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RESEARCH ARTICLE

Possible effect of Economic Boom on ABO and Rh Blood Groups in Tabuk, Saudi Arabia.

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Abstract

We studied the ABO and Rh blood groups in 823 Saudis, at King Fahd Hospital, Tabuk. Blood typing was by standard agglutination techniques. Blood group O+ was found in 42.28 % of the subjects, and AB- was the least common blood group (0.12%). The Rh+ percentage was at 90.88 and the Rh- was at 9.11%. This investigation is useful to those dealing with blood banks, pre-natal and post- natal screening centres, population genetics and forensic medicine.

Introduction:

Karl Landsteiner was the first to discover the ABO blood groups in 1901. Later along with AS Weiner, in 1937, he discovered the Rhesus (Rh) factor. The blood groups are relevant even today, though so many years have elapsed since their discovery.

ABO blood groups are classified by the presence of antigens A and B, which are found on the surface of red blood cells. Anti-A and Anti-B antibodies are present in plasma. The four major blood groups are A, B, AB and O. Group A blood has A antigens and B antibody, group B blood has B antigen and A antibody, and group O blood has neither A or B antigens, but has A and B antibodies. Blood group AB has A and B antigens and no corresponding antibodies [1]. The ABO gene determines the blood groups A, B, AB and O. The ABO gene is present on the long arm of chromosome nine (9q34) [2].

The Rhesus (Rh) factor has more than 50 antigens [7]. The D antigen is the most significant of them. Two genes RHD and RHCE control the expression of D antigen [8]. These genes are found on chromosome one (1p34-p36) [9]. Rh D negative (Rh D-) persons do not have the antigen, but it is present in case of the Rh D positive (Rh D+) individuals [10].

The ABO blood groups follow a diverse distribution. The most common blood group is the O blood group in USA [3] and Western Europe [4].It is followed by groups A and B, with blood AB group being the least common. O blood group has been found in 49% Nigerians, followed by A and B in 22% and blood group AB at 7% [5]. In the Orientals, however, incidence of group O is at 36%, group A at 28%, group B at 23%, and group AB at 13% [6].

Distribution of the Rh D negative phenotype is also variable. It is at 5.5% in South India, 5% in Nairobi, 4.8% in Nigeria, 7.3% in Lahore, 7.7% in Rawalpindi [11], [12]. About 95% of African Americans are Rh D positive [5].

Rh D phenotypes can pose a problem during a pregnancy when the mother is Rh negative and the developing foetus is Rh positive [13].The Rh antibodies cross the placental barrier and cause agglutination of the foetal erythrocytes causing haemolytic disease of the new-born (HDN) or erythroblastosis foetalis, and the condition may worsen if mismanaged [14].

The ABO and Rh systems are one of the most worked out genetic markers [15]. It is essential to know ABO blood groups to save lives, and the much-needed phenotypes should be made accessible at the blood banks and hospitals [16].Furthermore, the analysis of blood groups is cost-effective and facilitates easy resolving of disputed paternity and forensic issues.

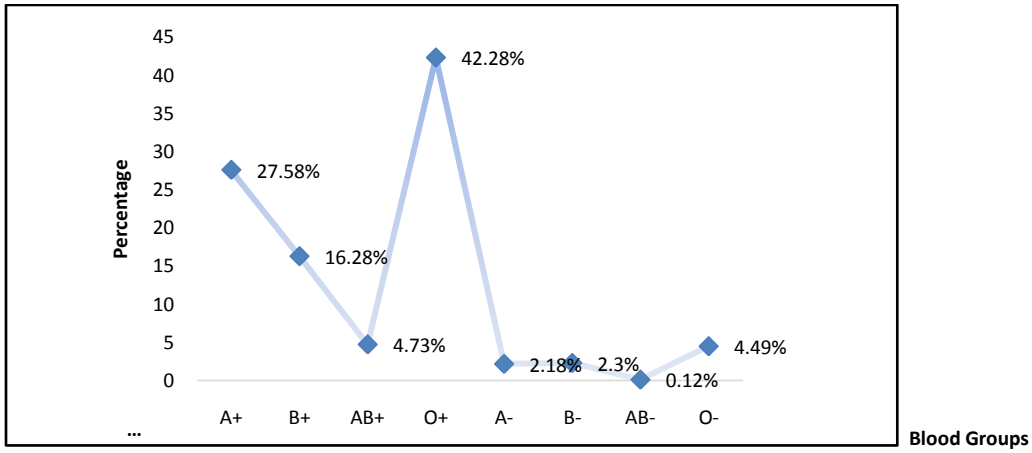
Population studies using genetic markers are limited from Middle Eastern countries, and particularly so from Saudi Arabia [16]. The populations which are bound by strict endogamy interest the geneticists even more.

