Prevalence of Diego blood group antigen and the antibody in three ethnic population groups in Klang valley of Malaysia

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Abstract:
Background: Diego blood group antigen, Di(a), is very rare among Caucasians and Blacks, but relatively common among the South American Indians and Asians of Mongolian origin. The antibody to Di(a) is clinically significant to cause hemolytic disease in a new-born or hemolytic transfusion reaction. Objectives: This study was designed to determine the prevalence of Di(a) antigen among the blood donors from the three major ethnic groups in Klang Valley of Malaysia as well as to find an incidence of an antibody of the Diego antigen, anti-Di(a), in a tertiary care hospital to ascertain the need to include Di(a+) red cells for an antibody screen cell panel. Materials and Methods: Serological tests were performed by column agglutination technique using commercial reagents and following instruction as per kit insert. Results: Di(a) antigen was found with a frequency of 2.1% among the Malaysians donors in three ethnic groups viz, Malay, Chinese and Indian. It was present among 1.25% of 401 Malay, 4.01% of Chinese and 0.88% of 114 Indian origin donors. None of the 1442 patients, including 703 antenatal outpatients, had anti-Di(a) in serum. Conclusion: The prevalence of Di(a) antigen was found among the donors of all the three ethnic background with varying frequency. Inclusion of Di(a+) red cells in routine antibody screening program would certainly help in detection of this clinically significant antibody and to provide safe blood transfusion in the Klang Valley, though the incidence of antibody appears to be very low in the region.
Key words: Anti-Di(a), Di(a), Klang Valley, Malaysia, prevalence

Introduction

An antibody of the Diego antigen, Anti-Di(a), was first described by Layrisse et al.[1] as the cause of HDN in the serum of a Venezuelan woman. Antithetical antibody, designated as anti-Di(b) was reported a decade later by Thompson et al.[2] and a new blood group system was evolved. The system was further expanded through its genetic association with already existing antithetical pair of Wr(a)/Wr(b).[3] The Diego blood group system, in its present form, consists of two closely linked pairs of Di(a)/Di(b) and Wr(a)/Wr(b) of which the Di(b) and Wr(b) are the high frequency antigens whereas the Di(a) and Wr(a) occur as the low frequency antigens.[4]

Although the Di(a) antigen is found with a very low frequency (<0.01%) among the Caucasians and Blacks,[4] its incidence among the Native American Indians and Asians with Mongoloid extraction is not that rare. The prevalence of Di(a) antigen in South American Indians was reported as high as 36%, and in Asians of Mongoloid origin like Japanese, Chinese and Koreans have its prevalence any way between 5 and 15%.[6] The high prevalence of Di(a) antigen in Asian populations with Mongoloid ancestry makes it interesting to both, those working with the anthropology as well as the transfusion medicine.

Anti-Di(a) was occasionally incriminated as a cause of hemolytic transfusion reactions and hemolytic disease of the newborn.[7-10] Although the prevalence of Di(a) antigen among the Asians of Mongoloid ancestry has been worked out well, none of the study address its incidence in Malaysian population comprising three ethnic groups viz., Malay, Chinese and Indian. Likewise, there is no report available on an occurrence of clinically significant anti-Di(a) antibody in Malaysians of diverse ethnicity.

Materials and Methods

Subjects
The blood samples for detection of the Di(a) antigen were obtained from healthy volunteer blood donors through blood donation drives, organized by the National Blood Transfusion Centre, Kuala Lumpur. Ethical approval was granted by research and Ethics committee and informed consent was obtained from all the blood donors participated in this study. A total of 1170 blood donors’ samples were collected from 29/11/2008 to 20/01/2009.
The blood samples to screen for anti-Di(a) antibody were obtained during the study period between 21/11/2008 and 20/01/2009 on the patients (n = 759) admitted as inpatients to, as well as the pregnant women (n = 716) attending antenatal clinic at Kuala Lumpur Hospital (HKL) in the city of Kuala Lumpur.

