
ABO blood group prevalence in spontaneously repeated abortion

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ABSTRACT

The relation of ABO blood groups to disease is well established. In 1943, Levine had identified ABO incompatibility as a cause of early abortions and stillbirths. From this time onwards numerous workers produced data suggesting, mainly on the grounds of a deficiency of A children, and an excess of abortions, in the families of O women married to A men, that the A fetuses produced by such mating were especially liable to be aborted. Seventy-nine couples from Pune city (India), suffering from repeated abortion have been investigated for the ABO blood groups system to find out the frequency of ABO blood group phenotypes and ABO incompatibility as a cause of abortion. In husband group maximum number of individuals had blood group A. In wife group, blood group B showed the highest number of individuals. In mixed group 154 patients have been tested and out of these, again blood group A, shows the highest number of individuals. Blood group "A" and "AB" was significantly higher in individual and mixed groups as compared with normal groups in this study. ABO blood group of husband/wife mating was also determined, the analysis of husband/wife joint "ABO" blood group distribution in these couples, shows an excess of joint "A/B" blood groups in couples as compared with expected proportions assuming random mating. This study came to a conclusion that there is a clear increase in number of individuals for blood group A and AB in-patients with repeated abortion, and this factor may need to pay more attention in future investigations. It is possible that incompatibility of the antigens present in red blood cell membrane of husband/wife may play some role in abortion.

Key Words: Blood group, Abortion, Incompatibility.

ÖZET

Yineleyen spontan düşüklerde ABO kan grup prevalansı

ABO kan gruplarının hastalıklarla ilişkisi iyi belirlenmiştir. 1943 yılında Levine ABO uyumsuzluğunun erken düşük ve ölü doğumlara neden olduğunu göstermiştir. Bu tarihten sonra çeşitli araştırmacılar A erkeklerle evlenen O kadınlarda artmış düşük olduğunu ve bunun A çocuklar için özellikle geçerli olduğunu bildirdiler. Hindistan Pune şehrinde yineleyen düşüktan yakınan 79 çift ABO kan grup fenotiplerinin belirlenmesi ve düşük nedeni olarak ABO uyumsuzluğunun saptanabilmesi amacı ile incelendi. Erkeklerin çoğunluğunun A grubu olduğu saptanırken, kadınlarda en sık B grubu gösterildi. Karışık grupta ise 154 kişiye test ve bu grupta da A kan

grubunun en sık olduğu görüldü. Normal grupla karşılaştırıldığında "A" ve "AB" kan grupları karışık ve bireysel grupta belirgin derecede fazla görüldü. Karı-koca ABO grup eşleştirmesi yapıldığında karı/koca bileşik ABO grup dağılımı bileşik "A/B" kan grubu dağılımında artış göstermekte idi. Sonuç olarak yineleyen düşük olan hastalarda kan grubu A ve AB sıklığında artış olup, bu faktör daha sonraki araştırmalarda dikkate alınmalıdır. Karı/koca eritrositlerinin membranlarında yer alan antijenlerdeki uyumsuzluğun yineleyen düşüğe rolü olabilir.

Anahtar Kelimeler: Kan grupları, Düşük, Uyumsuzluk.

INTRODUCTION

In 1943, Levine had identified ABO incompatibility as a cause of early abortions and stillbirths. From this time onwards numerous workers produced data suggesting, mainly on the grounds of a deficiency of A children, and an excess of abortions, in the families of O women married to A men, that the A fetuses produced by such mating were especially liable to be aborted^[1,2].

Although the relation of ABO blood group system to disease is well established, it may not be of great genetic importance, because the disease concerned usually affects people in middle or later life, after the peak reproductive period.

The relation of early abortion and ABO blood type incompatibility has been reported in some studies. The analysis of wife-husband joint ABO blood group distribution in couples with habitual abortions showed an excess of A compared with expected proportions assuming random mating^[3].

