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ABO Blood Groups Compatibility and Incompatibility among Basrah Families

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Abstract: In the present study, 277 couples were randomly collected from Basra population who have at least two live births and below 60 years of age to study of ABO blood groups compatibility and incompatibility among Basra families. It has been shown that the incidence of compatible matings (51.625%) higher than incompatible matings (48.375%). The study has been revealed the spontaneous abortion and stillbirth were slightly higher in couples with incompatible (11.889%)(2.797%) as a compared with compatible couples (10.778%)(2.333). While the incidence of living births higher in compatible matings (86.889%) than incompatible matings (85.315%). study came to a conclusion that there is an increase in the number of spontaneous abortions and stillbirth among B wife and AB husband couples and followed by O wife and AB husband incompatible couples (35.294),(20.833%) respectively.

Keywords: ABO Blood Group, Compatibility, Incompatibility, Spontaneous Abortions, Stillbirth

Introduction

Two hundred fifty blood group antigens have been reported (Gareer *et al.* ,2008). which have been classified into 29 blood group (Mehta,2009; Ganitha et al.,2012).

Landsteiner was the first scientist find the ABO blood group system. The ABO and Rh are recognized as the major and clinically significant blood group antigens (Gareer et al. ,2008). ABO blood group antigens are one of the most important issues in transfusion to evaluate the adaptability of donor blood cells with bone marrow transplantations, and lifespan of the hemocytes (Hosoi,2008).The ABO blood groups can be divided into 4 types according to antigen–antibody reactions: A,B,AB and O, determined by molecules (proteins with polysaccharides attached on the surface of human red blood cell membranes (Cummings , 1997). ABO blood types are controlled by a single gene I with three alleles I^A, I^B and i to form 3 phenotypes and six genotypes. The blood type A have antigen A on the surface of their red blood cells. Blood type B have antigen B. Blood type AB have both antigens A and B whereas blood type O have neither antigens (Lewis,2007).

In ABO compatible mating, blood groups of both parents are identical or in which the mother carries the dominant blood group. but In the case of incompatible mating, the mother is lacking the dominant blood factor which presents in the child (Bottin et al., 2001).

The effects of ABO antigenic incompatibility have been of much attention to geneticists for its role in the sterility, fertility , risk of fetal and neonatal deaths also in the maintaining the blood group polymorphism. This type of incompatibility caused ABO hemolytic disease of the newborn (ABO HDN) (Stoll and Kleigman ,2007) when maternal IgG antibodies with specificity for the ABO blood group system pass through the placenta to fetal circulation where they can cause hemolysis of fetal RBCs which can lead to anemia and jaundice (Mercier *et al.* ,2008). Another study has been concluded that blood type has no effect on the severity of the hemolytic jaundice in ABO incompatibility (Akgül *et al.*, 2013).

Several studies have been carried out to evaluate the association of ABO incompatibility in couples with infertility (Behrman,1960 ; Hoff and Bixler, 1986; Dibby;2015).Other studies showed that there is no association between ABO blood groups with male infertility (Prasad *et al.*, (2015) .

Hiraizumi *et al*., (1970), Takano and Miller,(1972) and Ghasemi *et al*., (2011) showed ABO incompatibility also caused recurrent abortions and hemolytic disease.

Objectives

The main aims of the present study are:

1- To determine the incidence of ABO compatibility and incompatibility couples among Basrah population.

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2- To study the relationship between ABO incompatibility and spontaneous abortions and stillbirth.

Materials and Methods:

A total number of 277 couples who have at least 2 live births and below 60 years of age were selected randomly from Basra population families in the southern parts of Iraq. The data about reproductive life including a number of living birth and spontaneous abortions (early neonatal, neonatal death) and stillbirth was recorded.

The blood groups of parents were determined by slide agglutination test using the anti- A, anti-B and anti-Rh sera (Lorne Laboratories Limited, England)) according to the manufacturer's instructions. The ABO blood grouping procedure is based on the principle of agglutination or clumping (Nneli *et al*,2004 ; Harmening and Firestone,2005). The patient's blood is reacted with anti-A, anti-B, and anti-Rh antibodies separately and the agglutination reaction can be visible in a naked eye to determine the blood group type.

The compatible and incompatible couples on the bases of their blood groups were summarized in the table (1).The incompatibility of the couples was determined when wife and husband have 2 different blood groups , or when a mother has blood group O and her husband A,B and AB (Solish and Gershowitz ,1969).

To eliminate the possible selection effect of Rh incompatibility .This was made possible by eliminating Rh incompatible couple from the couples sampled for investigation. Data were analyzed with SPSS (15) version using Independent t-test. The results were considered significant when P-value was <0.05.

