

ASSOCIATION BETWEEN GLAUCOMA AND BLOOD GROUPS

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Abstract- There are reports from different countries that some types of glaucoma are associated with blood groups. This cross-sectional study was performed on 400 glaucomatous patients [100 patients in each group of Primary open angle glaucoma (POAG), chronic angle closure glaucoma (CACG), pseudoexfoliative glaucoma (PEXG) and primary congenital glaucoma (PCG)] and 400 blood donors as control group to assess the association between blood groups and glaucoma. All patients underwent ABO and Rh blood group testing. The prevalence of blood group A was 30% in the control group, 27% in POAG, 33% in CACA, 38% in PEXG and 36% in PCG. The prevalence of blood group B was 24% in the control group, 19% in POAG, 20% in CACG, 15% in PEXG and 34% in PCG ($P < 0.025$). The prevalence of blood group AB was 8% in the control group, 9% in POAG, 5% in CACG, 12% in PEXG, and 8% in PCG. The prevalence of blood group O was 38% in the control group, 45% in POAG, 42% in CACG, 35% in PEXG and 22% in PCG ($P < 0.001$). The prevalence of Rh⁺ was 88% in the control group, 84% in POAG, 87% in CACG, 86% in PEXG and 87% in PCG. Compared to control group, blood group B was more prevalent and blood group O was less prevalent in PCG. There was no association between other types of blood groups (ABO and Rh) and PCG. There was no association between blood groups (ABO and Rh) and other types of glaucoma.

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Key words: Glaucoma, blood groups, red blood cells

INTRODUCTION

Identification of any association between diseases and blood groups is an excellent source for genetic researches in human. The membranes of red blood cells have several hundreds of isotopes that their structure is under control of genes that are located on different chromosomes (1).

There are several reports about the genetic basis of glaucoma (2-5). Also there are reports from different countries that some types of glaucoma are associated with blood groups (6-10).

Identification of any association between any type of glaucoma and blood groups can help us to better know about the genetic loci of glaucoma. This study was conducted to evaluate this association in Iranian glaucomatous patients.

MATERIALS AND METHODS

This cross-sectional study was performed on 400 glaucomatous patients in glaucoma clinic of Farabi eye hospital (as study group) and 400 blood donors in blood transfusion center (as control group) from January to March of 2003.

Glaucomatous patients were classified in four groups of: primary open angle glaucoma (POAG), chronic angle closure glaucoma (CACG), pseudoexfoliative glaucoma (PEXG) and primary

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congenital glaucoma (PCG) and sample size was calculated about 100 patients in each group.

Initially patients were examined by an ophthalmologist and after taking informed consent, 1 CC of venous blood was taken from each patient and blood group (ABO and Rh) of each patient was determined. Blood taking from children with PCG was done on the first “exam under anesthesia” session. Determination of blood groups was done as slide testing. First one drop of each antibody (anti-A, anti-B, anti-D) was placed on three separate glass lamellas, then one drop of patient’s blood added on each lamella and after 1-3 minutes, agglutination on each lamella was evaluated. Patients’ data (age, sex, type of glaucoma and blood groups) were recorded.

Four hundred volunteer for blood donation in the blood transfusion center were considered as control group and their data were also recorded. Collected data of both groups were analyzed by SPSS software (statistical analyses used were Chi test and independent student *t* test). A *P* value of less than 0.05 was considered as significant.

RESULTS

In the study group 53.2 % were male and 46.8% were female. In the control group 66% were male and 34% were female ($P < 0.001$). Mean age was 55.5 (± 3.4 sd) years in the study group and 36.6 (± 2.5 sd) years in the control group ($P < 0.0001$). In the study group the prevalence of blood groups were: A = 33.5%, B = 22%, AB = 8.5%, O = 36% and Rh+= 86%.

In the control group the prevalence of blood groups were: A = 30%, B = 24%, AB = 8%, O = 38% and Rh⁺ = 88% (Fig. 1). The prevalence of blood group A was: 27% in POAG, 33% in CACG, 38% in PEXG and 36% in PCG (Fig. 2). The prevalence of blood group B was: 19% in POAG, 20% in CACG, 15% in PEXG and 34% in PCG ($P < 0.025$) (Fig. 3). The prevalence of blood group AB was: 9% in POAG, 5% in CACG, 12% in PEXG, and 8% in PCG (Fig. 4). The prevalence of blood group O was: 45% in POCG, 42% in CACG, 35% in PEXG and 22% in PCG ($P < 0.001$) (Fig. 5). The prevalence of Rh⁺ was: 84% in POAG, 87% in CACG, 86% in PEXG and 87% in PCG, (Fig 6).