**Results**

Table 1 shows distribution of the Di(a) antigen among 1089 Malaysian blood donors in three ethnic groups. The Di(a) antigen was present in 23 of the 574 Chinese, 5 out of 401 Malays, and 1 out of 114 Indians, thereby showing the incidence of Di(a+) phenotype as 4.01%, 1.25% and 0.88%, respectively, with a significant intergroup difference (P = 0.014, < 0.05) in distribution of the antigen among the three groups. This observation has also indicated that each of the groups were maintaining its ethnic phenotype as 4.01%, 1.25% and 0.88%, respectively, with a significant intergroup difference (P = 0.014, < 0.05) in distribution of the antigen among the three groups. This observation has also indicated that each of the groups were maintaining its ethnic identity through endogamous social structure of one’s own.

Antibody screening using known Di(a+) red cells was carried out on the 739 inpatients including 510 Malays, 111 Chinese, 118 Indians, as well as 703 patients attending antenatal clinic that included 554 Malays, 81 Chinese, 68 Indians. None of these 1442 patients were tested positive for anti-Di(a) antibody. The data is not tabulated.

**Discussion**

The Di(a) antigen is very rare among Caucasians and Blacks, but is relatively common among South American Indians and Asian population, especially in people of Mongolian origin.[11] The Diego blood group system, therefore interest more to the anthropologists than to the hematologists. However, the differential prevalence of Di(a) antigen is also important in the field of transfusion medicine as Di(a) incompatibility may give rise to alloimmunization that cause HTR[7,8] and HDN.[9,10]

In present study, none of the samples tested was found as positive for anti-Di(a) antibody among the 1475 patients tested in the region, even though the prevalence of Di(a) antigen was found as 2.1%. Han et al.[6] have reported an incidence of anti-Di(a) as 8 out of 11,219 (0.07%) in face of a prevalence of the Di(a) antigen to be as high as 6.4-14.5% in Korea. Besides, seven of these eight cases had history of blood transfusions or multiple pregnancies as well and that could be a contributory factor for a higher incidence.[6] Therefore, it is as conceivable that the Japanese and Koreans have their descendents in Klang Valley have their origin in the southern part of China.[17,18]

In this study, the Malaysians of Indian origin showed 0.88% prevalence of Di(a+) phenotype which is quite lower than that of 4% from the North Indian population.[19] This difference could be due to the fact that the Malaysian Indians have their descendents came from Tamil-speaking Southern India that have genetic diversity from the North Indian population. Besides, the Northern and the Northeast regions of India bear geographical proximity with bordering Nepal, Tibet and China so it is not surprising to find a higher incidence of Di(a+) phenotype in the Northern region of India. However, there is no study reported on Di(a+) phenotype status among the Tamil-speaking population of Southern India to compare the same in Malaysian Indians.

The overall prevalence of Di(a+) phenotype as 2.1% in Klang Valley may have clinical impact in terms of all immunization through blood transfusion or pregnancy that may eventually result in mild to as severe as fatal blood transfusion reaction.[7,8] In Japan, the country has adopted to screen for the anti-Di(a) antibody in routine for all blood transfusion recipients. Likewise, anti-Di(a) antibody has also been implicated as clinically significant to cause the hemolytic disease of the newborn.[9,10]

**Table 1: Prevalence and association of Di(a) antigen for different ethnic groups living in Klang Valley, Malaysia**

| Ethnicity | Donors tested n | Donors with Di(a) antigen n | χ² statistic (d.f) | P-value |
|-----------|-----------------|----------------------------|-------------------|---------|
| Chinese   | 574             | 23 (4.01)                  |                   |         |
| Malays    | 401             | 5 (1.25)                   | 8.51 (2)          | 0.014   |
| Indians   | 114             | 1 (0.88)                   |                   |         |

*Chi-square (χ²) test for independence, df = degree of freedom*
Wei, et al.: Prevalence of Diego blood group antigen and the antibody in Malaysia

Conclusions

The Di(a) antigen in Malaysians of different ethnic background has variable prevalence of the Di(a) antigen is, the Chinese having the highest and the Indians with the lowest. It is advisable to screen the transfusion recipients for anti-Di(a) in the region inhabited by the Chinese population, though none of the patients in our series had shown a presence of anti-Di(a) presumably due to a lower sample size for such study and that too among the patients with little history of transfusion.

