# Distribution of ABO blood groups in beta thalassemia patients dependent on blood transfusion In Bagdad city.

***Sarah M. Mahmoud Marbut*, Maha A. Hamdi**, Abdulhadi M.Jumaa**, Basma Abbas Salman*** .***

***Dept. of Microbiology*, Physiology**, College of Medicine, Tikrit University.***

***Lab. Dept. Renal dialysis, Baghdad Teaching Hospital***.***

Sarah1993@yahoo.com

## Abstract

**Introduction:** People have different blood types, known as blood groups. Antigens are hereditary determined and plays a vital role in transfusion safety. The discovery of the ABO blood groups by Karl Land steiner was an important achievement in the history of blood transfusion followed by discovery of Rh antigen. There are differences in the distribution of ABO, and Rh (D) blood groups amongst different populations. The study of blood groups plays an important role in various genetic studies, in clinical studies for reliable geographical information and in blood transfusion practice, which will help in reducing morbidity and mortality rate. The **aim** of the study is to find out whether there is any relationship between ABO blood groups and thalassemia patients. **Methods:** The present study was done at Baghdad teaching hospital, GIT center from 1st of Jan 2017 to the end of September 2017 . A cross sectional study was done in Baghdad-Iraq, in collaboration with GIT center. A total of 200 ß- thalassemia patients without viral hepatitis. (100 males and 100 females) (the age of patients is between 7 to 24 years). Thalassemia patients ABO type beta major were tested by ABO blood group at laboratory department. Determination of ABO blood group Blood group is determined by slide haemagglutination technique. **Result:** In male and female thalassemia patients, blood group O is the highest %, followed by B blood group in in males. However, the 2nd one in female patients is (A) blood group. The lowest ABO blood group in male and female patients is AB blood group. In thalassemia patients, both gender, the highest percentage rate of Rh antigen is found in O+ , (43% in males and 38% in female patients), followed by B+, (29% in males and 21% in female patients), However, and

the lowest was in ABO blood group. From the present study; it could be summarized that ABO blood groups in thalassemia patients was found mostly in O+ blood group, and almost there is no thalassemia in AB- and O- groups.

**Key words**: Thalassemia, ABO, blood group, Baghdad.

## الخلاصة

### تعين مجاميع الدم في مرضى الثلاسيميا نوع بيتا و المعتمدة على نقل الدم المنتظم في مدينة بغداد

***م.م ساره موسى محمود و مها ارشد حمدي و عبد الهادي محمد جمعه و باسمه عباس سلمان***

توجد أنواع و فصائل دم مختلفة في البشر ، والمعروفة باسم مجاميع الدم. المستضدات في مجاميع الدم (ABO) هي مادة وراثية مصممة وتلعب دورًا حيويًا في سلامة نقل الدم و التي تم اكتشاف مجاميع الدم من قبل كارل لاند ستينر. هناك اختلافات في توزيع ABO ، ومجموعات الدم Rh (D) بين مجموعات سكانية مختلفة. وفي الدراسات السريرية للحصول على معلومات جغرافية موثوق بها وفي ممارسة نقل الدم ، والتي ستساعد في تقليل معدل المراضة والوفيات. **الهدف** من الدراسة هو معرفة ما إذا كانت هناك أي علاقة بين مجموعات الدم ABO ومرضى الثلاسيميا في بغداد. **طرق العمل**: أجريت الدراسة الحالية في مستشفى مركز الجهاز الهضمي-بغداد من 1 يناير 2017 حتى نهاية سبتمبر 2017. أجريت دراسة مقطعية مستعرضة في بغداد-العراق ، بالتعاون مع مركز .GIT ما مجموعه 200 مريض من مرضى الثلاسيميا دون الالتهاب الكبدي الفيروسي. (100 من الذكور و 100 من الإناث) (عمر المرضى بين 7 إلى 24 سنة). تم اختبار مجاميع الدم لمرضى الثلاسيميا نوع بيتا الكبرى بواسطة مجموعة ABO الدموية في قسم المختبر. تحديد مجموعة فصيلة الدم ABO يتم تحديدها عن طريق تقنية الصفيحة الدموية. **النتائج**: في مرضى الثلاسيميا الذكور والإناث ، تكون مجموعة الدم O هي أعلى نسبة مئوية ، تليها مجموعة الدم B في الذكور. ومع ذلك ، فإن الثانية في المرضى الإناث هي مجموعة الدم. أقل مجموعة دم ABO في المرضى الذكور والإناث هي مجموعة الدم .AB في مرضى الثلاسيميا ، كلا الجنسين ، تم العثور على أعلى نسبة مئوية من مستضد Rh في O + ، 43%)في الذكور و 38 ٪ في المرضى الإناث) ، ثم تليها + B ، 29%)في الذكور و 21 ٪ في المرضى الإناث)