Levine and Rosenfield then give a highly critical and detailed analysis and recalculation of all available published data on the ABO groups of parents and offspring. Most of the information on possible loss of children from materno-fetal incompatibility can be derived from the frequencies of A and O children in A/O mating, comparing those mating where the mother is O with those where she is A. The combined data show a significant deficiency of 25% of A children in the incompatible mating. Other mating, involving B, are less conclusive because of small numbers, but the overall conclusion is that 'there is a loss

of between 14% and 32% of all A or B children from mating of an A, B (and presumably AB) father and an O mother, as compared with the reciprocal mating, and that the most likely value for this loss is 25%^[4]. Some authors suggest that ABO-related infertility be due to the action of antibodies, in the secretions of the mother's genital tract, on incompatible spermatozoa. It is difficult to explain the marked discrepancies between the results of the different infertility studies, and there is a need for further data^[4].

The papers cited above show, on the whole, very strong evidence that in mating where the husband has an A antigen which the wife does not possess, there is a marked selection against the birth or survival of A (i.e. heterozygous) offspring. In a study by Nunzio Botiny et al, the possible differential effects of A and B blood group materno-fetal incompatibility on human fertility through a comparative analysis of couples with recurrent spontaneous abortion (RSA) and healthy mothers in two populations (Rome & Sassari) has been reported. A low number of "B" incompatible mother (women) A/infant (husband) B in RSA couples and a high number of "B" incompatible in healthy mothers was observed. The phenomenon is much more evident in women aged 24-28 years, a period of maximum fecundity^[5].

Relationships between maternal-fetal ABO compatibility and both human fertility and fetal growth parameter have been observed^[6,7]. It may be better to investigate the possibly different roles of anti-A and anti-B antibodies in repeated abortion patients and in normal groups, specially because Bakacs

et al., suggest different complement-binding capacities between anti-A and anti-B monoclonal IgM antibodies^[8,9]. It is possible that anti-B immunoglobulins could have, at least in some mother-infant joint types, a specific protective effect against abortion^[10].

MATERIALS and METHODS

ABO Methodology^[11]

The antisera used for blood grouping in this study were provided by monosera. Monosera immunoglobulins are produced from individual cell lines, hence they are identical in their chemical structure and biological activity.

Principle

Human red cells processing A and/or B blood group antigen(s) will be agglutinated by monosera directed towards respective antigen(s) indicating a positive test result. Absence of agglutination of red cells with monosera indicates a negative result and therefore absence of corresponding antigen(s). Absence of both A and B blood group antigens is indicative of blood group O. The blood sample should be tested immediately after collection, in case of delay in testing, the sample may be stored at 2°C to 8°C up to two days.

RESULTS

In the present study 79 couples (4 husband was absent) have been investigated for the ABO blood group incompatibility to see if the frequency of specific ABO blood types in these patients have any effect in their repeated

abortion. Two mode of analysis has been used, one is the individual ABO blood group to evaluate the frequency of each blood groups in each category (male, female and mix), and the second one is the joint ABO blood group mating between husband and wife.

As it is shown in Table 1, these patients have been divided into two groups of husband and wife for individual ABO blood group analysis. Out of 75 husbands 27 individuals (36%) had blood group A which is the highest no of individuals; the next are the individuals of O blood group with 23 individuals (30.7%). Seventeen individuals also had blood group B (22.7%) and finally 8 individuals had blood group AB, which account for (10.7%).

In wife group the highest blood group belong to B with 27 patient (39.2%). The second highest blood group is O with 30.38 percent (24 individuals) and next is blood group A with 21 individual (26.6), and the last one is the AB with 7 individuals (8.9%).

In the mixed group (husband + wife) 48 individuals (31.2%) had blood group A. Forty-seven individuals (30.5%) had blood group O, and 44 individuals (28.6%) had blood group B.

