

RESEARCH PAPER

Frequency of Rhesus and Kell antigens among a sample of Basrah population, Southern Iraq

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Abstract

Background: after antigens of the ABO system, which are the most immunogenic, Rh D antigen comes second, followed by K antigen in the Kell blood group system and other antigens of the Rhesus system, including Rh c, Rh E, Rh C and Rh e. Determination of these antigens before any blood transfusion is vital to prevent alloimmunization and subsequent transfusion-associated hemolytic complications.

Aim of the study: this study aimed to know the frequency of Rhesus (Rh) and Kell (K) antigens among a sample of the Basrah population.

Methods: this retrospective study included a total of 3357 tests for Rh C, Rh c, Rh D, Rh E, Rh e and K antigens. These tests were done in The Main Blood Bank of Basrah and The Basrah Center for Hemoglobinopathies.

Results: the most frequent antigen was the Rh e antigen (96.7%), followed by Rh D antigen (88.8%), Rh c antigen (77.7%), Rh C antigen (68.3%), Rh E antigen (52.6%), and K antigen (8.5%) which was the least frequent.

Conclusion: the prevalence of Rhesus and Kell antigens among the Basrah population doesn't stray from the results around the world.

Keywords: Rh antigens, K antigen

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Introduction

There are up to 360 antigens recognized on red blood cells (RBC) membrane, among them 322 are assigned into 36 blood group systems.¹ Regarding immunogenicity, which is the tendency of the immune system to form alloantibodies after exposure to incompatible RBC antigens, the ABO antigens are the most important, followed by antigens of Rhesus (Rh) and Kell (K) systems.² These alloantibodies are clinically important as they can induce RBC

destruction. The target populations are females of child-bearing age, as these alloantibodies may cause severe hemolytic disease in newborns,³ and people who are anticipated to need frequent packed RBC transfusions in their life, like patients with hemoglobinopathies.⁴ When preparing such patients for blood transfusion, it would be vital if we select an already phenotyped and fully matched RBC units to avert alloimmunization.⁵ Moreover, urgent transfusion required for already an alloimmunized patient with specific antigen(s) could be safely done by using a corresponding antigen-negative blood unit.⁵ In Basrah, Southern Iraq, there is a high frequency of hemoglobinopathies, around 6.48% with Hb S disease and 4.6% with B-thalassemia.⁶

However, only ABO and Rh D figures of blood donors and recipients were considered for compatibility testing before 2021, the time when testing of Rh (C, c, E, e) and Kell antigens has been taken into account before transfusion of patients attending The Basrah Center for Hemoglobinopathies. Therefore, post-transfusion hemolytic anemia due to alloimmunization was and still is a common problem on daily practice.

Aim of the study: this study aimed to know the frequency of Rh C, Rh c, Rh D, Rh E, Rh e and Kell antigens among a sample of the Basrah population.

Methods

This retrospective study included a total of 3357 tests for Rh (C, c, D, E, e) and Kell antigens. These tests were done in The Main Blood Bank of Basrah, including a sample of voluntary blood donors of both genders and in The Basrah Center for Hemoglobinopathies, where testing of these antigens has become a routine procedure for all newly diagnosed and registered patients. These tests were conducted during the period from January to July 2021. The gel card TANGO Optimo Automated Blood Bank Analyzer System was used to test for different Rhesus and Kell antigens. Weak D samples were deemed as D positive.

Results

After a total of 3357 tests for Rh C, Rh c, Rh D, Rh E, Rh e and K antigens, Rh e antigen was the most frequent (3249 tests: 96.7%), followed by Rh D antigen (2983 tests: 88.8%), Rh c antigen (2610 tests: 77.7%), Rh C antigen (2295 tests: 68.3%), Rh E antigen (1768 tests: 52.6%), and K antigen (288 tests: 8.5%) which was the least frequent. (Table-1)

Table 1. Frequencies of Rh C, Rh c, Rh D, Rh E, Rh e and K antigens

Antigen	Positive tests, n	Frequency, %
Rh C	2295	68.3
Rh c	2610	77.7
Rh D	2983	88.8
Rh E	1768	52.6
Rh e	3249	96.7
K	288	8.5

