific programs can be intensified in such areas.

We conducted a prospective study to find the prevalence of blood groups in various districts of Tamilnadu and Kerala of India, association between blood groups and heart disease and cardio metabolic profile between various demographic areas seven different districts of two states in India.

2. Materials and Methods

The present study is a product of routine health checkups carried out for the graduate students of Karpagam Educational Institutions, Coimbatore conducted in September 2015 in Central Service Laboratory of Karpagam Faculty of Medical Sciences and Research, Coimbatore.

977 students aged 17-20 years from various districts of Tamilnadu and Palakkad district of Kerala participated in this study. Blood was collected in fasting state in sitting position and transferred to EDTA and Clot activator tubes. Tubes were immediately sent to Hematology and Biochemistry labs for analysis. Blood group was determined by commercially available kits. The second tube was centrifuged and analyzed immediately for Fasting blood sugar (GOD-POD method), Total Cholesterol (CHOD-PAP method), LDL & HDL Cholesterol (Direct method) and Serum Triglycerides (TG) using ERBA system packs in ERBA EM 360 analyzer. VLDL was calculated by formula TG/5. Institutional Human Ethical Committee approval was obtained. Statistical method like 'Independent t test' was carried out using SPSS 17 software.

3. Results

Out of 977 students, 658 are males and 319 are females. The Blood group distributions are O-37.6%, B-31%, A- 23.1% and AB-8.2%. Males had higher VLDL (p<0.05 TG (p<0.005) and lower HDL (p<0.001) than females which is shown in Table 1. "A" Blood group had significantly higher Total cholesterol (p<0.005) and LDL (p<0.005) than other Blood groups (Table 2).

Table 1: Comparison of characteristics between males and females

Parameters	Sex		Significance
	Male	Female	
N (population)	658	319	-
Fasting Blood Sugar (mg/dL)	111±17	110±14	p=0.451
Total cholesterol mean mg/dL	147±30	151.3±30	<0.05
TGL mean mg/dL	110±52	99.1±51	<0.005
HDL mean mg/dL	46.9±12	53.8±12	<0.001
LDL mean mg/dL	83.9±23	86.6±23	p=0.1
VLDL mean mg/dL	22.5±11	20.1±13	<0.05

Table 2: Comparison of characteristics between A Phenotype and other individuals

Parameters	Blood Group		Significance
	A Phenotype	Other blood groups	
N (population)	225	747	-
Total cholesterol mean mg/dL	153.4 ±30	146.9 ±30	<0.005
LDL mean mg/dL	88.6 ±24	83.6 ±23	<0.005

There is a small but significant increase in Blood glucose level in Rh negative individuals than positive ones (p<0.05) as shown in Table 3.

Table 3: Comparison of FBS in Rh Positive and negative individuals

Parameters	Rh Group		Significance
	Positive	Negative	
N (population)	925	52	-
FBS mean mg/dL	111.1 ±16	116.5 ±19	<0.05

Out of students from 7 districts of Tamilnadu and Kerala analyzed, Coimbatore District students had higher HDL (p<0.0001). This data is presented in Table 4.

Table 4: Comparison of HDL between Coimbatore and other Districts' native individuals

Parameters	Native District		Significance
	Coimbatore	others	
N (population)	474	503	-
HDL mean mg/dL	52.4 ±12	46.2 ±12	<0.0001

Low HDL among districts are seen with Salem (p<0.0001) and Madurai District (p<0.0001) Students. Data is shown in Table 5 and 6.

Table 5: Comparison of HDL and FBS between Salem and other district participants

Parameters	Native District		Significance
	Salem	others	
N (population)	100	877	-
FBS mean mg/dL	105.7 ±20	112 ±16	<0.0001
HDL mean mg/dL	44.4 ±10	49.7 ±12	<0.0001

Table 6: Comparison of HDL between Madurai and other district subjects

Parameters	Native District		Significance
	Madurai	others	
N (population)	140	837	-
HDL mean mg/dL	43.9±13	50.1 ±12	<0.0001

Nilgiris Students had a significantly lower total cholesterol (<0.05) and LDL (0.005) than other students altogether as shown in Table 7.

Table 7: Lipid profile of Nilgiris district students versus other students

Parameters	Native District		Significance
	The Nilgiris	Others	
N (population)	29	948	-
Total Cholesterol mean mg/dL	136.7 ±25	148.8 ±30	<0.05
LDL mean mg/dL	70.3 ±23	85.2 ±23	<0.005

Students from Palakkad district of Kerala had a high cholesterol (p<0.05), high LDL (p<0.05) and low HDL (p<0.05) when compared with other students of Tamilnadu (Table 8).

