

RESEARCH REGARDING THE FREQUENCY AND TRANSMISSION OF AB0 BLOOD GROUPS IN A POPULATION OF PUPILS FROM ROMAN, NEAMȚ COUNTY

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Abstract: Part of a larger study regarding the genetic polymorphisms present in the human population of Romania, we have studied the frequency and transmission of AB0 blood groups in Roman, Neamț County. We have investigated a population of school-boys from Roman town, Neamț County. The blood groups frequency were: O = 30%; A = 42%; B = 19%; AB = 9%. These values are in accordance with the values registered for all Romanian population. In Roman town, between 2001-2004, the frequency of blood groups is, also, in accordance with our results. The blood groups O, B and AB are more frequent in males, and A is more frequent in females.

It is, on the other hand, difficult to compare our results with the worldwide situation.

INTRODUCTION

AB0 blood groups are ones of the most studied pure inherited traits. Due to their monogenic determinism, AB0 blood groups are fulfilling all the criteria for the optimal genetic study: high frequency, easy to be determine and analysed statistically (Tudose et al., 2000).

For a correct genetic analysis regarding genes frequency and dynamics in a population, some rules must be followed:

- selection of genitors who has to differ one from the other by one or more constant quantitative traits;
- check out the genetic purity of genitors before their cross;
- analyses of offspring type frequency, which gives information about the differences between genitors traits;
- offspring analyses for each genitors pair, for many generations.

Obviously, it is still typical the question if Mendel's laws, discovered and formulated for pea, are universal. At the beginning of XX-th century, W. Bateson, proved the validity of Mendel's laws also for animals, including human beings. For *Homo sapiens sapiens*, investigations are more difficult comparing to those regarding plants, animals or microorganisms. Difficulties arise from the fact that for human being, because of ethical and moral reasons, it can not be done controlled cross experiments, consanguinisations, offspring is reduced as number for each genitor pear, carrier of any genetic maladies can not be excluded from reproduction.

Because of this difficulties, in human genetics, specific working methods were elaborated for the study of heredity and analyses of genotype (populational studies, mono- and dizygote twins investigations).

Part of a larger study regarding the genetic polymorphisms present in the human population of Romania, we have studied the frequency and transmission of AB0 blood groups in a scholar population from Roman, Neamț County. The motivation of the study resides in the need of a centralised and widespread research covering all Romanian regions. There are also medical and forensic reasons to study thoroughly this subject, such as transfusions, certification of identity, paternity and filiation. The well known correlation between AB0 worldwide distribution in human populations ant the biological history of some infectious diseases will be investigated in a future study of ecogenetics, a major concern of the authors.

From both medical or juristic grounds, knowing the frequency and dynamics of blood groups in a human population is very important. From medical point of view, knowing the blood group is compulsory in blood transfusions, juristic, it can be distinguish filiations aspects (paternity), or the belonging to a family. Because in the last years, for the population of Romania, AB0 system blood groups frequency analyses are missing from scientific publications, we have planed to investigate the situation for the beginning at regional level, followed in the future by the elaboration of a map illustrating the situation for the whole country.

Our researches are directed on:

- processing data for 300 pupils from School Nr.1, Roman, Neamț County
- processing data regarding AB0 blood groups, determined at Blood Transfusion Center, Roman, between 2001-2004.

From the investigated group, we obtained data regarding AB0 system blood groups frequency for scholar population and for the two sexes.

All the results were reported to published papers, and to Blood Transfusion Center Roman statistical data, helping us to formulate conclusions with theoretical and applicative utility.

MATERIAL AND METHODS

The data, regarding blood groups, were obtained from 300 pupils, 164 girls and 136 boys, born between 1989-1992, in matriculated in scholar year 2003-2004 at School Nr.1, Roman, as it follows: 60 fellows in the 5th class, 80 in the 6th class, 91 in the 7th class, 69 in the 8th class. Data were processed based on a filled out printed form, regarding the blood groups of them and of their families members (parents, brothers or sisters, grandparents), were grouped in 4 files, base on year of birth (1989, 1990, 1991, 1992), and than reported to recorded data from Blood Transfusions Center (CTS) Roman, for 2001-2004.

Based on this, it was possible to elaborate 21 pedigrees, using the international symbols.

RESULTS AND DISCUSSIONS

THE FREQUENCY OF AB0 BLOOD GROUP SYSTEM IN HUMAN POPULATIONS AND PARTICULARLY IN ROMANIA

In 1914, Hirzfeld established that blood groups differ from one population to the other. McArthur and Penrose estimated A, B and 0, blood groups frequency at the level of global Earth population, to: 0=62%, A=21,5% and B=16,2%. This estimation is surprising, because regarding dominance-codominance relation, $(L^A=L^B)>1$, the 0 group frequency in human population should be lower.

