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A 5-YEARS SURVEY ON THE FREQUENCY OF UNEXPECTED ANTIBODIES IN TERTIARY HEART CENTER

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ABSTRACT

Introduction:
Antibodies that are present in serum but are unknown before the antibody screening test is called unexpected antibodies. Although these antibodies usually have no specific manifestations, they can cause various disorders, such as hemolytic disease of the fetus and newborn and blood transfusion reactions, in the case of need for blood transfusion. Therefore, detection of these antibodies is especially important before blood transfusion. Hence, the objective of this study was to detect unexpected antibodies in the Mazandaran heart center during five years for the first time.
Methods:
In this retrospective study, the investigation was carried out on the data which were available in Mazandaran heart center and Mazandaran blood transfusion organization in Sari, Iran during 2012-2017. Data included details of antibody screening and indirect antiglobulin tests results. MS Excel 2016 and SPSS 16.0 were used for statistical calculations.
Results:
A total of 22,527 antibody screening tests were conducted over the past 5 years. According to nine positive antibody screening tests, the frequency of unexpected antibodies was 0.04%. Positive tests included an anti-M antibody, anti-Kell antibody, anti-Fy^a antibody, anti-E antibody, and various autoantibodies.
Conclusion:
The frequency of unexpected antibodies in our healthcare center was less than those reported in different parts of the world. It is recommended that appropriate measures should be taken for the early detection of unexpected antibodies to prevent the consequences of risk factors.

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Introduction

Unexpected antibodies are antibodies that their presence and type are unknown before antibody screening tests [1]. Unexpected antibodies include two types: alloantibodies and autoantibodies. Alloantibodies are produced in response to allogeneic red blood cells (RBCs) carrying the same antigens, and autoantibodies are produced in response to the self-antigens of the surface of the RBCs [2].

The immune response to foreign antigens after exposure to genetic cells or tissues is called alloimmunization [3]. The probability of alloantibody formation against RBC antigens in people with a history of blood transfusions and pregnancy is unpredictable, because the causative agents of alloimmunization are complex and involve at least three main factors including antigenic difference of RBCs in donor and recipient, the recipient's immune system status and modifying the effect of allogeneic blood transfusion on recipient immune system [4, 5].

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The immune response to red blood cell surface antigens plays an important role in blood transfusion. The probable occurrence of alloimmunization in thalassemic and dialysis patients who requiring regular blood transfusion is higher and the incidence rate is reported to be between 6-36% according to previous studies [6-8].

The American Blood Bank Association recommends testing such as ABO typing, Rh typing, unexpected antibody screening and cross-match tests, which should be done before blood transfusion [9]. Antibody screening tests are carried out routinely in clinical laboratories to ensure safe blood transfusion to prevent various blood transfusion reactions such as fever or hemolytic reactions [7].

Given the hemolytic disorders caused by unexpected antibodies, antibody screening test and indirect Antiglobulin test is needed to screen and detect unexpected antibodies before transfusion. Therefore, by early detection of these antibodies, preventive measures can be taken to prevent blood transfusion reactions in these patients. However, no studies have been conducted on the topic in this center so far. Hence, the objective of this study was to identify unexpected antibodies in the Mazandaran heart center.

Methods:

Study design

In this retrospective study, data were collected from Mazandaran heart center and Mazandaran blood transfusion organization in Sari city, Mazandaran, Iran. These two centers are adjacent to each other. The study was conducted between 2012 and 2017.

Data collection

One of our team members referred to the Mazandaran heart center to complete the checklists for antibody screening tests information. The checklist contains variables such as age, gender, blood group, rhesus factor status and the result of antibody screening test. Since positive antibody screening tests are sent to the blood transfusion organization for the detection of the type of unexpected antibody, additional information about positive tests was extracted by the other team member from the blood transfusion organization of the province. All data were collected from electronic documents and manual archives of these centers.

Tests

Standard Operating Procedure (S.O.P) used for antibody screen tube method and Indirect Antiglobulin Test (IAT) used for the detection of antibodies to red cell antigens, which were approved by Iran Blood Transfusion Organization Immunohematology Reference Laboratory by the code IP05IBTO90/1.

Data analysis

Extracted data were entered into Microsoft Excel 2016, and some descriptive statistical calculations were done by Statistical Package for the Social Sciences 16.0 (SPSS Inc., Chicago, IL, USA) software.

Ethical considerations

Ethics Committee of Mazandaran University of Medical Sciences was approved the present study by the code 45 which adopted on May 25, 2017. To comply with ethical standards, all information contained in the Blood Bank Archive was used confidentially and exclusively for the aim of this study and all files were delivered to the Blood Bank Archive without any changes.

