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RESEARCH ARTICLE

A study to find out association between blood group and lipid profile

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ABSTRACT

Background: In transfusion science, ABO blood group system is the most important blood group system. Numerous studies show that certain types of diseases are more common in certain blood groups such as tuberculosis is more common in Type O and *Plasmodium vivax* infection is more common in Type A and O blood group. **Aims and Objectives:** As cardiovascular diseases and lipid profile are strongly associated with genetic predisposition it may be possible to differentiate and quantify the possibility of heart problem in certain blood groups compared to others. **Materials and Methods:** A total of 50 cases in time span of 1 month have been included in this study. Prior Indian Ethics committee approval was taken and information sheet was provided to subjects about this study. On voluntary consent, subjects' 0.5 ml venous blood was collected aseptically and lipid profile parameters such as serum cholesterol, serum triglycerides, direct high-density lipoprotein-cholesterol (HDL-C), direct low-density lipoprotein-cholesterol (LDL-C), Choles./HDL-C ratio, LDL-C/HDL-C ratio, and Very LDL cholesterol were measured using autoanalyzer instrument. All healthy male and female subjects above 18 years were included in the study. Data analysis was done by MedCalc v18.6 and single factor ANOVA was applied for various lipid profile parameters. **Results:** Out of 50 cases, the majority are B positive and O positive blood group with 18–14 cases, respectively each. In the present study, mean and standard deviation of LDL (in mg/dl) of A positive blood group is 88.49 ± 20.17. Similarly for B positive blood group, mean and its standard deviation are 104.82 ± 29.85. Furthermore, for B negative its 127.06 ± 25.13 and A negative its mean 84 and for O positive, its mean and standard deviation is 102.39 ± 19.24. Applying single factor ANOVA in MedCalc v18.6 various blood group system gives *P* value at 0.135. **Conclusion:** Out of 50 cases, 46 have Rh positive and 4 are Rh negative. Out of 46 Rh positive, 30 were male, and 16 were female. Out of 4 Rh negative, 2 were male and 2 were female. On applying single factor ANOVA for finding an association between blood group types and lipid profile, *P* value was found to be >0.05. Thus, no association was found between blood group type and lipid profile parameters.

KEY WORDS: Blood Group Types; ABO and Rh; Lipid Profile

INTRODUCTION

In transfusion science, ABO blood group system is the most important blood group system. ABO blood group system is determined by the presence and absence of antigen A and B which are present on the cell membrane of red blood cells (RBCs).[1] Discovery of ABO blood group by Karl Landsteiner lead to great amount of interest in other classification and association of diseases with ABO type.[2] Certain studies have reported that A blood group is predisposed to cardiovascular diseases and O blood group is a protective anti atherogenic factors.[3] There are numerous studies which show that certain types of diseases are more common in certain blood group types such as Type O have higher chances of tuberculosis, Type A and O have higher chances of *Plasmodium vivax* (Malaria parasite) infections,

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and Type B have higher chances of *Plasmodium falciparum* (another malaria parasite) infections.[4] Thus, it's quite evident that certain blood groups have certain diseases more commonly than others. It may be associated with a genetic predisposition, or it may be even immunological reactions which different individual with different blood groups has against certain diseases. Now blood group type may have a genetic predisposition or immunological influence on number of RBC, white blood cell and platelets.[5] Now as cardiovascular diseases and lipid profile are strongly associated with genetic predisposition it may be possible to differentiate and quantify the possibility of heart problem in certain blood groups compared to others.

MATERIALS AND METHODS

In total 50 cases are included in span of 1 month from start of the study. Prior Institutional Ethics Committee approval was taken for this study. Healthy individuals were given information sheet about the present study detailing all procedures and aims and objectives of the present study. Basic questions about any known cardiovascular, diabetes, or any endocrine diseases were asked and only if the person does not have such diseases were included in the study. Subject was informed about procedure and risk and benefit of study and were included in the study only if given voluntary consent.

Subject was instructed to be nil by mouth after 8 pm on the previous day and next day blood sample of 0.5 ml was collected incompletely sterilized, and standard universal protocol after 8 am. This fasting blood sample will have lipid panel tests which include total lipids, serum total cholesterol, serum high-density lipoprotein (HDL), serum low-density lipoprotein (LDL), serum Very LDL (VLDL), serum triglyceride, and total cholesterol/HDL ratio, and LDL/HDL ratio. Furthermore, blood group type, that is, ABO and Rh were analyzed to know blood group of the individual.

All healthy male and female subjects and all age (above 18) group individuals are included in the present study. Persons not willing to give consent are excluded. All teaching staff, postgraduates and undergraduates of Shri M. P. Shah Medical College, Jamnagar, have been excluded.