Material and Methods:

Blood samples were collected as a part of a routine check-up, by venepuncture from a total of 823 Saudi patients at King Fahd Hospital, Tabuk. Both men and women comprised the group. They were evaluated for the ABO and Rh blood groups by standard agglutination techniques by slide and tube methods.

Result and Discussion:

Fig 1:



The incidence and types of phenotypes obtained in the present study are shown in Fig 1 and the two studies, on Tabuk population are compared in Table 1.

Table 1:

Blood Group	A	B	AB	O	Rh +	Rh-
Present study (2015)	245 (29.76%)	153 (18.59%)	40 (4.86%)	385 (46.78%)	748 (90.88%)	75 (9.11%)
Ozsoylu and Aljeaily (1987)	50 (30%)	20 (12%)	8 (5%)	88 (53%)	153 (90%)	13 (10%)

The O+ was the highest prevalent blood group in the subjects with 42.28 %. The negative phenotypes were low in number with blood group AB- being the least common with an incidence of 0.12%. Blood types A +, B+ and AB+ were higher than their negative counterparts. The Rh+ percentage was 90.88 and the Rh- was 9.11%.

Ozsoylu and Aljeaily reported an incidence of O blood group at 53%, AB group at 8%, B group at 12%, and A group at 30% [17]. O (46.78 %) and AB (4.86%) blood groups were found in reduced numbers in our study and the blood group B was higher .However, the value of group A changed little in the present investigation.

We found a slightly lower incidence of Rh negative phenotypes (9.11 %), as compared to Ozsoylu and Aljeaily's study. A frequency of 9% for Rh negative phenotype has been reported from the region [16], which is close to this investigation.

Our investigation and that of Ozsoylu and Aljeaily is more than 2 decades apart. During this period the Kingdom has witnessed tremendous economic growth. The variation in values of the two studies could be attributed to a possible population drift due to the economic boom. Though for varied reasons, migrations over centuries have changed the genetic composition of populations. For instance, Ashkenazi Jews have received not only commercial but also genetic inflows from the Chinese, along the Silk Route [18]. Thus it is our surmise that in view of the rapid economic growth in the Kingdom, and subsequent movement of people for livelihood, there could be changes in genetic pool. Further studies employing more polymorphic markers and on a larger scale, are necessary to substantiate the view.

Blood groups are correlated with disease [19]. The blood group AB has been correlated with predisposition to stroke [20]. As blood group AB is in the least proportion in our study, fewer cases of stroke are expected in the observed population. Group O is associated with a reduced risk of pancreatic cancer [21] [22].It also offers resistance to plasmodium falciparum malaria [19] and cholera [23]. Group O gives a possible selective advantage, and since it is the dominant blood group in the region, it is expected that cases of pancreatic cancer, malaria and cholera would be less in the population under study.

A significant implication of the observed Rh negative phenotypes in our study is a lower incidence of haemolytic disease in new-born in the population. By combining pre and post-partum prophylaxis of Rh negative mothers, the disease can be further decreased by 90% [8].

Typing of blood groups could facilitate establishment of a large donor database at urban and rural levels for future reference. Rare phenotypes stored at the registry could be used in medical emergencies. Furthermore, the blood groups are critical to understanding organ transplantation, blood incompatibility and forensic issues. Since the blood groups predispose to various clinical conditions [24] identifying them and monitoring them at the pre-clinical stage would reduce the challenges of the diseases.

ABO blood groups define the unique genetic identity of a population and are an index of the variations in the gene pool [25]. A positive outcome of such investigations would be to encourage the population geneticists, to study the population using varied genetic polymorphisms. This would aid in understanding the evolutionary processes acting on the population.

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