**الكلمات المفتاحية**: مرضى الثلاسيميا، مجاميع الدم. بغداد

**Introduction:**

The thalassemias (Greek: Thalassa meaning sea) are a group of single gene inherited autosomal recessive hematological disorders caused by defects in the synthesis of one or more of the hemoglobin chains that cause hemolytic anemia.1,2 α and ß-thalassemias are caused due to reduced or absent synthesis of α and ß globin chains respectively, (1).

Phenotypically ß-thalassemia is of three types. ß-thalassemia minor is a heterozygous state in which there is around 50% decrease in synthesis of ß-globin protein, causing mild to moderate microcytic anemia. Affected individuals are usually asymptomatic. ß-thalassemia intermedia shows mild to moderate anemia, (2).

The ABO system is one of the most important blood group systems in transfusion medicine. The ABO system consists of A antigens, B antigens, and antibodies against these antigens. Landsteiner discovered the ABO system in 1900. As opposed to many other blood group systems such as the Rh system, in this system the presence of "naturally occurring" antibodies against A and B antigens in individuals who do not express those antigens (Landsteiner's Law) causes an adverse and occasionally fatal outcome at the first mismatched transfusion, (3,4).

The existence of ABO and Rhesus (Rh) antigens is clinically very important as it plays a major role in blood transfusion and organ transplantation. Though all the population of the world have same blood group system, but the frequency of ABO and Rh antigens is found to vary amongst all populations, (5).

A relationship between blood groups and certain diseases in human was well established, it may not is of great genetic importance. Such a study found that the blood group B was more susceptible to hypertension, (6).

Previous Studies showed an association between ABO blood group and severity of chronic periodontitis. Investigators concluded that the patients with group B were found to be at greater risk of developing more severe form of periodontitis, (7).

Also, a previous study found that blood type A was more directly related with insulin resistance, while those with type O are less directly related with insulin resistance in Turkish population, (8). A large number of studies have examined the association between ABO blood groups and variety of diseases or conditions, (9, 10).

The **aim** of the study is to find out whether there is any relationship between ABO blood groups and thalassemia patients and the study also attempt to explore any relationship between blood group antigens and ß-thalassemia so that it will become very easy to predict the type of population which is more prone or resistant to ß-thalassemia.

**Patients and Methods**

The present study was done at GIT center in Baghdad, from 1$^{st}$ of Jan 2017 to the end of September 2017. A cross sectional study was done in Baghdad-Iraq, in collaboration with GIT center. A total of 200 ß-thalassemia patients without viral hepatitis. (100 males and 100 females) (the age of patients is between 7 to 24 years)

Thalassemia patients ABO type beta major were tested by ABO blood group at laboratory department.

**Determination of ABO blood group**

Blood group is determined by slide haemagglutination technique. 2.5% suspension of red blood cells was prepare in normal saline (0.85g/dl sodium chloride in distilled water) preparation method given below. Mix one drop of blood with 1 ml of normal saline. This provided the red suspension. On one half of glass slide, one drop of Anti A human poly clonal or murine monoclonal blood grouping serum was placed. On the other half a glass slide one drop of Anti B (yellow color) human polycolonal or murine monoclonal blood grouping serum was placed. Using a Pasteur pipette one drop of red blood cell suspension was added to each half of the side. With separate applicator; the serums was well mixed back and forth and observe for agglutination, (1).

**Statistical analysis**

All data were presented as a mean & standard deviation (S.D). Un paired student T test was used to compare between mean of variables. P value less than 0.05 was accepted as a significant value.

**Results**

The distribution of ABO blood group in male and female thalassemia patients is presented in table 1. In male and female thalassemia patients, blood group O is the highest %, followed by B blood group in in males. However, the 2$^{nd}$ one in female patients is A blood group.

The lowest ABO blood group in male and female patients is AB blood group.

