

# **Study of possible association between ABO, Rhesus blood groups & Mental retardation**

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**Running title:**

Blood groups association with Mental retardation.

**Keywords:** Intellectual disorder, Blood genetics, Birth order, Consanguinity

## **Introduction :**

Currently 30 blood group systems have been discovered [Daniels et al.,2009]. ABO blood group system was first to be recognized by Landsteiner in 1901 and remains the most important [Garraty et al., 2000]. In the ABO blood group, individuals are divided into four major blood groups, A, B, AB and O, according to the presence of the antigens [Eastlund, 1998].

The Rh blood group system was the fourth system to be discovered by Levine and Stetson in 1939. People are positive if they have a certain Rh antigen (the D antigen) on the surface of their erythrocytes, and people are Rh – negative if they do not have this Rh antigen [Avent, 1999].

The study of blood groups is very important as it plays an important role in genetics, blood transfusion, forensic pathology and may have some association with diseases like duodenal ulcer [Ziegler et al., 2004], diabetes mellitus [Akhtar et al., 2003], urinary tract infection [Qureshi and Bhatti, 2003], Rh incompatibility and ABO incompatibility of newborn.

Mental retardation (MR) is a relatively frequent condition and has a major impact on the lives of the affected individuals, their families, and society. MR is defined as a disability characterized by remarkably low intellectual functioning ( $IQ < 70$ ) in conjunction with significant limitations in adaptive functioning [American Association on Mental retardation, 2002]. The estimated prevalence of MR is 1% to 3% of the general population [McLaren and Bryson 1987].

Some genetic disorders are associated with mental retardation, chronic health problems and developmental delay. Because of the complexity of the human body, there are no easy answers to the question of what causes mental retardation. Mental retardation is attributable to any condition that impairs development of the brain before birth, during birth or in the childhood years [The

Arc ,1993]. As many as 50 percent of people with mental retardation have been found to possess more than one causal factor[American Association on Mental Retardation , 1992].

The aim of the present work was to study the possible association between ABO, RhD blood groups with Mental retardation patients in Jazan, Saudi Arabia.

## **Subjects and methods:**

This study was conducted on 93 mentally retarded male children's with average age of 8 years from the Rehabilitation center in Jazan, Kingdom of Saudi Arabia. *The subjects were selected with the aid of Wechsler Intelligence Scale method.* The control group constitutes 300 normal healthy male children's. ABO, RhD blood grouping was determined for every mentally retarded subjects as well as control groups. The blood samples were collected by finger prick with sterile lancet, after warm and clean the puncture site with 70% ethyl alcohol.

*ABO and RhD Blood Group Tests:* A drop of monoclonal anti-A, anti-B and monoclonal/polyclonal anti-D (BioTec Laboratories, UK) was added to a drop of finger prick blood on clean slide and mixed well. Results of agglutination were recorded immediately for ABO blood groups and after 2 minutes in RhD. Birth order was determined and Consanguinity, Maternal age, and Paternal age were specified.

## **Results:**

### *ABO blood groups:*

The frequency of ABO blood groups were illustrated in Table-I. The frequency of blood group-A in mentally retarded subjects (35.5%) was predominant than blood group-A among the control group subjects (23%) with statistically high significant ( $P < 0.05$ ). The incidence of group-B (4.3%) and group-O (59.1%) respectively in MR subjects were less than control subjects group-B (8%) and group-O (67%). The difference is statistically insignificant ( $P > 0.05$ ).

#### *RhD Typing:*

The percentage of RhD negative blood group among mentally retarded subjects (8.6%) was higher than the control group subjects (2.67%). The frequency was statistically significant ( $P < 0.05$ ). The RhD positive blood group percentage in MR subjects (91.4%) was slightly higher than control group subjects (97.3%). The difference was statistically insignificant ( $P > 0.05$ ). The values are illustrated in Table-II.

#### *Consanguinity:*

The percentage of consanguineous marriage among the mentally retarded subjects was 47.31% while the frequency in control subjects was 40.33% (Table-III). This higher frequency is statistically insignificant ( $P > 0.05$ ).

#### *Paternal age:*

Regarding the mean paternal age for the mentally retarded subjects, it was found to be  $35 \pm 10.831$  years (Table-IV), while that for the control group was  $33.14 \pm 9.346$  years and there is no statistically significant difference between these two values ( $P > 0.05$ ).

#### *Maternal age:*

The mean maternal age among the MR group was  $22 \pm 10.022$  years, while the mean control group was  $23.85 \pm 7.66$  years (Table-IV), and there is no statistically significant difference between these two group values ( $P > 0.05$ ).

#### *Birth order:*

Regarding birth order, there was a significant association between birth order and the occurrence of mental retardation (Table-V). Chi square was 15.34 and most of the subjects were first or second child (56%). It is statistically highly significant ( $P < 0.05$ ).

## **Discussion**

The Arc reviewed a number of prevalence studies in the early 1980's and concluded that 2.5 to 3% of the general populations have mental retardation [ARC National Research and Demonstration Institute Association for Retarded Citizens of the United States, 1982]. Based on the 1990 census, an estimated 6.2 to 7.5 million people have mental retardation. Mental retardation is 10 times more common than cerebral palsy and 28 times more prevalent than neural tube defects such as spina bifida. It affects 25 times as many people as blindness [Batshaw, 1997; Nelson et al., 2001].

In the present study, it was found that blood group-O frequency was higher among the other blood groups (group-A, group-B, group-AB) in control group subjects, this is similar frequency to other early studies in Saudi Arabia [Bashwari et al., 2001]. [The degree of intellectual disability is from 20 to 30 \(severe\).](#)

It was found that 35.5% of the mentally retarded subjects had blood group-A in comparison to 23% of the control group subjects and the difference is statistically significant. Therefore, there is an association between the occurrence of mental retardation and blood group-A. The frequency of blood group-O among MR subject as well as in control group subjects shows that might be these blood group peoples have less chance to have Mental retardation than group-A.