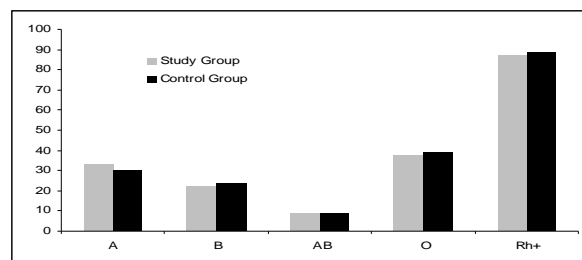


Fig. 1. Frequencies of blood groups in study and control groups.

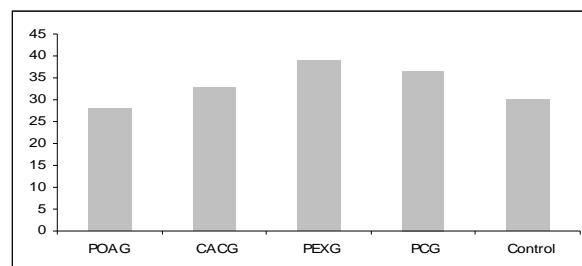


Fig. 2. Frequencies of blood group A in glaucoma types and control group. POAG, primary open angle glaucoma; CACG, chronic angle closure glaucoma; PEXG, pseudoexfoliative glaucoma; PCG, primary congenital glaucoma.

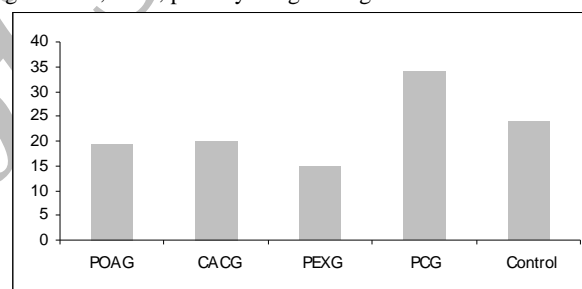


Fig. 3. Frequencies of blood group B in glaucoma types and control group. Abbreviations: see Fig. 2.

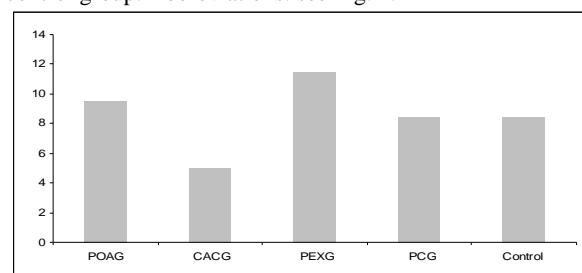


Fig. 4. Frequencies of blood group AB in glaucoma types and control group. Abbreviations: see Fig. 2.

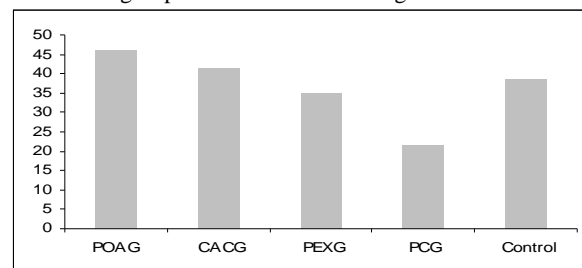


Fig. 5. Frequencies of blood group O in glaucoma types and control group. Abbreviations: see Fig. 2.

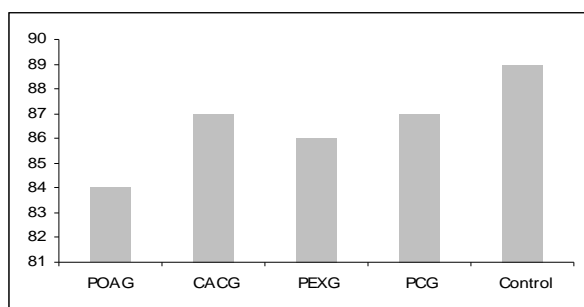


Fig. 6. Frequencies of Rh⁺ in glaucoma types and control group. Abbreviations: see Fig. 2.

DISCUSSION

This study showed that in PCG, in comparison to control group, blood group B was more prevalent and blood group O was less prevalent. There was no association between other types of blood groups and PCG. Also there was no association between other types of glaucoma (POAG, CACG, and PEXG) and blood groups (ABO and Rh).

Leske and coworkers (in Barbados Eye Study) did not find any association between POAG and blood groups (ABO and Rh) (6). Ringvold in "the middle-Norway eye-screening study" (that evaluated the relation between blood groups and PEX syndrome, single and capsular glaucoma) reported that there is less glaucoma prevalence in the capsular A- group compared to the O- group (7).