Table 2 shows ABO blood group of husband/wife mating. In this type of analysis we have the highest couples of A/B mating with 16 individuals (21.3%). A/O joint blood group was in second rank with 12 individuals (16%). The other more important husband/wife joint ABO blood group in this study was O/O with 11 couples (14.7%),

Table 1. ABO blood group frequency in repeated abortion cases

Blood group	Husband	Percent	Wife	Percent	Mixed	Percent
A	27	36.0	21	26.6	48	31.2
B	17	22.7	27	34.2	44	28.6
AB	8	10.7	7	8.9	15	9.7
O	23	30.7	24	30.4	47	30.5
Total	75	100	79	100	154	100

Table 2. ABO joint blood group frequency according to husband/wife mating

Sr. number	Joint blood group	No. of couples	Percentage
1	A/B	16	21.3
2	A/O	12	16.0
3	O/O	11	14.7
4	B/O	11	14.7
5	B/AB	9	12.0
6	A/A	8	10.7
7	B/B	4	5.3
8	A/AB	4	5.3
9	AB/O		0
10	AB/AB	0	0
Total		75	100

B/O with 11 couples (14.7%). B/AB with 9 couples (12%), and A/A mating with 8 couples (10.7%). The remaining B/B, A/AB and AB/O accounts for few couples and AB/AB blood group mating was absent in these patients.

The blood group of the patients in this study (RA) has been compared with control group. Three-hundred-twenty patients from different wards attending B.J. Medical College blood bank for blood grouping have been compared with the patients of this study (Table 3).

Table 3 shows the comparison of a normal group with our RA patients. In this control group of 320 individuals, the blood group

O shows the maximum number of individuals with 37.2%. B type individuals stand second with 34.1% and A type account for 24.4 next to these two.

A comparative study of blood group of different normal group of Maharashtra (India), with RA patient of this study also reveals B and O blood groups to be dominated in other studies (Table 4). Blood group B shows highest number of individuals in six different studies in Maharashtra including Kolaba district, Bombay City, Dhulia district, Thana district, Nagpur district and Nashik district^[12]. In these districts blood group B was dominated by A and O with 41.3%, 36.3%, 38.1%, 39.0%, 52.9% and 31.5% respectively (Table 4). It is also shown that Nagpur dist-

Table 3. Comparison of ABO blood group frequency between RA and normal cases

Normal group (mixed)				RA cases (mixed)			
Sr. No.	No. of cases	Blood group	Percentage	Sr. No.	No. of cases	Blood group	Percentage
1	119	O	37.2	1	48	O	31.2
2	78	A	24.4	2	47	A	30.5
3	109	B	34.1	3	44	B	28.6
4	14	AB	4.4	4	15	AB	9.7
Total	320		100	Total	154		100

Table 4. ABO blood group frequency of some population in maharashtra

Sr. no.	Group	Place	Number	Blood group "A"	Percentage	Blood group "B"	Percentage	Blood group "AB"	Percentage	Blood group "O"	Percentage
1	BHIL	Dhulia Dt.	119	34	28.6	35	29.4	8	6.7	42	35.3
2	PAWARA	"	42	10	23.8	16	38.1	5	11.9	11	26.2
3	KATKARI	Kulaba Dt.	109	23	21.1	45	41.3	13	11.9	28	25.7
4	RAJGOND	Nagpur Dt.	51	7	13.7	27	52.9	3	5.9	14	27.5
5	TALAVIA	Bombay	212	47	22.2	77	36.3	18	8.5	70	33.0
6	KOLI	Tana & Kolaba	309	74	24.0	105	34.0	22	7.1	108	35.0
7	BHIL	Dhulia	110	21	19.1	32	29.1	7	6.4	50	45.5
8	KORKU	Amravati	137	44	32.1	38	27.7	24	17.5	31	22.6
9	KOKNA	Nasik & Tana	204	73	36.1	39	19.1	23	11.3	69	33.8
10	PAWARA	Dhulia	109	31	28.4	32	39.4	5	4.6	41	37.6
11	MAHADEB KOLI	Nasik	127	39	30.7	40	31.5	13	10.2	35	27.6
12	WORLI	Tana	123	19	15.5	48	39.0	9	7.3	47	38.2
13	BHIL	Ahmadnagar	112	34	30.4	31	27.7	7	6.3	40	35.7

riect have highest percentage of blood group B among other cities of Maharashtra with 52.9% followed by Kolaba district with 41.38%^[13].