Table 1 :ABO-compatible and incompatible mating types.

Compatible matings			Incompatible matings		
Male		Female	Male		Female
A	×	A	A	×	B
A	×	AB	A	×	O
B	×	B	B	×	A
B	×	AB	B	×	O
AB	×	AB	AB	×	A
O	×	A	AB	×	B
O	×	B	AB	×	O
O	×	AB			
O	×	O			

Results and Discussion:

Among Basrah families the incidence of compatible and incompatible matings was observed in the table (2) and figure (1),the percentage of the compatible matings was higher (51.625%) than incompatible matings (48.375%).In the present study, no significant differences (independent t-test) are seen between compatible and incompatible marriages (table 2). This finding disagrees with Kneib *et al.* , (2002), they find the incompatible marriage was 20-25%.This variable percentage may be due to geographical regions and sample size of the study group (Sandra et al.,2008).

Table 2: Compatible and incompatible couples among Basrah population

Type of mating	No. of couples
Compatible	143 (51.625 %)
Incompatible	134 (48.375 %)
Total	277
Independent T-test t	0.424
sig	0.678 ns

ns: non-significant

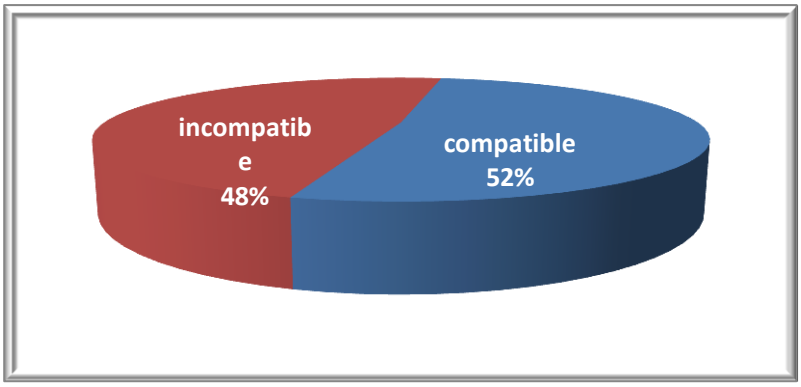

Figure 1: Compatible and incompatible couples among Basra population

Table (3) showed the fetal wastage in ABO-compatible and incompatible matings. In the case of incompatible matings, the percentage of spontaneous abortion (35.294%) and stillbirth (11.765%) higher in case AB husband and B wife, also high spontaneous abortion (20.833%) occurred in the O wife and AB husband. Generally, the transfusion of embryo red blood cells to the mother circulation could stimulate the antibodies against embryo cells and could cause mild to severe hemolytic anemia in the fetus and abortion (Madlon-kay,1993). In the first case, the fetus contains B antigen inherited from a father that is not present in the mother, in the other case the mother carry naturally occurring antibodies in her serum,anti-A or anti-B. Leak through the placental membrane of an O type mothers may quickly be destroyed by anti-A or anti-B antibodies (Pandey et al., 1997). The findings of maternal blood group O also shows a significant relationship with fetal losses are in line with Soni and Mukherjee,(2009) and Abdollahi et al.,(2013) on the subject of our study and confirm them. The incidence of live births (90.805%) was increased among couple with O wife and A husband.

In case of ABO-compatible matings, the percentage of the spontaneous abortion was highest in the couples with O husband and A wife mating (25.942%) , and with O husband and B wife (22.675%) but the percentage of live birth was higher in the couples with AB husband and A, AB wives (100%),(93.75%) respectively (Table 3) .

Table 3**:** Fetal wastage in ABO blood group compatible and Incompatible matings.

Compatible				
Mating type Male Female	**Spontaneous Abortion**	**Stillbirth**	**Living birth**	**Total pregnancies**
A × A	**8 (5.674%)**	**3(2.128%)**	**130(92.199%)**	**141**
A × AB	**-**	**-**	**3(100%)**	**3**
B × B	**6(10.909%)**	**-**	**49(89.09%)**	**55**
B × AB	**1(20.0%)**	**-**	**4(80%)**	**5**
AB × AB	**1(6.25%)**	**-**	**15(93.75%)**	**16**
O × A	**22(25.942%)**	**1(0.725%)**	**115(83.333%)**	**138**
O × B	**23(22.675%)**	**1(1.266%)**	**173(87.817%)**	**197**
O × AB	**4(9.302%)**	**-**	**39(90.698%)**	**43**
O × O	**32(10.596)**	**16(5.298%)**	**254(84.106%)**	**302**
Total	**97**	**21**	**782**	**900**
Incompatible				
A × B	**17(17.347%)**	**1(1.02%)**	**80(81.633%)**	**98**
A × O	**11(6.321%)**	**5(5.434%)**	**158(90.805%)**	**174**
B × A	**8(8.696%)**	**2(2.174%)**	**82(89.130%)**	**92**
B × O	**12(10.084%)**	**2(1.681%)**	**105(88.235%)**	**119**
AB × A	**3(9.677%)**	**2(6.452%)**	**26(83.871%)**	**31**
AB × B	**12(35.294)**	**4(11.765%)**	**18(52.941%)**	**34**
AB × O	**5(20.833%)**	**-**	**19(79.167%)**	**24**
Total	**68**	**16**	**488**	**572**