Quantitative data were analyzed by single-factor ANOVA using MedCalc v18.6, $P > 0.05$ is considered as not significant, $P < 0.05$ is considered as significant, and $P < 0.001$ is considered as highly significant.

RESULTS

In the present study, Table 1 shows a number of cases distributed in ABO and Rh blood group system. Table 1 shows that majority of cases are of B positive and O positive blood group types with each having 18 and 14 subjects, respectively, while least number of subjects was in A negative and B negative group each having 1 and 3 individuals, respectively.

In the present study, mean and standard deviation of LDL (in mg/dl) of A positive blood group is 88.49 ± 20.17. Similarly for B positive blood group, mean and its standard deviation are 104.82 ± 29.85. Furthermore, for B negative its 127.06 ± 25.13 and A negative its mean 84 and for O positive, its mean and standard deviation is 102.39 ± 19.24. Applying single factor ANOVA in MedCalc v18.6 various blood group system gives *P* value at 0.135 [Table 2].

In the present study, mean and standard deviation of HDL (in mg/dl) for A positive blood group is 44.35 ± 1.45. Same way mean and standard deviation of HDL for B positive blood group is 43.96 ± 1.64 and for B negative blood group 44.20 ± 1.92, and AB positive blood group 45.02 ± 1.26, and O positive blood group 44.22 ± 1.15, and A negative blood group, mean is 43. Applying single factor ANOVA in MedCalc v18.6 various blood group system gives *P* value at 0.771 [Table 3].

Table 1: Distribution of ABO and Rh blood group types

Blood Groups	Number of cases
A positive	10
B positive	18
B negative	3
AB positive	4
O positive	14
A negative	1
Total	50

Table 2: Distribution of mean and standard deviation of LDL among various blood groups

Blood group	Mean LDL	Standard deviation
A positive	88.49	20.17
A negative	84.00	0
AB positive	121.47	30.62
B positive	104.82	29.85
B negative	127.06	25.13
O positive	102.39	19.24

LDL: Low-density lipoprotein

Table 3: Distribution of mean and standard deviation of HDL among various blood groups

Blood group	Mean HDL	Standard deviation
A positive	44.3500	1.4509
A negative	43.0000	0
AB positive	45.0250	1.2659
B positive	43.9611	1.6461
B negative	44.20000	1.9287
O positive	44.2286	1.1579

HDL: High-density lipoprotein

In the present study, mean and standard deviation of cholesterol (in mg/dl) of A positive blood group is 156.60 ± 21.13. Same way mean and standard deviation of cholesterol for B positive blood group is 173.83 ± 33.78 and for B negative blood group 197.66 ± 28.53, and AB positive blood group 198.50 ± 41.49, and O positive blood group 175.71 ± 23.32, and A negative blood group, mean is 154. Applying single factor ANOVA using MedCalc v18.6 gives *P* value at 0.136.

In the present study, mean and standard deviation of triglyceride (in mg/dl) of A positive blood group is 120.30 ± 12.64. Same way mean and standard deviation of triglyceride for B positive blood group is 125.22 ± 20.19 and for B negative blood group 132.00 ± 10.81, and AB positive blood group 160.00 ± 56.21, and O positive blood group 132.71 ± 16.73, and A negative blood group, mean is 135. Applying single factor ANOVA using MedCalc v18.6 gives *P* value at 0.089

In the present study, mean and standard deviation of VLDL (in mg/dl) for A positive blood group is 24.06 ± 2.52 same way mean and standard deviation of VLDL of B positive blood group is 25.04 ± 4.03 and for B negative blood group 26.40 ± 2.16, and AB positive blood group 32.00 ± 11.24, and O positive blood group 26.54 ± 3.34, and A negative blood group, mean is 27. Applying single factor ANOVA using MedCalc v18.6 gives *P* value at 0.089.

In the present study, mean and standard deviation of LDL/HDL for A positive blood group is 1.99 ± 0.47. Same way mean and standard deviation of LDL/HDL for B positive blood group is 12.66 ± 43.51 and for B negative blood group 2.86 ± 0.47, and AB positive blood group 2.69 ± 0.64, and O positive blood group 2.37 ± 0.46, and A negative blood group, mean is 1.95 applying single factor ANOVA using MedCalc v18.6 gives *P* value at 0.888.

In the present study, mean and standard deviation of cholesterol/HDL for A positive blood group is 3.53 ± 0.48, for B positive blood group is 3.92 ± 0.68, for B negative blood group is 4.46 ± 0.49, for AB positive blood group 4.40 ± 0.84, O positive blood group 3.97 ± 0.49, and A negative blood group, mean is 3.58. Applying single factor ANOVA using MedCalc v18.6 gives *P* value at 0.112.