There is a geographical distribution of blood groups. For example, in the case of B group the higher frequency (25-30%) is in Central Asia (northern part of India), decreasing to 5-10% in France and England, and to almost 0% in Australia and South America. Similar distribution is shown in Africa, where L^B allele frequency is higher in Congo, and decreases in all directions.

L^A allele shows higher frequency in Western Europe, Australia and parts of North America, in Tibet, South Africa, Congo, for the black race from Filipine and for some populations from South part of India.

On the other hand, I allele is more frequent (75%) in natural populations from America (Amerindians), in some regions of Africa, Australia and Middle Orient. In Europe it has a 55-60% frequency. Some Amerindian tribes show a 100% frequency of I allele. In other populations a 49% frequency for I and 51% for L^A , or 87% for I and 13% for L^A

Blood groups frequency in Romania is similar with those of neighbored countries.

In Romania, in 1972, from a total of 10.048.701 determinations, repartitions for AB0 blood groups, was: **0 Group= 32,70%; A Group= 43,15%; B Group= 16,50%; AB Group= 7,65%**. In another statistics, for 14 millions determinations made between 1973-1977, blood groups frequency was: **0 Group= 36%; A Group= 41%; B Group= 16%; AB Group= 7%**. Last data (from 2000) shows the next frequency repartition: **0 Group= 34%; A Group= 41%; B Group= 19%; AB Group= 6%**.

For Neamț County, Roman region, it was noticed the next frequency repartition: **0 Group= 33%; A Group= 43%; B Group= 16%; AB Group= 8%**

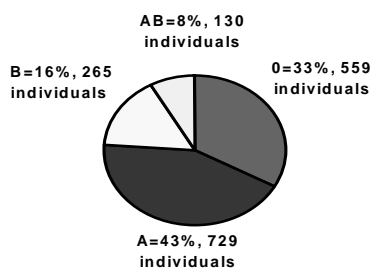


Figure 1. The AB0 blood groups frequency at CTS Roman, in 2001.

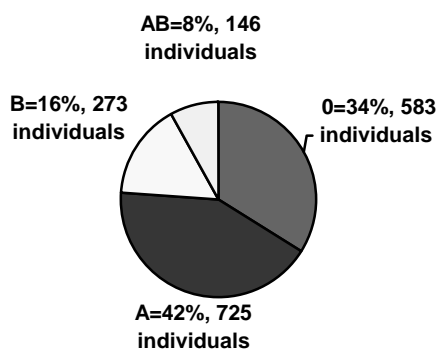


Figure 2. The AB0 blood groups frequency at CTS Roman, in 2002

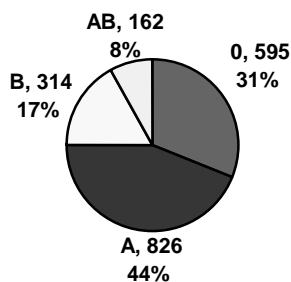


Figure 3. The AB0 blood groups frequency at CTS Roman, in 2003

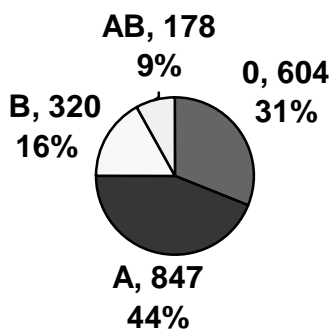


Figure 4. The AB0 blood groups frequency at CTS Roman, in 2004

The arithmetical mean for established AB0 blood system percent, in Roman, for period 2001-2004, is shown in table1.

Comparing this data with AB0 blood system frequency at the level of whole country, established for year 2000 (O – 34%; A – 41%; B – 19% și AB – 6%) it can be concluded that, **for Roman, blood groups frequency are in normal limits, characteristic for Romanian population.**

Table 1. The AB0 blood groups frequency at CTS Roman, during 2001-2004

Blood Group	2001 %	2002 %	2003 %	2004 %	Mean (%)
O	33,21	33,75	31,36	30,99	32,32
A	43,31	41,98	43,54	43,45	43,07

Blood Group	2001 %	2002 %	2003 %	2004 %	Mean (%)
B	15,74	15,80	16,55	16,41	16,12
AB	7,72	8,45	8,53	9,13	8,52

THE FREQUENCY OF AB0 BLOOD GROUP SYSTEM, IN THE INVESTIGATED SCHOLAR POPULATION

From the total of 300 investigated pupils, 89 belonged to O blood group, 125 to A blood group, 57 B group and 29 to AB group. The percentage is shown in figure 5.

From pupils born in 1992, 16 have O blood group, 26 have A group, 14 B group, 4 AB group (figure 6).