**Table 1** Distribution of ABO blood groups in thalassemia patients according to gender.

| Gender | A | B | AB | O | Total |
|---|---|---|---|---|---|
| **Males** | 19 | 34 | 3 | 44 | 100 |
| **Females** | 31 | 21 | 7 | 41 | 100 |
| **Total** | 50 | 55 | 10 | 85 | 200 |

While table 2 show the result of Rh antigen in thalassemia patients.

**Table 2** Distribution of Rh antigen in Thalassemia patients

| ABO types | Males | | Females | | Total | % |
|---|---|---|---|---|---|---|
| | Number | % | Number | % | | |
| **A+** | 19 | 19% | 30 | 30 | 49 | 24.5 |
| **A-** | 0 | 0 | 1 | 1 | 1 | 0.5 |
| **B+** | 29 | 29 | 21 | 21 | 50 | 25 |
| **B-** | 5 | 5 | 0 | 0 | 5 | 2.5 |
| **AB+** | 3 | 3 | 7 | 7 | 10 | 5 |
| **AB-** | 0 | 0 | 0 | 0 | 0 | 0 |
| **O+** | 43 | 43 | 38 | 38 | 81 | 40.5 |
| **O-** | 1 | 1 | 3 | 3 | 4 | 2 |
| **Total** | 100 | 100% | 100 | 100% | 200 | 100% |

In thalassemia patients, both gender, the highest percentage rate of Rh antigen is found in O+ , (43% in males and 38% in female patients), followed by B+, (29% in males and 21% in female patients), However, and the lowest was in ABO blood group.

The distribution of Rh antigen in both male and female patients was found as follows;

The highest % was in O+, (40.5%), followed by B+, (25%) and A+, (24.5%). However, the lowest one in AB-, (0%), and A-, (0.5%).

From table 1 and table 2, the study summarized that thalassemia found mostly in O+ blood group, and almost there is no thalassemia in AB- and O- groups.

**Discussion**

In the present study, in both gender of thalassemia patients, blood group O is the highest percentage in thalassemia patients, followed by B blood group in in males. However, the 2nd one in female patients is A blood group. The present study also found that the largest proportion of Beta thalassemia major patients was of group O+, followed B+, then A+. While, the lowest percentage of ABO blood group in thalassemic patients is B blood group.

A previous study was done by Abid Al-Kader Abbas (2013), during 2013 in Kirkuk found nearly similar results except that , his study revealed blood group "O+" was the most common group (48.4%) in his patients' sample, (11).

In previous study done in thalassemia unit in Mumbai, India; it was found that the most common blood group getting affected by the disease ß-thalassemia is O +ve with the same people having higher chances of family history of the same disease. Within the family members who have the positive history of the disease, most common was O +ve blood group again, (12).

Also, in study done during (2014) in Kirkuk showed that

blood groups "O+ " is the most common among blood group types equal to 48.4% followed by B+ (24.2%) and "A" equal to 18.1% among thalassaemic patients, (13).

As compare with normal population, a previous study, done in Tikrit city by Marbut *et al*, (2008). A total of 4309 subjects were investigated in this study. 2411 blood donors (2357 men 54 &women) & 1898 blood recipient patients (759 men & 1139 women). The highest frequency of blood group in blood donors subjects was blood group O+ (41.5%) & the lowest frequency of blood group was blood group AB- (0.29%). ،(%35.8)and the lowest frequency of blood group was blood group AB- (1%). (14).

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, (1).

From the Table 1 and 2, it can be concluded that the most common blood group observed in patients of ß-thalassemia is O +ve in 40.5% of the patients. This finding agree with previous result in normal population in Iraq, (14).

With 36% B+ve becomes the common blood group in the normal population. AB-ve and O –ve people are less likely to get affected by the disease. Comparing it with common population, O –ve becomes a blood group presenting in lesser number of people.

Mohssin MY *et al*, studied of frequency distribution of hemoglobin variant and ABO blood groups among thalassemia patients from Ibn-Al-Baladi hospital in Baghdad/Iraq stated

the same fact of O blood group being common incidence (59.1%) and AB with the least common occurrence of the disease ß-thalassemia, (2).