Some blood groups are statistically associated with medical condition or diseases such as blood group-A is more common in persons with cancer of salivary gland, stomach, and colon. Blood

group-O is more common in patient with duodenal and gastric ulcers, rheumatoid arthritis, and Von Willebrand disease[Issitt and Anstee, 1998; Nelson et al., 2001].

Association with infection arise when microorganisms carry structures with blood group activity. Yersinia Pestis carries H-like antigen, and the smallpox virus is associated with A-like antigen, making individuals with group-O and group-A more susceptible for infection. The presence of antibodies in secretions may help confer protection against infection. Having anti-B in secretions may offer protection against Salmonella, Shigella, and Neisseria gonorrhoea infections[Reid and Dird, 1990].

In our present study we found that there is no association between the occurrence of mental retardation and RhD negative blood group. Consanguinity has no significant effect on the occurrence of mental retardation although; there was higher frequency of consanguineous marriage (47.3%) among the mentally retarded group subjects in comparison to among the control group (40.3%) subjects. There is no effect of the paternal and maternal ages on the occurrence of mental retardation.

In our study point of view the frequency of birth rate was has strong association with occurrence of mental retardation. In number of the cases of 1<sup>st</sup> and 2<sup>nd</sup> child were subjected to mental retardation. So it can be concluded that there is a strong genetic effect on the occurrence of mental retardation and it can be useful as a genetic marker.



**Acknowledgment:**

The authors are thankful to Jazan University and Center of Rehabilitation, Jazan for their cooperation in this study. We also thankful to the blood donors who cooperated with us for this study.

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**Table-I: ABO blood groups distribution among the mentally retarded subjects and control group subjects.**

<b>Blood group</b>	<b>Mentally retarded subjects (93)</b>		<b>Control group subjects (300)</b>		<b>Z - test</b>
	<b>Frequency of distribution in number</b>	<b>Frequency of distribution in percentage (%)</b>	<b>Frequency of distribution in number</b>	<b>Frequency of distribution in percentage (%)</b>	
<b>A</b>	<b>33</b>	<b>35.5</b>	<b>69</b>	<b>23</b>	<b>2.4*</b>
<b>B</b>	<b>4</b>	<b>4.3</b>	<b>24</b>	<b>8</b>	<b>1.21</b>
<b>AB</b>	<b>1</b>	<b>1.1</b>	<b>6</b>	<b>2</b>	<b>1.1</b>
<b>O</b>	<b>55</b>	<b>59.1</b>	<b>201</b>	<b>67</b>	<b>1.396</b>

**\*P<0.05 statistically significant.**

**Table-II: RhD blood group distribution among the mentally retarded subjects and control group subjects.**

<b>RhD factor</b>	<b>Mentally retarded subjects (93)</b>		<b>Control group subjects (300)</b>		<b>Z - test</b>
	<b>Frequency of distribution in number</b>	<b>Frequency of distribution in percentage (%)</b>	<b>Frequency of distribution in number</b>	<b>Frequency of distribution in percentage (%)</b>	
<b>RhD positive</b>	<b>85</b>	<b>91.4</b>	<b>292</b>	<b>97.3</b>	<b>2.55*</b>
<b>RhD negative</b>	<b>8</b>	<b>8.6</b>	<b>8</b>	<b>2.7</b>	<b>2.55*</b>

**\* P<0.05**

**Table-III: consanguinity percentage among the mentally retarded subjects and control group subjects.**

<b>Consanguinity</b>	<b>Mentally retarded subjects (93)</b>		<b>Control group subjects (300)</b>		<b>Z - test</b>
	<b>Frequency of distribution in number</b>	<b>Frequency of distribution in percentage (%)</b>	<b>Frequency of distribution in number</b>	<b>Frequency of distribution in percentage (%)</b>	
<b>Positive</b>	<b>44</b>	<b>47.3</b>	<b>121</b>	<b>40.3</b>	<b>1.19</b>
<b>Negative</b>	<b>49</b>	<b>52.7</b>	<b>179</b>	<b>59.7</b>	<b>1.19</b>

**Table-IV : Mean Paternal and Maternal ages (years) of the mentally retarded subjects and control group subjects.**

<b>Age</b>	<b>Mentally retarded subjects (93)</b>		<b>Control group subjects (300)</b>		<b>t - test</b>
	<b>Mean</b>	<b>Standard Deviation(SD)</b>	<b>Mean</b>	<b>Standard Deviation(SD)</b>	
<b>Paternal age</b>	<b>35</b>	<b>10.83</b>	<b>33.14</b>	<b>9.346</b>	<b>1.522</b>
<b>Maternal age</b>	<b>22</b>	<b>10.022</b>	<b>23.85</b>	<b>7.659</b>	<b>1.819</b>

**Table - V: Birth order of the mentally retarded subjects and control group subjects.**

Birth order	Mentally retarded subjects (93)		Control group subjects (300)	
	Frequency of distribution in number	Frequency of distribution in percentage (%)	Frequency of distribution in number	Frequency of distribution in percentage (%)
1 <sup>st</sup>	33	35.5	62	20.7
2 <sup>nd</sup>	19	20.4	52	17.3
3 <sup>rd</sup>	8	8.6	48	16
4 <sup>th</sup>	16	17.7	40	13.4
5 <sup>th</sup>	6	6.5	34	11.3
6 <sup>th</sup>	6	6.5	28	9.3
Above	5	5.3	36	12

**\*Chi square = 15.314 and it is highly significant P<0.05**







