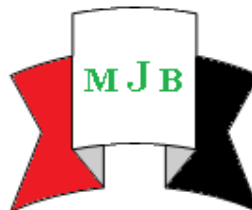


Blood Group and Infertility Relationship

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Abstract

The study carried out on 510 females with age ranges 20- 35 years from those attending the obstetrics & gynecology outpatient department in gynecology & pediatric hospital in Al-Diwaniya city and some private clinic , the study achieved during the period from march 2013 to July 2014, including 245 fertile & 265 infertile females. Determination of ABO blood group using antisera was done for each female, then measurement of FSH level was done for infertile females, it was found that blood group O is more predominant in infertile females, also FSH level is significantly higher among those females.

Keywords: blood groups, ABO, FSH, infertility, Women.

الخلاصة

اجريت الدراسة على ٥١٠ امرأة تتراوح أعمارهن بين ٢٠-٣٥ سنة من الوافدات للعيادة الاستشارية للنسائية والتوليد في مستشفى الولادة والاطفال في مدينة الديوانية وبعض العيادات الخاصة. اجريت الدراسة خلال الفترة من اذار ٢٠١٣ لغاية تموز ٢٠١٤, اشتملت ٢٤٥ امرأة خصبة و ٢٦٥ امرأة عقيمة, تم تحديد فصيلة الدم لكل امرأة ثم قياس مستوى الهرمون المحفز للأوكياس البويضية للنساء العقيمات. لقد وجد ان فصيلة دم (و) هي السائدة بين النساء العقيمات كما ان مستوى الهرمون المحفز للأوكياس البويضية كان اعلى معنويا عند النساء العقيمات ذوات الفصيلة.

Introduction

The ABO and Rh are recognized as the major and clinically significant blood group antigens [1]. Rhesus blood group system was the 4th system discovered and yet it is 2nd most important blood group from the point of view of transfusion [2]. Karl Landsteiner was the first person who put forward the ABO blood group system in 1900 [3, 4]. After 40 years, Landsteiner and Wiener discovered that blood group antigens could be recognized with specific anti-sera and a vast number of antigens have been detected on human blood cells, of which about 10–15% from well-defined systems and only 1–2% play a significant role in blood transfusion. These blood group antigens are divided into many blood group systems. Each of this system

is inherited quite independently from all other system [2, 5, 6]. Human blood antigen may be erythrocytic related, leukocytic related and platelet related [7].

Blood group antigens are not only important in relation to blood transfusion and organ transplantation but also have been utilized in genetic research, anthropology and tracing ancestral relation of humans [8].

The factors responsible for the maintenance of ABO polymorphism in man have been the objective of intensive but inconclusive investigation. Three principle but not mutually exclusive mechanisms can be visualized, namely differential mortality of the ABO genotypes, distortion of the proportion of ABO blood groups, as from meiotic drive & differential fertility of ABO

genotypes [9]. Hirszfeld and Zborowski called attention to the possibility of a serological incompatibility of the gamete as a cause of infertility later studies of Hirszfeld (1934, 1938) failed to support this hypothesis, later several reports have claimed detection of an association between ABO blood group of the parents& the mean number of children produced in each family [9].

A woman blood group may yield clue to her fertility [10]. a result of new study done on group of women in their 30s who sought medical fertility help, that those women with blood type O were more likely than woman with other types to have diminished ovarian reserve (DOR); meaning that their ovaries had few eggs or had eggs unlikely to meet success during *in vitro* fertilization procedures [11].

The concept of ovarian reserve reflects the quantity and possibly the quality of residual oocytes available for procreation [11]. While numerous surrogate markers are recognized to reflect ovarian reserve, female age remains the strongest predictor of reproductive success in couples undergoing fertility treatment [12].

Despite accruing evidence identifying anti-Müllerian hormone and antral follicle count as sensitive prognostic markers of ovarian reserve, early follicular phase serum level of FSH appears to be the most commonly utilized parameter for assessment of ovarian reserve in clinical practice[13]. A serum FSH level >10 mIU/ml is a commonly utilized threshold to identify women at risk for suboptimal quantitative response to ovarian stimulation and poor reproductive

success, an entity alluded to as diminished ovarian reserve (DOR) [14]. The objective of this study was to assess the relationship between blood group & infertility.

Materials and Methods

The study carried out on 510 females from those who are attending the obstetrics& gynecology outpatient department in gynecology & pediatric hospital in Al-Diwaniya city and some private clinic during the period from march 2013 to July 2014, the age of females ranges from 20- 35 years , including 245 fertile female and 265 infertile females (with history of infertility for at least one year), the study include those female with a unknown cause of infertility and exclude the male cause of infertility and those with PCODs.

Careful history was obtained from all females including age, date of marriage, date of getting 1st pregnancy (regarding the fertile female), and regularity of menstrual period. The females classified into fertile group & non fertile female group.

