Original Article

DISTRIBUTION OF ABO BLOOD GROUPS AND ALLELOMORPHIC GENES IN POPULATION OF KHAMMAM

Ankur[1], J.M.Desai[2], VarshaJadhav[3]

[1]Assistant Professor of Physiology, [2]HOD & Professor of Physiology, [3]HOD & Professor of Pathology, Mamata Medical College, Khammam, 507002. Telangana. India.

ABSTRACT

Background and objective: The study was undertaken with the objective to find out the distribution of ABO blood groups, gene frequency and genotype frequency in population of Khammam.

Materials and Methods: The study group includes a total of 15846 blood donors from Khammam. The study was a retrospective study, all donors were registered in the central blood bank at Mamata Medical College during the period of last five years.

Results: The study showed that O is the most common blood group (43.21%) followed by B (30.50%), and then A at (20.38%) while AB is the least prevalent group at (05.91%). The gene frequencies were calculated by using Fisher's maximum likelihood method modified by Dobson and Ikin, the genotype frequency is calculated by using Hardy–Weinberg principle. The calculated gene frequencies are A 0.140, B 0.202, 00.658; O > B > A.

Conclusion: The study provides information about the distribution of blood group in general population of Khammam and that O is prevailing; gene frequency of O is 0.658. This knowledge may help us to safeguard against the diseases that are likely to influence O gene.

Key words: gene frequencies, general population.

INTRODUCTION

The Austrian pathologist, Karl Landsteiner discovered the ABO blood group system in 1901, which opened the door for performing safe blood transfusions. The Rh system of blood groups was discovered in 1940 by Landsteiner and Wiener. [123]

All human populations share the same blood group systems; although they differ in the frequencies of specific types. The incidence of ABOblood groups varies markedly in different races, ethnic groups and socioeconomic groups in different part of the world and represents heterogeneity (mixing of races). The frequencies of ABO blood groups vary from one population to another and from time to time in the same region. [4]

It has been reported that certain diseases are more common among certain blood groups and it is likely that depending upon the distribution of ABO blood groups, a given population may be more prone to develop a given disease. The studies have reported the link between ABO blood group and duodenal ulcer, tuberculosis, gastric cancer, lung cancer, arterial and venous thrombotic diseases etc.[5-11] My aim is to find out the distribution of ABO blood group, gene frequency and genotype frequency in population of Khammam. And predict the percentage of population likely to be affected by certain common diseases that are related to ABO blood group as investigated by various scientists.

MATERIAL AND METHODS

After obtaining ethical clearance from the human ethical committee of Mamata Medical College Khammam, Telangana; a retrospective study was conducted at Department of Physiology by collecting data from blood bank of Mamata Medical College, Khammam, Telangana. All donors were registered in the central blood bank at Mamata Medical College during the period of last five years (1st January

2009 to 31st December 2013). The information was obtained by going through the records of blood bank, and these records are: Donors records which involve name, age, sex, time, address, ABO phenotype. The study group includes a total of 15846 blood donors from Khammam. From the distribution of ABO blood group, the gene frequencies were calculated byusing Fisher's maximum likelihood method modified by Dobson and Ikin[12], the genotype frequency is calculated by usingHardy–Weinberg principle.

After compiling the results the observed distribution was statistically compared with that of expected ABO frequencies calculated by using formula given by Taylor and Prior[12]and chi-square test was calculated and the significant level was referred.

RESULTS

Phenotype	Number of Donors	Phenotype frequency in percentage	Gene Frequency
O	6847	43.21%	O = 0.658
A	3229	20.38%	A = 0.140
B	4833	30.50%	B = 0.202
AB	937	05.91%	
TOTAL	15846	100	1.000

Table 1:Distribution of the ABO blood group and their gene frequency in Khammam.