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References

1. Layrisse M, Arrend T, Dominguez SR. Nuevo group sanguineo encontrado en descendientes de Indios. Acta Medica Venez 1955;13:128.
2. Thompson PR, Childers DM, Hatcher DE. Anti-Di(b)-first and second examples. Vox Sang 1967;13:314-8.
3. Bruce LJ, Ring SM, Anstee DJ, Reid ME, Wilkinson S, Tanner MJ. Changes in the blood group Wright antigens are associated with a mutation at amino acid 658 in human erythrocyte band 3: A site of interaction between band 3 and glycoporphin A under certain conditions. Blood 1995;85:541-7.
4. Harmening DM. Modern blood banking and transfusion practices. 4th ed. Bangkok: FA Davis Company; 1999.
5. Layrisse M, Arrend T. The Diego blood factor in Chinese and Japanese. Nature 1956;177:1083-4.
6. Han KS, Park MH, Kim SI. Transfusion Medicine. Seol: Korea Medical Publishing Co; 1999.
7. Hinckley ME, Huestis DW. Case report: An immediate hemolytic transfusion reaction apparently caused by anti-Di(a). Rev Fr Transfus Immunohematol 1979;22:581-5.
8. Tohyama H. Blood transfusion reaction due to Diego blood group. Tokyo: Chuogai Medical Publishers; 1989. p. 379-80.
9. Kusnierz-Alejska G, Bochenek S. HDN due to anti-Di(a) and incidence of the Di(a) antigen in Poland. Vox Sang 1992;62:124-6.
10. Chung MA, Park EH, Lee CH, Oh CH, Namgung R, Kim HO, et al. A case of hemolytic disease in the new born due to anti-Di(a) antibody. J Korean Soc Neonatal 2002;8:141-4.
11. Mollison PL, Engelfriet CP, Contreras M. Blood transfusion in clinical medicine. 10th ed. Oxford: Blackwell Scientific; 1997.
12. Raman Y. Incidence of Diego [D(a)] antigen in Southeast Asia. Transfusion Medicine. 2004;30:119-24.
13. Lin-Chu M, Broadberry RE, Chang FJ. The distribution of blood groups and alloantibodies among Chinese in Taiwan. Transfusion 1988;28:350-2.
14. Lin M. Blood groups and transfusion medicine in Taiwan. J Formos Med Assoc 1997;96:933-42.
15. Miyazaki T, Sato S, Kato T, Ikeda H. Human anti-Di(a) monoclonal antibodies for mass screening. Immunohematology 2000;16:78-81.
16. Komatsu F, Hasegawa K, Yanagisawa Y, Kawabata T, Kaneko Y, Watanabe S, et al. Prevalence of Diego blood group Di(a) antigen in Mongolians: Comparison with that in Japanese. Transfus Apher Sci 2004;30:119-24.
17. Available from: http://www.joshuaproject.net/people-profile.php?peo3=12057androg3=MY [Last accessed on 2012 Jan 16].
18. Available from: http://www.mapsofchina.net/p_guangdong_map.html [Last accessed on 2012 Jan 16].
19. Mourant AE, Kopec AC, Domaniewska-Sobczak K. The distribution of the human blood groups and other polymorphisms. 2nd ed. Oxford: University Press; 1976.
20. Park TS, Oh SH, Choi JC, Lee DD, Kim HH, Chang CL, et al. The clinical significance of antibody screening test including Di(a+) panel cell in Asian-Mongoloid populations (Abstract). J Korean Med Sci 2003;18:669-72.
21. Thompson C. Diego(a) antigen frequency and anti-Diego(a) frequency in a South Texas community. Clin Lab Sci 2006;19:203.

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