Table 8: Comparison of Lipid profile of Palakkad and other district students

Parameters	Native District		Significance
	Palakkad, Kerala	Others, Tamilnadu	
N (population)	75	902	-
Total Cholesterol mean mg/dL	159.9 ±32	147.5 ±30	<0.005
HDL mean mg/dL	46 ±13	49 ±12	<0.05
LDL mean mg/dl	90.8 ±28	84.3 ±23	<0.05

Also Trichy District students had lower LDL (p<0.0001) level than remaining students. Students of Salem (p<0.0001) had lowest FBS, whereas Trichy (p<0.0001) and Tirupur (p<0.0001) had significantly higher FBS (Table 9 and 10). The overall significance is graphically represented in Figure 1.

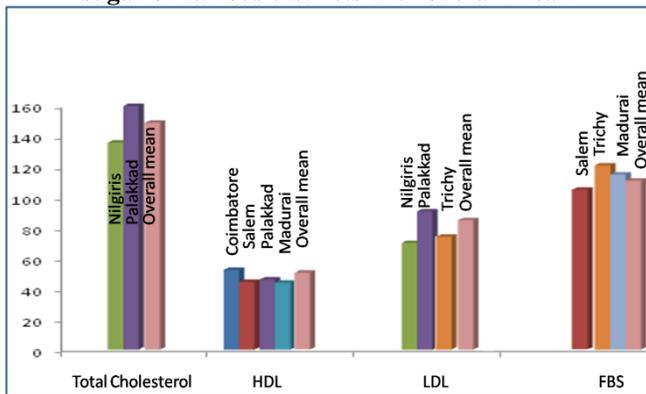
Table 9: Comparison of FBS and LDL among Trichy and other students Parameters

Parameters	Native District		Significance
	Trichy	Others	
N (population)	62	915	-
FBS mean mg/dl	121.5 ±19	110.7 ±16	<0.0001
LDL mean mg/dl	74.1 ±23	85.5 ±23	<0.0001

Table 10: Comparison of FBS among Tirupur and other district students

Parameters	Native District		Significance
	Tirupur	Others	
N (population)	97	880	-
FBS mean mg/dl	115.6 ±16	110.9 ±16	<0.0001

Figure 1: Comparison of Lipid profile and Fasting blood sugar of various districts with overall mean



4. Discussion

Our study seems to reflect the overall Asian trend of high number of O group followed by B, A and the lowest being AB group. As per global trends Rh group is positive for high number of people and Rh negative was a bare minimum. Other few studies conducted in south India shows similar trends in ABO and Rh distribution [6-8].

The important drawback in the previous studies establishing the link between blood groups and risk of heart diseases is the age factor. Most of the study populations are relatively elder which may have the risk of not eliminating the environmental factors, food and work habits which may

confound the risk association. But our study population is very young and those factors may not start affecting their existing lipid levels. So a direct association between the blood groups and the cardiac risk factors can be established.

This study confirms the previous finding of other such studies that the CVD risk is more for the “A” Phenotype individuals irrespective of their Rh statuses based upon their increased Total cholesterol and LDL levels. This is consistent with the large metaanalysis study [12] which also proved that the CVD risk in “A” blood group is due to increased Factor VIII and Von willi brand factor, increased cholesterol levels and various genetic factors. Also there seems to be an increased risk for developing Diabetes for Rh negative individuals when compared to Positive subjects. The reason for this phenomenon cannot be explained.

In the second part of our study we have compared the lipid profiles based up on the demographic data. The students from Trichy district showed good LDL levels but high fasting blood glucose levels compared with other districts. Similarly students of Tirupur district showed high glucose levels. Participants of Coimbatore district showed excellent HDL levels but peers from Madurai and Salem districts had very low HDL. Students from the Hilly Nilgiris district have less risk than people living in plains. This may be attributed to high Basal metabolic rate due to colder conditions. Students from Kerala showed relatively poor lipid values than Tamilnadu students. This may be attributed to highest consumption of Palm oil by people of Kerala [13] and may be due to high prevalence of low physical activity, obesity, Hypertension and Diabetes among them [14]. A change in diet pattern and lifestyle is of utmost need to students of Kerala origin.

5. Conclusion

We have found that the lipid levels are altered in 'A' Antigen blood group individuals. Also varied lipid and serum glucose patterns are observed based on demographical divisions in Tamilnadu and Kerala. The study was conducted among college students. Appropriate health education should be directed towards Palakkad, Madurai and Salem district school students to improve their lipid levels and cardiac health. School students of Trichy and Tirupur districts should be educated for Diabetes prevention. Also Rh negative and “A” Positive individuals should be targeted on prevention of Diabetes and CVD respectively.

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