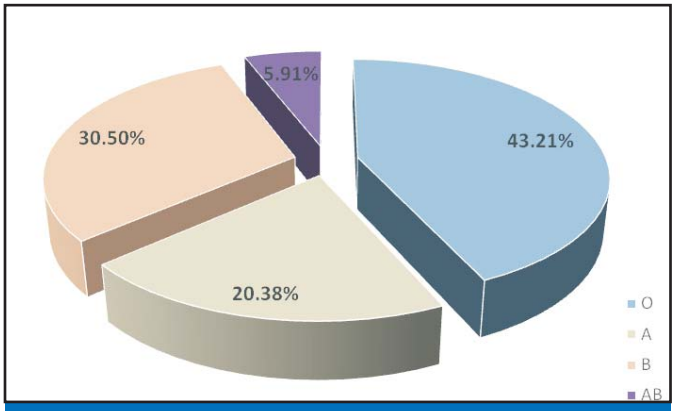
Blood Group	Observed number	Expected number	Genotypes	Genotypic frequency	Percentage frequency
O	43.21	44.17	OO	0.43	43.0
A	20.38	18.79	AO AA	0.18 0.02	18.0 02.0
B	30.50	31.28	BO BB	0.27 0.04	27.0 04.0
AB	05.91	05.68	AB	0.059	05.0
TOTAL	100	100		1.000	100

Table 2:Distribution of phenotypes and allelic frequencies of ABO blood group in Khammam

d.f.= 3

$\chi^2 = 0.08794$

P < 0.995 > 0.99 (the distribution of observed number and expected number does not vary significantly and therefore the observed frequency appears to have normal distribution).



Pie Diagram 1: Distribution of blood group in Khammam

It is evident from Table 1 in population of Khammam blood group O is most prevalent (43.21%); followed by group B (30.50%); group A (20.38%) and group AB (05.91%). Gene frequency is also calculated O= 0.658, A= 0.140, B= 0.202 In other words, O gene is distributed in 65.8% of the population and anything that influences or associated with this gene will influence/associate with 65.8% of population. Similarly, A gene is distributed in 14% of population and influence these individuals and B gene is distributed in 20.2% of the population and influence it. Table 2 shows the distribution of phenotypes and allelic frequencies of ABO blood group, for calculating the genotype frequency we have used the Hardy-Weinberg Theorem. We found out the expected frequency from the observed frequency using the formula given by Taylor and Prior and p value was obtained by chi-square test. Statistically the results is not significant (d.f. = 3 $\chi 2$ = 0.08794 P < 0.995 > 0.99) the distribution of observed number and expected number does not vary significantly and therefore, the observed frequency does not vary much from expected frequency and so ABO distribution in the population of Khammam appears to be normal as observed.

DISCUSSION

The knowledge of distribution of ABO blood group at local and regional levels are helpful in effective management of blood banks and safe blood transfusion services. Knowledge of the distribution of ABO blood group is essential for effective management of blood banks inventory, be it a facility of a smaller local transfusion service or a regional or national transfusion service. It is, therefore imperative to have information on the distribution of these blood groups in any population. [13]

The present study shows the distribution of blood groups in Khammam regionand thatO>B>A>AB. Similar studies show that similar relationship exists in south India and Andhra Pradesh.[14-16] Gene frequency and genotype frequencies were also calculated and we observed that the distribution of O gene is in 65% of the population; in other words, 65% of the population may be influenced by a factor or factors that influencesO gene, it may be beneficial or harmful for example, duodenal ulcer that is associated with blood group O [17]is likely to occur in 65% of the population; similarly pulmonary tuberculosis also. [18]

CONCLUSION

The blood group distribution in general population of Khammam is O>B>A>AB. The study also provides information about the relative distribution of various alleles in the population of Khammam.Our study suggests that the distribution of O blood group is 43.21%and O gene is distributed in 65% of the population. Any factor that is associated with O gene is likely to influence 65% of the population.

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Corresponding author
Dr. ANKUR
M.B.B.S, M.D Physiology
Assistant Professor of Physiology
Mamata Medical College
Khammam, 507002
Telangana
India.
Telephone No. : 00918106983131
E-mail: ankurwadhwa.dr@gmail.com