Results:

Among a total of 22,527 antibody screening tests during 5 years, only nine positive tests resulted. Four of them were female and five of them were male with mean age of 56.2 (±7.7) years old.

The frequency of unexpected antibodies calculated 0.04% (9/22,527). Of the 9 positive tests; 1) anti-M antibody was detected in a 47-year-old woman with a B-positive blood group. 2) anti-Kell antibody was detected in a 55-year-old woman with an O-positive blood group. 3) anti-Fy^a and anti-E antibodies were detected in a 63-year-old woman with B-positive blood group. 4) cold-autoantibodies and warm-alloantibodies were identified in a 49-year-old man with O-negative blood group. 5) autoantibody was positive in three cases, but non-specific antibodies were detected in this cases. 6) two other cases were negative for autoantibodies and we could not detect any specific antibody. No significant relationship was found between the study variables.

Discussion

Comprehensive studies of the frequency of blood group antigens in a population are helpful to provide healthier blood transfusion services. It has been shown that there are many differences in the frequency and type of unexpected antibodies during the antibody screening test. Some factors such as blood group, genotypes, methods of antibody screening test, decoder ability and etc. can be reasons for this diversity [1].

In this study, the frequency of unexpected antibodies was approximately 0.04% in Mazandaran heart center. Our study compared to several other studies showed a lower frequency [10-12].

Moreover, there are different reports of the frequency of unexpected antibodies in different parts of the world, so that in the United States [13, 14], Germany [15], South Korea [16-18] and Denmark [19] there were reported by 0.3-2%, 0.78%, 0.51-1.57% and 1.35%, respectively.

One of the unexpected antibodies that we detected was an anti-M antibody which is usually a natural IgM, but alloimmunization may stimulate anti-M IgG through pregnancy or blood transfusion. Although the incidence of hemolytic disease of the fetus and newborn (HDFN) is low due to the anti-M antibody, the presence of this antibody in the mother's serum may cause the disease during pregnancy [20]. Therefore, early detection of this antibody and control of the pregnant mother during pregnancy can prevent the onset of the HDFN.

Besides, it is interesting to note that, a review of the literature by Yasuda et al. [21] on Japanese population reported that a low-titer IgG type anti-M may appear to result in an unusual HDFN, including hemolysis associated with alloantibodies and sudden anemia due to the destruction of embryonic red blood cells (RBCs) and erythropoietic suppression. They also recommended Reticulocyte counting in relation to Hb measurements to detect Anti-M HDFN.

One of the most important unexpected antibodies that have been identified in our study is an anti-Kell antibody which is usually IgG and like anti-M may cause HDNF and hemolytic transfusion reactions [22]. After the ABO and Rhesus group systems, it has the highest clinical significance [23].

The other case was associated with anti-Fy^a and anti-E antibodies. Both erythroid and non-erythroid cells express Duffy antigens [24]. As like as the two previous antibodies, Duffy antibodies also play a role in developing HDNF and hemolytic transfusion reactions [25]. Moreover, it should also be noted that Rh blood type antigens are involved in HDNF and the anti-E antibody is one of the Rh blood type alloantibodies, which is a rare cause of mild HDNF [26, 27]. However, the presence of auto-antibodies in the maternal serum is an indication of the probability of severe HDNF [28].

Besides, despite the development of maternal care for rhesus isoimmunisation, the HDNF is one of the main causes of anemia and jaundice in infants [29].

In addition, we identified a number of autoantibodies which can be detected in some disorders with no clinical manifestation. In fact, autoantibodies can predict the risk of a disease, as well as the rate of progression of the disease. Hence, autoantibodies are known as prognostic markers of the diseases [30, 31]. So that previous studies suggest a direct relationship between autoantibodies and disease severity [32-34].

The remarkable point of this study is that no such study had been carried out in this center as well as Mazandaran province so far.

The limitations of this study include the failure to detect the type of 2 unexpected antibodies and the lack of access to clinical history and clinical manifestation of patients related to these antibodies.

Conclusion

The results of this study showed that the frequency of unexpected antibodies in the Mazandaran heart center between 2012 and 2017 was approximately 0.04%, which is less than those reported in previous studies in different parts of the world. In addition, according to previous studies that indicate the importance of identifying unexpected antibodies to prevent various diseases, especially hemolytic disease of the fetus and newborn, various measures should be taken at different healthcare centers for the early detection of these antibodies, especially pregnant mothers in order to avoid its irreversible consequences.

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Conflict of interest

The authors did not disclose any conflicts of interest.

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