Blood group O was dominated in another five studies carried out in different normal group. In these studies which was carried out in three different Dhulia districts, Ahmednagar district, and Kolaba and Thana district, maximum number of individuals was found to be of blood group O type^[14]. In Dhulia (BHIL) district it was 45.5% followed by another group from Dhulia (PAWARA) with 37.6%, Ahmednagar with 35.7%, Dhulia (BHIL) with 35.3% and Kolaba and Thana with 35.0%. Out of these five studies with maximum number of O blood group type, three population are from Dhulia.

Blood group A was maximum in Amravati (Korku) with 32.1% followed by Nasik and Thana with 36.1%^[14]. Only these two studies show that the blood group A has the maximum frequency among different population of Maharashtra. In the remaining 11 different studies blood group "A" shows the minimum frequency.

DISCUSSIONS

ABO blood group system is one of the most commonly used factor in different investigation especially in human population genetics for its important role and easy availability as compared with other tissues of the human body.

Except blood group AB that is very low in both males and females and mixed group, the remaining A, B and O blood group is almost equal in mixed group (Table 1). This distribution rarely seen in other non RA population. An increase of "A" blood type individuals can be seen in most RA populations and not in general population as compare to other population studies in this area Table 4.

In couples with repeated spontaneous abortion (RSA), it has recently been shown that there are a high number of A incompa-

tible couples (i.e., husband possessing A specificity of ABO system and mother possessing anti-A immunoglobulin types and a low number of B incompatible couples with respect to reciprocal mating types^[3,5]. Most of the differences between A and B incompatibility observed in RSA couples are due to a decreased proportion of couples characterized as wife A/husband B (B incompatible) with respect to reciprocal mating type, which would be wife B/husband A (A incompatible)^[5].

Our finding shows that blood group "A" are the highest blood group in husbands (A/incompatible) group. In females the highest blood group was B and again in mixed group type A shows the highest number of individuals. Therefore, a clear increase in A type in husband and mixed group can lead us to consider the difference and this can result in an increase in incompatibility between husband/wife and may affect the fetus. Unfortunately we have not studied the abortuouse or children of these patients to find out the blood group incompatibility in them, but other studies have reported an increase of A and B incompatibility when compare the mother child joint ABO type^[5]. Normally no other husband/wife joined studies show an increase proportion of phenotypes in random mating as we fund here in RA individuals. There is a high increase of A and AB blood group individuals in repeated abortion patients as compare to normal groups.

A comparative study of blood group of different normal populations of Maharashtra with RA patient's of this study conforms that the blood group A is significantly increased in-patients of repeated abortion.

The joint ABO bloods group of husband/wife mating in RA patient of this study also shows an increase toward A/B and A/O individuals. In this type of analysis, most of the couples had A/B and A/O (husband/wife) joint blood group mating. In both of these joint blood groups, husbands have A phenotype and therefore have an antigens which in not present in wife's RBCs. In another

study by Lucarini and Nicotra in 1995, the analysis of husband/wife joint ABO blood group distribution in couples with habitual abortion, an excess of A compared with expected proportions assuming random mating have been reported which agree with our analysis^[3].

Blood group substances could play an important role in the organization of cell membrane structure and expression of membrane protein^[15]. Genetic polymorphism of blood groups might influence the function of proteins involved in substrate transport and signal transduction^[16]. On the other hand, maternal-fetal differences in membrane transport and signal transduction of growth factors could affect intrauterine development and survival^[17].

Thus, maternal-fetal differences in ABO membrane protein structure, which is originated from wife/husband differences, could be involved in the maternal-fetal biological competition by mechanisms different than those implicated in classical immunological phenomena. The long evolutionary history of ABO and H structures, present in the cell membrane long before the appearance of immunological phenomena, argues in favor of this possibility^[18].

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