

Original Research Article


Association between ABO and RhD blood group and gestational hypertensive disorders - A retrospective study

Rajakeerthana^{1*}, Swarnapriya², Vasantha N Subbiah³

¹Post Graduate, ²Associate Professor, ³Professor and HOD

Department of Obstetrics and Gynecology, Chettinad Hospital and Research Institute, Kelambakkam, India

*Corresponding author email: keertitbest@gmail.com

| | |
|---|---|
|  | International Archives of Integrated Medicine, Vol. 3, Issue 7, July, 2016. Copy right © 2016, IAIM, All Rights Reserved. Available online at http://iaimjournal.com/ ISSN: 2394-0026 (P) ISSN: 2394-0034 (O) |
| | Received on: 19-06-2016 Accepted on: 01-07-2016 Source of support: Nil Conflict of interest: None declared. |
| How to cite this article: Rajakeerthana, Swarnapriya, Vasantha N Subbiah. Association between ABO and RhD blood group and gestational hypertensive disorders - A retrospective study. IAIM, 2016; 3(7): 274-280. | |

Abstract

Background: Hypertension is the most common problem facing by pregnant women. Nowadays in developing countries one of the major causes for maternal and fetal mortality is gestational hypertension disorders. Even though most of the existing studies were concluded that ABO blood groups of mother have an association with PIH but its etiology is still uncertain. The objective of the present study is to assess the association of ABO and RhD blood groups and gestational hypertensive disorders.

Material and methods: The study was a case control study undertaken in the Department of Obstetrics and Gynecology of a tertiary care teaching hospital in Chennai from July 2015 to April 2015. All the pregnant women diagnosed with gestational hypertensive disorders in the study setting were the cases. Antenatal women without gestational hypertension were the control group.

Results:

A total of 183 participants were included in the final analysis. 83 were pregnant women with gestational hypertension and 100 normal controls. Among 83 PIH cases majority were having pre-eclampsia (38.25%). 9 cases have severe eclampsia (4.91%), only 1 case (0.005%) with eclampsia and 3 cases were with chronic hypertension (0.016%). There was no statistically significant association of PIH and maternal age, gravida, para. Non O-blood groups have high risk of PIH than O-blood group (P=0.639) and RhD positive pregnant women have high risk of PE than the RhD negative mothers (P=0.153).

Conclusion: Among ABO blood groups non O- blood groups have high risk of gestational hypertensive disorders than O blood group. RhD positive pregnant have significantly higher risk PIH than RhD negative mothers. Other factors like maternal age, gravida, para are not significant association with gestational hypertension disorders.

Key words

ABO, RhD, Gestational hypertension.

Introduction

As per the reported literature, hypertension is the very common problem facing by pregnant women [1, 2]. Nowadays in developing countries nearly 16% maternal deaths were caused by gestational hypertensive disorders [3]. According to ASSHP, NHBPEP [1, 4], WHO and Canadian hypertension society [2, 5] hypertensive disorders are of 4 types: chronic hypertension, preeclampsia-eclampsia, preeclampsia superimposed on chronic hypertension, and gestational hypertension [1].

Among the gestational hypertensive disorders Preeclampsia is major causative agent for the maternal mortality [6]. A number of risk factors have been associated with the PE development, including previous history of PE, preexisting diabetes, multiple pregnancy, null parity, previous raised blood pressure and raised body mass index before pregnancy [6-8].

Etiological information of the PE was still uncertain, as per few old studies reported by Roberts, et al. [9]; Than NG, et al. [10] changes in vascular ischemic function which is related with ABO blood group may cause Pre-eclampsia. Currently, it is recognized that ABO blood group may impact hemostatic balance, having the non-O blood groups (A, B or AB) subjects an increased risk for thrombus formation when compared to those of O blood group. An association between ABO blood groups, vascular diseases and thrombotic disorders [11-13] has also been shown in several studies outside pregnancy, this including venous thrombosis and hormone therapy in post menopause women [14-16].

Few existing studies of available literature stated that the pregnant women having O group blood have less risk of PE than non-O blood groups [12, 17-19]. Even though non-O blood groups have high risk of gestational hypertensive disorders, especially AB + ve group, etiological information of the gestational hypertensive disorders is still uncertain. Our study is aimed to find the effect of ABO and RHD groups on gestational hypertensive disorders.

Objectives

- To determine the association between gestational hypertensive disorders with ABO and RhD blood groups

Materials and methods

Study design: The study was a case control study.

Study setting: The study was undertaken in the department of obstetrics and gynecology of a tertiary care teaching hospital in Chennai from July 2015 to April 2015

Study population: All the pregnant women diagnosed with gestational hypertensive disorders in the study setting were the cases. Antenatal women without gestational hypertension were the control group.