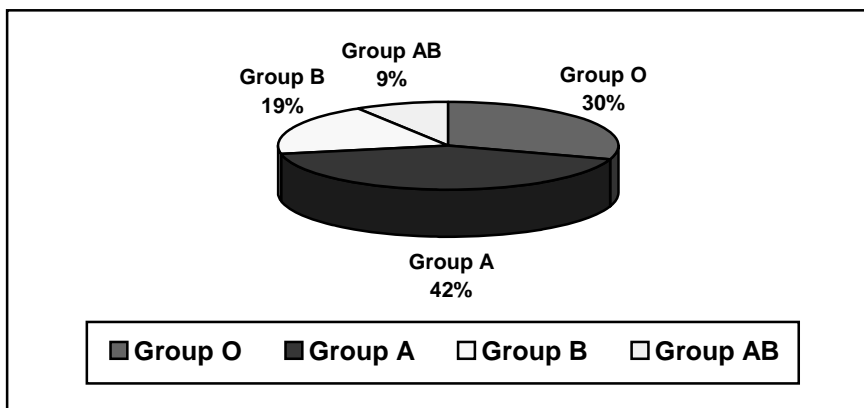


Figure 5: General frequency of AB0 blood groups in the studied group

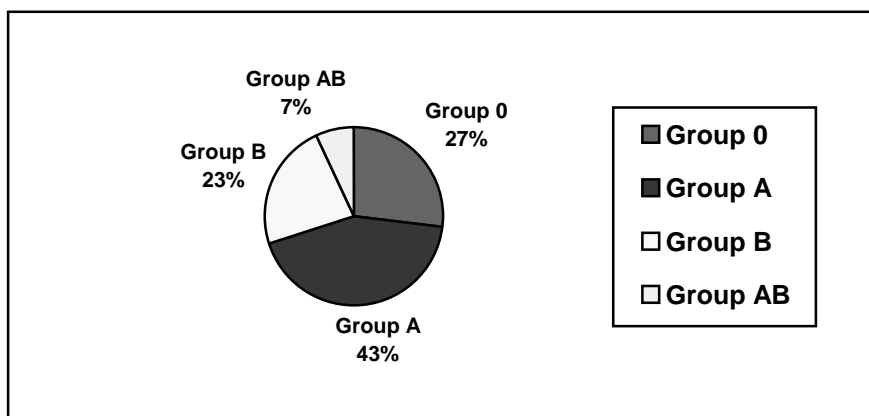


Figure 6: Frequency of AB0 blood groups for the group of pupils born in 1992

Regarding those born in 1991, situation is the next: 25 belong to 0 group, 29 to A group, 14 to B group and 12 to AB group (figure 7).

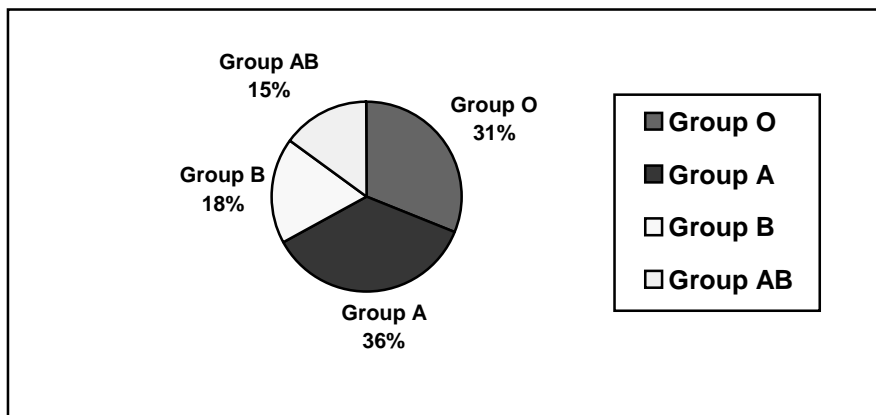


Figure 7: Frequency of AB0 blood groups for the group of pupils born in 1991

For pupils which were born in 1990, the following situation was noticed: 26 belongs to 0 blood group, 39 to A blood group, 18 to B blood group and 8 to AB blood group (figure 8).

