



FREQUENCY OF BLOOD GROUP A SUBTYPES AMONG SUDANESE DONORS ATTENDING THE
MILITARY HOSPITAL BLOOD BANK

¹Elena Bakri Ali and ^{2*}Abdel Rahim Mahmoud Muddathir

¹Haematology Department - Central laboratory – The Military Hospital

² Department of Haematology and Blood transfusion, Faculty of Medical Laboratory Sciences
Alzaiem Alazhari University - Sudan

ARTICLE INFO

Article History:

Received 22nd January, 2013
Received in revised form
11th February, 2014
Accepted 11th March, 2014
Published online 23rd April, 2014

Key words:

Red cells,
Monoclonal IgM anti-A and Anti-B.

ABSTRACT

Background: Blood groups play an important role in transfusion medicine. A blood group has many subtypes, but A₁ and A₂ are the main subtypes. The percentage of these subtypes was fluctuating in an approximate average of 80% for A₁ and 20% for A₂. This study conducted to measure the frequency of the subgroups A₁ and A₂ among Sudanese donors attending the Military hospital blood bank.
Materials and methods: A total of 100 venous blood samples collected randomly from blood group A donors attending military hospital blood bank between September –October 2013. Red cells were tested against monoclonal IgM anti-A and Anti-B, while the sera was tested against A₁, B and O cells.
Results and conclusion: Among the analyzed one hundred blood samples, 74% were A₁ and 26% were A₂. Our results was likely similar to the results obtained by other researchers worldwide.

Copyright © 2014 Elena Bakri Ali and Abdel Rahim Mahmoud Muddathir This is an open access article distributed under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

The term blood group is generally based on the presence or absence of certain antigens on the RBC membrane. These are identified by characteristic agglutination reactions with specific antibodies and this field is referred to as blood group serology (Daniels 2002). The two isoagglutinins, anti-A and anti-B, occur naturally in humans, contrary to most other blood groups antibodies (Erskine and Socha 1978; Mollison *et al.*, 1993). ABO blood grouping system was established by Karl Landsteiner (Landsteiner 1900) in 1900 on the basis of the presence or absence of two antigens (A and B) on RBC and its Mendelian inheritance pattern by Bernstein in 1924 (Crow 1993). In this system, four blood groups namely A, B, AB and O are identified by blood tests. The fourth blood type (AB) was discovered by Des Casterllo and Sturli in 1902 (DesCasterllo and Sturli 1902). Except for humans, only anthropoid apes, the orangutan and the gorilla have ABO antigens on their red cells, which suggest that the red cells are the last cells during evolution to obtain the ABO antigens (Oriol *et al.*, 1986).

The ABO blood groups system is not only important in blood transfusions, cardiovascular diseases, organ transplantation, erythroblastosis in neonates, but also one of the strongest predictors of national suicide rate and a genetic marker of obesity (Molison 1979; Hein *et al.*, 2005). In 1911 von Dungern and Hirschfeld reported the distribution of blood group A (47 %),

B (11%), AB (6%) and O (36%) in Europeans, and separation of blood group A into A₁ and A₂ (Morgan and Watkins 2000). Weak subgroups of A can be defined as those of group A subjects whose erythrocytes give weaker reactions or are non reactive serologically with anti-A antisera than do those of subjects with A₂ RBCs (Cartron *et al.*, 1974). The A blood type contains about twenty subgroups, of which A₁ and A₂ were the most common (over 99%). A₁ makes up about 80% of all A-type blood, while the A₂ making up the rest. These two subgroups are interchangeable as far as transfusion is concerned, but complications can sometimes arise in rare cases when typing the blood (The Owen Foundation 2008).

Sera from blood group A individuals contain anti-B antibody while B individuals' sera contain two types of antibody against A antigens. The first is anti-A and the second one is specific towards A₁ RBCs. Anti-A reacts with both A₁ and A₂ cells whereas the second only does with A₁ RBCs. Anti-A₁ is also present in some A₂ and A₂B individuals (Landsteiner and Levine 1926). The two most common subgroups of blood group A are A₁ and A₂ expressing on average, 1 million and 250,000 A determinants, respectively (Economidou *et al.*, 1967). This study was designed to gives insight about the frequencies of these two major subgroups among Sudanese donors attending the military hospital.