Inclusion and exclusion criteria: All the antenatal women were included without any age restriction. Pregnant women conceived after in vitro fertilization, on steroid therapy were excluded from the study.

Sample size and sampling methods: A total of 80 pregnant women with gestational hypertension and 100 normal controls were included in the study. Cases were recruited sequentially in to the study after screening for compliance with inclusion and exclusion criteria,

hence no sampling was done. Controls were selected by systematic random sampling basing on their hospital registration number.

Ethical issues: Approval of the Institute Human Ethics committee was obtained. Informed written consent was obtained from all the participants, after explaining the objectives of the study, risks and benefits involved. The personal details of the patients were kept confidential throughout the study.

Statistical analysis: Presence or absence of gestational hypertension was the primary outcome variables variable. ABO and RH blood group type was considered as primary explanatory variable. Sociodemographic parameters like age, obstetric parameters like parity etc. were considered as other explanatory variables. The baseline parameters were compared between the cases and controls, using frequency and percentage for categorical variables. The association between the explanatory and outcome variables was assessed by calculating P value. Chi square test was used to test the statistical significance of the association. P value 0.05 was considered as statistically significant. IBM SPSS version 21 was used for statistical analysis.

Results

A total of 183 participants were included in the final analysis, out of which 100 were Normal controls and the remaining 83 were pregnant ladies with gestational hypertension (PIH) cases. Among 83 PIH cases majority were having pre-eclampsia (38.25%). 9 cases have severe eclampsia (4.91%), only 1 case (0.005%) with eclampsia and 3 cases were with chronic hypertension (0.016%) as per **Table – 1**.

Majority of the Gestational hypertension cases were distributed between 21 years to 25 years and 26 to 30 years (37.30% and 45.80%). Only one case is reported above 35 years (1.20%). The association of age and gestational hypertension was statistically not significant (P=0.361). Majority of the PIH cases have Gravida 1 (48.20%) and Para 0 (61.40%). But the

association was not statistically significant (P = 0.348 and 0.205). In most of the pregnant women pregnancy was continued, abortions were less than 20% both in Cases and controls but the association was not statistically significant (P = 0.339) as per **Table – 2**.

Majority of the study participants i.e. nearly 40.4% have O group, 33.3% pregnant women were from B group, 20.2% were belongs to A group only 6.0% were having ABO blood group. Nearly 95.1% study population were RH positive (**Table - 3**).

Almost equal distribution of cases and controls in B group (33.70%: 33.00%). Slightly higher percentage of controls (21% and 42%) were belongs A and O blood groups than the Gestational hypertensive cases (19.30% and 38.6%) respectively. But the cases from ABO blood group are double than the controls (8.4%: 4%). Most of the cases were RH positive group (97.6%) but in controls slightly lower (93%) than cases. But the association of blood groups gestational hypertension was not statistically significant (P = 0.15) as per **Table – 4**.

Discussion

Few existing studies have evidenced that gestational hypertensive disorders are related with Mothers blood group. As per available literature pregnant women with non AB blood groups have high risk of gestational hypertensive disorders, but its etiology is uncertain [9, 10, 12, 17, 18, 20-22]. Our study has focused on effect of pregnant women blood group on gestational hypertensive disorders and its association with RhD group.

Current study findings reveal that among 183 study participants 100 are normal controls and 83 pregnant ladies are of gestational hypertension. 38.25% cases are with pre-eclampsia, 4.91% were severd eclampsia cases, 0.005% were eclampsia cases and 0.016% are with chronic hypertension. Similar findings were reported by Hutcheon, et al. [6] and Lee, et al. In the study of

Hutcheon, et al. [6], 3% of cases were pre-eclampsia and remaining all other hypertensive disorders were observed in 10% of cases. In the study of Lee, et al. [18] out of total study participants (n = 641926) 6.1% of people were

with gestational hypertensive disorders. Among the gestational hypertensive disorders 4.6% were with pre-eclampsia and 1.3% were with severe pre-eclampsia.

Table - 1: Description of study population (N=183).

| Parameter | Frequency | Percentage |
|--------------------------|-----------|------------|
| Normal | 100 | 54.6 |
| Gestational hypertension | 83 | 45.40 |
| • Pre eclampsia | 70 | 38.25 |
| • Severe pre eclampsia | 9 | 4.91 |
| • Eclampsia | 1 | 0.0054 |
| • Chronic hypertension | 3 | 0.016 |

Table - 2: Comparison of demographic and obstetric parameters between the study groups.