Determination of ABO blood group using antisera was done for each female , then measurement of FSH level was done for infertile females.

Results

The data of 510 females were collected and analyzed statistically by using (chi square & SPSS). Determination of blood group was done for each fertile females and non-fertile females, the corresponding number and percentage for each blood group was taken.

Table (1): Number of fertile female and non fertile female with their corresponding blood groups.

Blood group	Fertile females		Non fertile females	
	No.	%	No.	%
A	87	35.5	60	22.6

B	102	41.6	73	27.5
O	45	18.3	126	47.5
AB	11	4.4	6	2.2
Total	245		265	

Table (2): Comparison of blood group B expression in fertile & non-fertile females.

Blood group	Fertile female		Non fertile female		Total	
	N	(%)	N	(%)	N	(%)
B	102	41.63	73	27.55	175	34.3
others	143	58.37	192	72.43	335	65.68
Total	245		265		510	

$X_2 = 11.0106$ Df = 1 p.value = 0.001 significant

Table (3): Comparison of blood group O expression in fertile & non-fertile females.

Blood group	Fertile female		Non fertile female		Total	
	N	(%)	N	(%)	N	(%)
O	45	18.37	125	48.83	170	33.33
others	200	81.63	140	54.69	340	66.67
Total	245		265		510	

$X_2 = 47.521$ Df = 1 p.value < 0.001 significant

Table (4): Number of non-fertile female with FSH < 10 mIU/ml and ≥ 10 mIU/ml with their corresponding blood groups

Blood group	FSH < 10 mIU/ml No. (%)	FSH ≥ 10 mIU/ml No. (%)	Total
A	45(75%)	15(25%)	60
B	62(84.9%)	11(15%)	73
O	52(41%)	74(58%)	126
AB	5(83.3%)	1(16.6%)	6
Total	164	101	265

$X_2 = 14.317$ Df = 3

P value = 0.003 More than 20% of cells have expected counts of less than 5

Discussion

The present study shows that blood group B is more predominant among the fertile female (41.6%), while blood group O is the predominant blood group among non-fertile female (47.5%) as shown in table (1) & both are statistically significant (table 2, 3), this result is agreed with Nejat *et al* [16] & Pal *et al*. who hypothesized that the same molecular machinery that determine blood type could affect ovarian cells, red blood cells have an identifier molecule that sticks out of the cell surface like

flagpole, people with blood group A, AB, B have enzyme that modify the end of the flagpole, a process similar to raising a flag on the pole. in blood type O no flag is raised. it's possible that some of the process that raises the flag in blood type A, B & AB is missing in type O also performs some unknown function in ovarian cell [16].

The ABO gene locus has three main allelic forms: A, B and O. The H antigen is an essential precursor to the ABO blood group antigens. The gene products of the A and B alleles are

glycosyltransferases that catalyze the transfer of carbohydrates to the H antigen, forming the A and B antigens, respectively [17].

The A & B allele codes for a glycosyltransferase (A, & B transferase) that catalyzes the transfer of N-acetylgalactosamine to the H antigen, producing the A& B antigen. The O allele has a single base deletion (258-guanine) in the coding region close to the N terminus of the protein. The deletion shifts the reading frame, resulting in translation of an entirely different protein. The product of the O allele is an enzymatically inactive protein leaving the H antigen unchanged on the red blood cells of those with blood type O [17].

Though traditionally considered red blood cell antigens, the A and B antigens can be found on the cell membranes of a variety of cell types, including epithelial cells. It is unknown whether the H antigen is present in ovarian cells. Considering the protective effect blood group A transferase appears to exhibit against diminished ovarian reserve (DOR) [18]. Of interest is a recent report relating blood group antigens and ovarian hyperstimulation syndrome (OHSS); the authors observed that (OHSS) was more likely during the course of ovarian stimulation in infertile women with blood type A compared to those with blood type O. [19]. Bellver *et al.* however, failed to observe a similar relationship between blood type and likelihood of OHSS in their series [20].

Another possible explanation for the observed relationship between blood type and ovarian reserve may include genetic inheritance. Specific genes (known or predicted from the genome sequence) relevant to ovarian reserve may be linked with the ABO gene, which is located on chromosome 9 [21]. Other investigators like Hogben, Allan, Bryce *et al*, Kirk *et al.* didn't found such association between blood group & infertility [9]. Although decreased reproductive success in women exhibiting ABO incompatibility

with their male partners has been reported [13].

The present study shows that among infertile females, those with blood group O showing elevated FSH level as compared with other group (table 4) this result is agreed with Nejat *et al.* [22] & Pal *et al.* [16] who reported that women with blood group O were twice as likely as those with blood type A and AB to have FSH levels high enough to indicate they had diminished ovarian reserve.

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