MATERIALS AND METHODS

This was cross-sectional study done on a total of 100 venous blood samples collected randomly from blood group A donors

*Corresponding author: Abdel Rahim Mahmoud Muddathir
Department of Haematology and Blood transfusion, Faculty of Medical Laboratory Sciences, Alzaiem Alazhari University – Sudan.

attending military hospital blood bank between September – October 2013. In order to determine subgroup of A. red cell were tested against monoclonal IgM anti-A and Anti-B, while the sera was tested against A1, B and O cells. A total of 7 ml of venous blood samples were collected from donors 3.5 ml in (EDTA) vacuococontainer and another 3.5 ml in plain containers. Direct blood grouping was done using 5% of the red blood cells suspension of the donor against anti-A and anti-B antisera. Two drop of 5% of the red blood cells suspension of A blood group sample was divided into two different tubes, One drop of anti A1 antisera was added to the first tube and one drop of anti AB antisera was added to the other tube, the two tubes were centrifuged at 5.000 rpm for twenty seconds. 15 (any negative results were obtained with anti A1 antisera was confirmed by examination under the light microscope). For the indirect grouping, six drops of serum from each A blood group sample was added into three test tube (two drops in each tube) and then one drop of known A1, B and O cells were added in each tube and centrifuged at 5.000 rpm for twenty seconds. (Denise M. Harmening 2005)

RESULTS AND DISCUSSION

A₁ constituted approximately 80% of entire A blood group population and group A cell which react with anti-A and not agglutinate with anti-A₁ are classified as A₂, making up of remaining 20% 12, this results approximately agreed with our results which showed that 74 samples (74%) were A₁ and the remained 26 samples (26%) were A₂. The differences between the published date and the result we obtained might be due the number of samples examined.

Acknowledgement

We are so grateful to Dr. Abdalaziz Mohammed Homed (Director blood bank - the Military hospital) for his advice and valuable assistance; also support from Mr. Abuhurirah Mohamed and blood bank staff during laboratory work is so appreciated.

Conflict of Interest

The Authors declare that they have no conflict of interest

REFERENCES

- Cartron JP, Gerbal A, Hughes-Jones NC, *et al.* 'Weak A' phenotypes: relationship between red cell agglutinability and antigen site density. *Immunology*. 1974; 27: 723-727.
- Crow JF. Felix Bernstein and the first human marker locus. *Genet* 1993;133(1):4-7.
- Daniels G. Human blood groups. Blackwell Scientific, Oxford, UK, 2002.
- Denise M. Harmening. Modern Blood Banking and Transfusion Practices, 5th Edition. Jaypee Brohters Medical Publishers. 2005; 112-117.
- DesCasterllo, A. and Sturli, A. Uber die Isoagglutinine im Serum gesunder und kranker menschen. *Mfinch Med W schar* 1902; 49:1090-5.
- Economidou J, Hughes-Jones NC, Gardner B. Quantitative measurements concerning A and B antigen sites. *Vox Sang*. 1967;12: 321-8.
- Erskine AG, Socha WW. The principles and practice of blood grouping. The C.V. Mosby Company, Missouri, USA, 1978.
- Hein HO, Suadican P, Gyntelberg F. The Lewis blood group-a new genetic marker of obesity. *Int J Obes Relat Metab Disord* 2005;29:540-52.
- Landsteiner K. Note the antifermantative, lytic and agglutinating activity of blood serum and lymph. *Centralblatt f Bacteriol Infect Dis Parasit Cust* 1900;27:357-62.
- Landsteiner, K., and Levine, P. On the Cold Agglutinins in Human Serum. *The Journal of Immunology*. 1926; (12). 6: 441-460.
- Molison PL. Blood transfusion in clinical medicine. 6th ed. Oxford, UK: Blackwell Scientific Publication; 1979.
- Mollison PL, Engelfriet CP, Contreras M. Blood transfusion in clinical medicine. Blackwell Scientific, Oxford, 1993.
- Morgan WT, Watkins WM. Unravelling the biochemical basis of blood group ABO and Lewis antigenic specificity. *Glycoconj J*. 2000;17: 501-30.
- Oriol R, Le Pendu J, Mollicone R. Genetics of ABO, H, Lewis, X and related antigens. *Vox Sang*. 1986;51: 161-71.
- The Owen Foundation. ABO Blood Group A Suptypes,. Retrieved 2008-07-01.