Discussion

In addition to ABO antibodies, antibodies to other clinically significant antigens, like Rhesus and Kell, are also known to induce hemolytic transfusion reaction and hemolytic disease in newborns.⁷ All these complications are not uncommon in our daily practice. So, good awareness and extended phenotypic detection of these antigens can help to prevent and manage these complications. This study was conducted in Basrah, Southern Iraq, where there is a high prevalence of hemoglobinopathies. Among the studied antigens, Rh e was the most frequent, followed by Rh D, Rh c, Rh C, Rh E, and K. The frequencies were 96.7%, 88.8%, 77.7%, 68.3%, 52.6% and 8.5% respectively. Our findings are almost in line with some studies conducted in Saudi Arabia⁸ and Nigeria.⁹ However, an Egyptian study demonstrated some agreement and disagreement with our findings, as the frequencies of Rh C, Rh c, Rh D, Rh E, Rh e and K antigens were 70.4%, 91.2%, 85.6%, 41.7%, 100% and 23.6% respectively.¹⁰ A Chinese study demonstrated a higher frequency of the C antigen (88%) and a lower frequency of the c antigen (60%) among a group of Chinese donors.¹¹ These differences can be attributed to the diversity of donors' ethnicities. Regarding immunogenicity, the Rh D antigen is the most clinically significant among other members of the Rhesus family as more than 25% of Rh D -ve recipients can develop anti-D antibodies after exposure to the

antigen.¹² In our study, the frequency of D antigen was 88.8%, which was slightly less than Taha JY's results; of 93.1%.¹³ The Kell (K) antigen is significantly immunogenic because of the tendency of anti-K antibodies to induce immediate and delayed hemolytic transfusion reactions in patients with chronic transfusion needs due to an anamnestic rise in antibody titer after each unmatched transfusion.¹⁴ There is some diversity in the frequency of K antigen throughout the globe. We found that the prevalence of K antigen was 8.5%, while it was 5.6%, 20% and 23.6% in Sudanese, Saudi Arabian and Egyptian studies respectively.^{15, 16, 10}

In conclusion, the prevalence of Rhesus and Kell antigens among the Basrah population doesn't stray from the results around the world. Knowing these numbers in any population will help in averting and management of alloimmunization in multi-transfused patients. Moreover, such data can help to establish a donor data bank to prepare baseline cell panels and to provide antigen-negative compatible blood to patients who may have developed alloantibodies.

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تواتر مستضدات الريسوس والكيل بين عينة من سكان البصرة جنوب العراق

الخلفية: بعد مستضدات نظام ABO ، التي تعتبر الأكثر قدرة لتحفيز الجهاز المناعي، يأتي مستضد Rh D في المرتبة الثانية، يليه مستضد K في نظام فصيلة الدم Kell ومستضدات أخرى لنظام Rhesus ، بما في ذلك Rh c و Rh E و Rh C و Rh e . يعد تحديد هذه المستضدات قبل أي عملية نقل دم أمرًا مهمًا لمنع التمنيع الخيفي وما يتبعه من مضاعفات نقل الدم التحليلية.

الهدف من الدراسة: هدفت هذه الدراسة إلى معرفة وتيرة مستضدات الريسوس (Rh) و الكيل (K) بين عينة من سكان البصرة.

الوسائل: تضمنت هذه الدراسة بأثر رجعي ما مجموعه ٣٣٥٧ اختبارًا لمستضدات Rh C و Rh c و Rh D و Rh E و Rh e و K. أجريت هذه الاختبارات في بنك الدم الرئيسي في البصرة ومركز البصرة لاعتلال الهيموغلوبين.

النتائج: كان المستضد الأكثر شيوعًا هو مستضد Rh e بنسبة ٩٦,٧% ، يليه مستضد Rh D بنسبة ٨٨,٨% ، ومستضد Rh c بنسبة ٧٧,٧% ، ومستضد Rh C ٦٨,٣% ، ومستضد Rh E بنسبة ٥٢,٦% ، ومستضد K بنسبة ٨,٥% وهو الأقل تكرارًا.

الاستنتاج: إن انتشار مستضدات Rhesus و Kell بين سكان البصرة لا يبتعد عن النتائج المستحصلة من دراسات مشابهة حول العالم.

الكلمات المفتاحية: مستضدات Rh ، مستضد K