Previous study done in Iran about the association of ABO blood group and complication of multiple blood transfusion in beta thalassemia, it was found that the prevalence of hepatitis-C and related factors among ß-thalassemia major patients in Southern Iran which stated that HCV rate in Overall distribution of ABO frequency in India shows the group B to be the commonest blood group in northern and western part of India whereas in eastern, southern and central part O is the most prevalent blood group. Cumulatively, O is the dominant blood group among the Indian population (15). While in previous study, ß-thalassemia patients was seen more in patients of blood group O, (16,17,18).

According to this result, we **recommended** that ABO blood group system should be included in future investigations related to blood disorder diseases.

## References

1-Rai, J. and Singh, B. Distribution of ABO Blood Groups and Rhesus Factor Percentage Frequencies Amongst the Populations of Sikkim, India.

2- Mohssin MY, Mahmood AE, Kamal SB, Batah EH. Frequency distribution of hemoglobin variant and ABO blood groups among thalassemia patients from Ibn-Al-Baladi pediatric hospital in Baghdad/Iraq. W J Pharma Pharmaceut Sci. 2015;4(11):31-9.

3- Landsteiner K, Weiner AS. An agglutinable factor on human blood recognized by immune sera for rhesus blood. Proceedings of the society for experimental Biology 1940; 43:223.

4- Koeppen, BM and Stanton, BA. Berne & Levy Physiology. 6th edition. Mosby. Ny. 2010: 287-290.

5- Neil D. Avent and Marion E. Reid. The Rh blood group system: a review. 2000; 95: 375-387 .

6- Sadiq, HN, Anjum, R., Shaikh, SM *et al*. A study on the correlation of ABO blood group system and hypertension. International J. of Applied Dental Sciences 2017; 3(4): 38-41.

7- Ghamdi AA. Association between ABO Blood groups and severity of Chronic Periodontitis. JKAU Med. Sci. 2009; 16:31-41.

6- Hasna Amer Mouhaus , Saleemh Hameed Abbas , Azhar Salih Musa, and Haider Kassim Mahawi. A study of ABO blood group and Rhesus factor distribution among sample of Missan province population. Journal of Basrah Researches ((Sciences)). 2010; 36(5): 48-53.

7- Watkins WM. The ABO blood group system: historical background. Transfus Med 2001;11:243- 65.

8- Aykas, F., Denizavci, L., Ferhatarik, F, Çetinkaya. AL. *et al*. There is a relation between blood subgroups and insulin resistance. Acta Medica Mediterranea, 2017, 33: 987.

9-O'Donnell, J & M.A. Laffan. (2001)."The relation ship between ABO blood group, factor VIII and von will brand factor". Transfuse Med. ; 11(4) : 343-351.

10- Reddy, VM; M. Daniel ; E. Bright ; S.R Broad and A.A. Moir. (2008) "Is there an association between blood group O and epistaxis". J. laryngology & Otology , 122 : 366-368.

11- Abbas AM. Iron overload in thalassemia and its effect on

gonads. M. Sc Thesis submitted to College of Medicine, Tikrit university 2013.

12- Pranoti A. Sinha1, Sachin H. Mulkutkar1, J. B. Bhavani. Study of distribution of ABO blood groups in ß-thalassemia patients. Int J Res Med Sci. 2017 Aug;5(8):3479-3483.

13- Azeez, FS. Iron Overload in Beta- thalassemia Major patients and its effect on Pituitary Gland. M.Sc Thesis submitted to the college of Medicine, Tikrit university. 2014.

14- Marbut, MM., Aseel H. Ali, Tamara A. Mujeed, Zahraa K. Subhy. Physiological and hematological characteristics of blood recipients and donors subjects attending Tikrit teaching hospital from 2006 to end of 2007. TMJ. 2008; 14(2): 222-234.

15-Shekhar H, Kaur A, Jadeja P, Parihar P M and Mangukiya K K. Frequency and distribution of ABO blood group and Rh (D) factor in southern Rajasthan International Journal of Science & Nature. 2014; 5 494-497.

16- Mohammadali F, Pourfathollah A. Association of ABO and Rh blood groups to blood borne infections among blood donors in Tehran-Iran. Iranian J Public Health. 2014;43(7):981-9.

17- Awad MH. Homozygous beta thalassemia in Mosul. M. Sc Thesis submitted to University of Mosul. Iraq. 1999.

18- 1-Ghori MR, Tayyab M, Raziq F. Frequency of ABO and Rh D blood groups in transfusion dependent patients. J Postgraduate Med Institute. 2003;17(2);177-83.