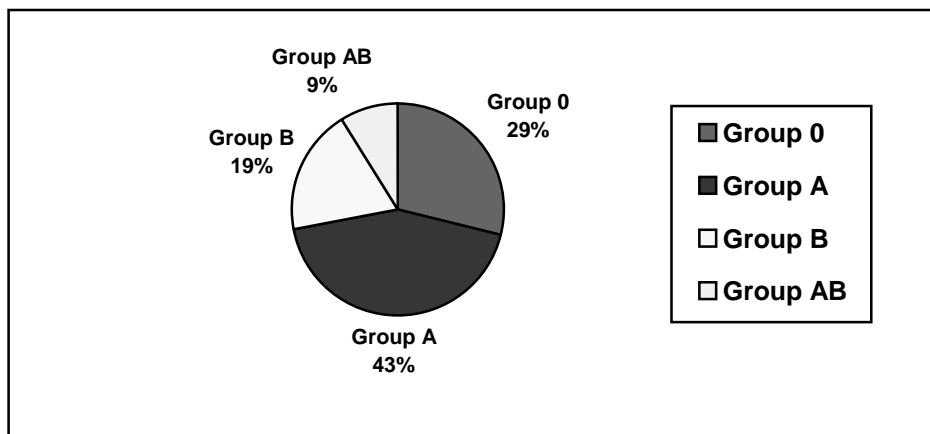


Figure 8: Frequency of AB0 blood groups for the group of pupils born in 1990

Regarding those born in 1989 (Figure 9): 22 pupils had 0 group; 31 A group; 11 B group and 5 AB group.

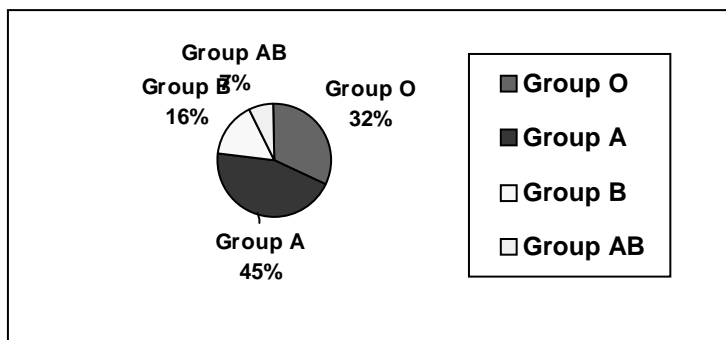


Figure 9: Frequency of AB0 blood groups for the group of pupils born in 1989

BLOOD GROUPS FREQUENCY SEX DISTRIBUTION

To estimate the repartition depending on sex, the previous data were rearranged in table 2.

Table 2: The AB0 blood groups frequency sex distribution in the investigated group

Blood group	O I	A II	B III	AB IV
Boys	42	64	20	10
Girls	47	61	37	19
TOTAL	89	125	57	29

For the investigated population sample, there were 136 boys and 164 girls, belonging to one or other blood group as shown in figure 10.

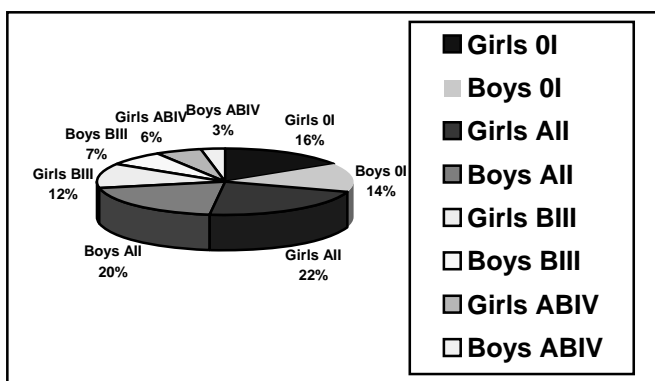


Figure 10. The AB0 blood groups frequency sex distribution in the investigated group

Investigated data shows that females are in all situations predominant. Considering also data related to blood groups of investigated sample ascendance, following results were obtained:

Table 3. Sex distribution of the ascendance of the studied group

BLOOD GROUPS							
0 I		A II		B III		AB IV	
♂	♀	♂	♀	♂	♀	♂	♀
313	302	328	389	171	142	79	62

By comparing results obtained for both sexes, insight each blood group, it can be concluded that **0, B and AB blood group are more frequent for males, and A blood group is better represented for females.**

CONCLUSIONS

The investigated populational sample was composed of 300 children, born between 1989-1992, learning at School Nr.1, Roman, which determined blood group type between 2003-2004. Collecting data was difficult because the number of persons determining blood group type decreased after 1996 (following Law 105/1996, which eliminated sanctions for peoples not having blood groups type written in ID card, and because of high costs of blood tests).

Blood groups frequency in the investigated scholar population, was: 0 Group= 30%; A Group= 42%; B Group= 19%; AB Group= 9%

Blood groups frequency the in investigated populational sample, was similar to values obtained for the population of Romania in the year 2000 (0 = 34% ; A = 41%; B = 19%; AB = 6%).

In accordance with data obtained from C.T.S. Roman, between 2001-2004, ABO system blood groups frequency for Roman, joins the normal parameters characteristic for the Romanian population, which is also in accordance with the general European values.

Regarding blood groups frequency sex distribution, it results that blood groups 0, B and AB are more frequent for males, and A is better represented for females.

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