DISCUSSION

In the present study, out of 50 subjects, 46 are Rh positive, and only 4 are Rh negative. Out of 46 Rh positive, 30 subjects were males, and 16 subjects were females, and out of 4 Rh negative cases 2 were female, and 2 were male. In our cross-sectional analytic study, 18 subjects were female, and 32 were male subjects. Out of 18 female, 3 were A positive, 1 was A negative, 7 were B positive, 1 was B negative, and 6 were O positive, no one in AB positive and O negative. Out of 32 males, 7 were A positive, 11 were in B positive, and 2 were in B negative, and 8 were in O positive, and 4 were in AB positive blood group and no one in A negative and O negative. In our study, mean and standard deviation of total cholesterol (in mg/dl) of A blood group is 155.30 ± 21.13 and for B blood group is 185.75 ± 31.16, and for AB blood group 198.50 ± 41.49, and O blood group is 175.71 ± 23.32. *P* value on applying single factor ANOVA for the association of total cholesterol level and blood group types is 0.136. In our study, mean and standard deviation of direct LDL-C of A blood group is 86.25 ± 20.17 and for B blood group are 115.94 ± 27.49 and AB positive is 121.47 ± 30.62, and O positive is 102.39 ± 19.24 mg/dl. *P* value on applying single factor ANOVA for LDL-C level and blood group types is 0.135. In our study, mean and standard deviation of HDL for A blood group is 43.68 ± 1.45 and B blood group is 44.08 ± 1.78, and AB blood group is 45.02 ± 1.26, and O blood group is 44.22 ± 1.15. *P* value on applying single factor ANOVA for the association of HDL level with blood group types is 0.771. Similarly, for other lipid profile values applying single factor ANOVA using MedCalc software, *P* value for cholesterol/HDL-C ratio is 0.112, for LDL-C/HDL-C ratio is 0.888, for VLDL is 0.089, and finally for triglyceride is 0.089. Thus, in all *P* value is >0.05 indicating that there is no association between various lipid profile parameters and blood group type.

Compare to present study values of total cholesterol in Iheanacho *et al*. study[6] (values were in Mmol/L, and we have converted them into mg/dl) mean and standard deviation of cholesterol (mg/dl) for A (both positive and negative) blood group was 56.34 ± 10.98, and for B (both positive and negative) blood group was 51.3 ± 8.1, and AB (both positive and negative) was 53.28 ± 9.54, and O (both positive and negative) was 54 ± 8.46. Thus, values of total cholesterol for all blood group types in Iheanacho *et al*. study[6] were significantly lower than the present study. Furthermore, in Iheanacho *et al.* study[6] mean and standard deviation of LDL (Mmol/L) for A (both positive and negative) blood group was 33.84 ± 12.6 and for B (both positive and negative) blood group was 29.34 ± 9.54, and AB (both positive and negative) was 29.88 ± 11.52, and O (both positive and negative) was 28.98 ± 11.52. Hence, we can say that even LDL-C values are lower in Iheanacho *et al*. study[6] compare to the present study. Finally, in Iheanacho *et al*. study[6] mean and standard deviation of HDL (mg/dl) for A (both positive and negative) blood group was 18 ± 21.78 and B (both positive and negative) blood group was 19.26 ± 4.32, and AB (both positive and negative) was 19.44 ± 5.22, and O (both positive and negative) was 20.42 ± 5.4. Here also, in Iheanacho *et al*. study[6] values are lower than the present study. Lower values in Iheanacho *et al*. study[6] may be due to geographical variation and diet patterns in Nigeria as the study was conducted there. Malnutrition being quite common in Nigeria lipid profile values may have been lower than our present study which is conducted at Jamnagar, Gujarat, India.

The present study included all age and gender individuals from all socioeconomic backgrounds thus ruling out

confounding factors associated with it. However, sample size was limited, and thus results should be corroborated in similar fashion.

Total cholesterol value was higher in AB blood group in our study while it was higher in A blood group in Iheanacho *et al*. study.[6] LDL-C level was higher in AB blood group again in the present study, and similarly, A blood group had the highest LDL-C level in Iheanacho *et al*. study.[6] Finally, in the present study, AB blood group had marginally higher HDL level while in Iheanacho *et al*. study[6] O blood group had higher HDL level.

CONCLUSION

Out of 50 subjects, the highest amount of LDL cholesterol (127.06 ± 25.13 mg/dl) was found in B negative blood group, and the lowest amount was found in A negative blood group (84 mg/dl), while the highest amount of HDL is found in AB positive blood group (45.02 ± 1.26 mg/dl) and the lowest amount of HDL is found in A negative blood group (43 mg/dl). *P* value for finding an association between blood group type and all lipid profile parameters was done using single factor ANOVA in MedCalc v18.6. *P* value for all lipid profile parameters was found to be >0.05. Thus, no association is present between blood group type and lipid profile parameters. However, larger sample size and more in-depth analysis of factors affecting lipid profile could give more insight in this research field.

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