In a study by Brooks AM and coworkers that evaluated the association between blood groups (ABO and Rh) and glaucoma, their only finding was less prevalence of Rh⁻ in CACG (8). Blikas and coworkers did not find any association between glaucoma and blood groups (9). Kaiser-Kupfer MI and coworkers reported that there is no association between blood groups and pigment dispersion syndrome (10). As we saw the findings of such studies in different countries are conflicting and no similar findings are between two studies. These different findings can be due to: 1-different racial and ethnic study population, 2- low sample size in most of these studies. In our study there was largest sample size. Significant difference in age and sex between study group and control group can be due to more inclination of male and middle aged population for blood donation. The recent explosion in our knowledge of the genetic basis of glaucoma brings promise for understanding the cause of glaucoma

and improving its diagnosis and treatment. Mapping techniques based on large families with well-defined forms of glaucoma have localized several genes related to specific types of glaucoma. Studies of DNA from families with glaucoma showed that glaucoma loci can be located or mapped to specific sites on a human chromosome. In the mid-1990 GLC1A, a form of juvenile open angle glaucoma gene, was mapped to chromosome 1. (11) This was soon followed by the mapping of five POAG genes (GLC1B, GLC1C, GLC1D, GLC1E and GLC1F) that are located on chromosomes 2, 3, 7, 8 and 10 (11).

Also one gene associated with angle closure glaucoma (NNOS) is known to be located on chromosome 11 and two genes associated with PCG (GLC3A and GLC3B) are known to be located on chromosomes 1 and 2. As mentioned before, the blood groups (ABO and Rh) have well known genetic loci (long arm of chromosome 9 for ABO and chromosome 1 for Rh) and understanding of glaucoma genetic loci is in progress, and identification of any association between blood groups and glaucoma can help us to know more about these loci. Larger scale studies are recommended.

Conflict of interests

The authors declare that they have no competing interests.

REFERENCES

1. Dzieczkowski JS, Anderson KC. Transfusion biology and therapy. In: Braunwald E, Fauci A, Kasper DL, et al (eds): Harrison's principles of internal medicine. 15th ed. New York: Mc GrawHill; 2001. P. 733-739.
2. Wolfs RC, Klaver CC, Ramrattan RS, van Duijn CM, Hofman A, de Jong PT. Genetic risk of primary open-angle glaucoma. Population-based familial aggregation study. Arch Ophthalmol. 1998 Dec; 116(12):1640-1645.
3. Broughton WL, Fine BS, Zimmerman LE. Congenital glaucoma associated with a chromosomal defect. A histologic study. Arch Ophthalmol. 1981 Mar; 99(3):481-486.

4. Stone EM, Fingert JH, Alward WL, Nguyen TD, Polansky JR, Sunden SL, Nishimura D, Clark AF, Nystuen A, Nichols BE, Mackey DA, Ritch R, Kalenak JW, Craven ER, Sheffield VC. Identification of a gene that causes primary open angle glaucoma. *Science*. 1997 Jan 31; 275(5300):668-670.
5. Ritch R, Shields MB, Krupin T, editors. *The Glaucomas*. 2nd ed. St Louis: Mosby; 1996. p. 753-765.
6. Leske MC, Nemesure BB, He Q, Mendell N, Polednak A. Open-angle glaucoma and blood groups. The Barbados Eye Study. *Arch Ophthalmol*. 1996 Feb; 114(2):205-210.
7. Ringvold A, Blika S, Elsas T, Guldahl J, Juel E, Brevik T, Hesstvedt P, Hoff K, Hoisen H, Kjorsvik S, et al. The middle-Norway eye-screening study. III. The prevalence of capsular glaucoma is influenced by blood-group antigens. *Acta Ophthalmol (Copenh)*. 1993 Apr; 71(2):207-213.
8. Brooks AM, Gillies WE. Blood groups as genetic markers in glaucoma. *Br J Ophthalmol*. 1988 Apr; 72(4):270-273.
9. Blika S, Ringvold A, Braathen LN, Juel E. ABO-blood groups and D-antigen in simple and capsular glaucoma. *Acta Ophthalmol (Copenh)*. 1984 Dec; 62(6):1009-1013.
10. Kaiser-Kupfer MI, Mittal KK. The HLA and ABO antigens in pigment dispersion syndrome. *Am J Ophthalmol*. 1978 Mar; 85(3):368-372.
11. Wirtz M, Samples J. Glaucoma genetics. In: Morrison J, Pollack A. *Glaucoma science and practice*. 1st ed. New York: Thieme; 2003. p. 12-21.

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