Table (4) and figure (2) were revealed that the incidence of spontaneous abortion and stillbirth higher (11.889%),(2.797%) in incompatible matings than compatible matings (10.778%) (2.333%).Whereas the incidence of living birth increase in compatible matings (86.889%) as a compared to incompatible matings (85.315%). The current study does not show any statistical significance (independent t-test) differences between ABO-compatible and incompatible matings with regard to spontaneous abortion, stillbirth and living births.

The current study agreement with previous studies that carried by Berberovic et al. ,(2004) ;Mohanty and Das ,(2010) ; Bandyopadhyay et al. (2011) and Nazarabadi, et al. (2012), who they referred to the incidence of abortion, stillbirth and postnatal mortality are higher among incompatible couples than compatible couples without revealing significant statistical difference .

Table 4: Fertility performance according to ABO blood group and incompatibility among Basra families.

Mating	Spontaneous Abortions	Stillbirths	Living birth	Total pregnancies
Compatible	**97 (10.778%)**	**21 (2.333%)**	**782(86.889%)**	**900**
Incompatible	**68 (11.889%)**	**16(2.797%)**	**488(85.315%)**	**572**
Total	**165(11.209%)**	**37(2.514%)**	**1270(86.277%)**	**1472**
Independent T-test t sig	**0.224 0.824 ^{ns}**	**0.024 0.982^{ns}**	**0.459 0.653^{ns}**	

ns: non-significant

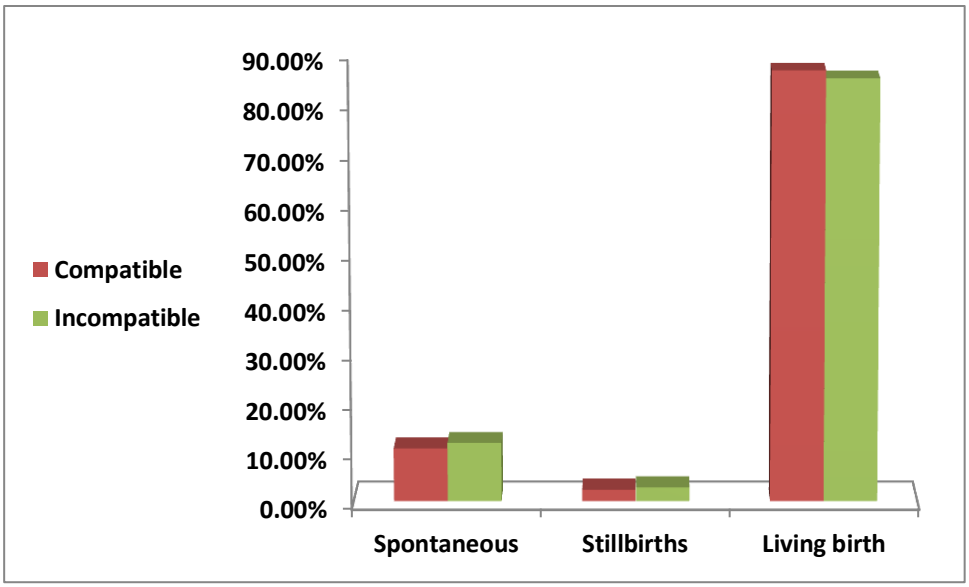

Figure 2: Fertility performance according to ABO blood group compatibility and incompatibility among Basra families.

Conclusions

From the results of the present study, the following conclusions could be considered:

1- The incidence of compatible matings higher than in incompatible matings.
2- The percentage of spontaneous abortion and stillbirth higher in both couples AB husband and B wife, O wife and AB husband.
3- The percentage of live birth was higher in the couples with AB husband and A , AB wives among compatible matings, but it was increased among couple with O wife and A husband in incompatible mating.
4- The incidence of spontaneous abortion and stillbirth higher in incompatible matings than compatible matings .
5- The incidence of living births slightly increase in compatible matings as a compared to incompatible matings .

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