| Parameter | Normal (N=100) | PIH (N=83) | P value |
|------------------------------|----------------|-------------|---------|
| I. Age groups (Years) | | | |
| 20 and < 20 | 6 (6.00%) | 4 (4.80%) | 0.361 |
| 21 to 25 | 47 (47.00%) | 31 (37.30%) | |
| 26 to 30 | 31 (31.00%) | 38 (45.80%) | |
| 31 to 35 | 15 (15.00%) | 9 (10.80%) | |
| > 35 | 1 (1.00%) | 1 (1.20%) | |
| II. Gravida rev | | | |
| 1 | 44 (44.00%) | 40 (48.20%) | 0.348 |
| 2 | 41 (41.00%) | 26 (31.30%) | |
| 3 | 15 (15.00%) | 17 (20.50%) | |
| III. Para | | | |
| 0 | 53 (53.00%) | 51 (61.40%) | 0.205 |
| 1 | 44 (44.00%) | 29 (34.90%) | |
| 2 | 1 (1.00%) | 3 (3.60%) | |
| 3 | 2 (2.00%) | 0 (0.00%) | |
| IV. Abortions | | | |
| 0 | 84 (84.00%) | 67 (80.70%) | 0.339 |
| 1 | 13 (13.00%) | 13 (15.70%) | |
| 2 | 1 (1.00%) | 3 (3.60%) | |
| 3 | 2 (2.00%) | 0 (0.00%) | |

In the current study, 83.1% of the gestational hypertension cases were distributed between the age of 21 to 30 years only one case present above 35 years. Association of maternal age and PIH

was not statistically significant (P = 0.361). Association of gravida, para of mother with PIH also not statistically significant (P=0.348 and 0.205). Abortions of PIH cases

also only 20%.and the association was not statistically significant (P=0.339). Similar observations were found in the studies of Spinnilo, et al. [23] and Hiltunen, et al. [17]. In the study of Spinnilo, et al. maternal age was 27.7±5.2 and only one primi gravid pregnancy was reported.

In the current study, nearly 40.4% of the study participants are belongs to O group, B and A group pregnant women are 33.3%, 20.2% respectively whereas 6.0% were having ABO blood group. Nearly 95.1% study population

were RH positive. In B blood group both cases and controls are nearly in same distribution (33.70%:33.00%). But the gestational hypertension cases are slightly lower than controls (21% and 42%) in A and O blood groups (19.30% and 38.6%) respectively. But the cases from ABO blood group are double than the controls (8.4%: 4%). Most of the PIH cases were RH positive group (97.6%) but in controls slightly lower (93%). The association of blood groups both ABO and RHD with gestational hypertension was not statistically significant (P=0.639 and P=0.153).

Table - 3: Descriptive analysis of type of gestational hypertension and ABO and RH blood group in study population.

| Parameter | Frequency | Percent |
|-------------|-----------|---------|
| ABO | | |
| A | 37 | 20.2 |
| AB | 11 | 6.0 |
| B | 61 | 33.3 |
| O | 74 | 40.4 |
| RH | | |
| RH Positive | 174 | 95.1 |
| RH negative | 9 | 4.9 |

Table - 4: Association between gestational hypertension and ABO/ Rh blood group.

| Parameter | Normal | PIH | P value |
|--------------------|-------------|-------------|---------|
| I.ABO | | | |
| A | 21 (21.00%) | 16 (19.30%) | 0.639 |
| AB | 4 (4.00%) | 7 (8.40%) | |
| B | 33 (33.00%) | 28 (33.70%) | |
| O | 42 (42.00%) | 32 (38.60%) | |
| II.RH | | | |
| RH Positive | 93 (93.00%) | 81 (97.60%) | 0.153 |
| RH Negative | 7 (7.00%) | 2 (2.40%) | |

Our Study findings are comparable with the findings of Lee, et al. [24] and Hiltunen, et al. [17]. Lee, et al. [24] in their study concluded that non-O blood groups have high risk of pre eclamsia than O group, odds ratio are significantly higher. AB blood group has high

sensitivity for PE and severe pre-eclampsia (OR=1.10, 95% CI 1.04-1.16) and (OR = 1.18, 95% CI 1.07–1.30).When compared to Rhd negative pageants RhD positive were have high risk of PE (OR = 1.07, 95%CI 1.03–1.10).

In the study of Hiltunen, et al. [17] 41.9% were from A blood group, 16.1% pregnant from B group, 12.9% from AB blood group and from O group 29.1% were involved. 87.1% PIH cases were RhD positive. AB blood group had significantly high risk of PE than other blood groups. The association of PE with AB blood group was having adjusted OR: 2.03; and 95% CI = 1.49 to 3.9.

Conclusion

Among ABO blood groups non O- blood groups have high risk of gestational hypertensive disorders than O blood group. RhD positive pregnant have significantly higher risk PIH than RhD negative mothers. Other factors like maternal age, gravida, para are not significant association with gestational hypertension disorders.

References

1. Mammaro A, Carrara S, Cavaliere A, Ermito S, Dinatale A, Pappalardo EM, et al. Hypertensive Disorders of Pregnancy. *Journal of Prenatal Medicine*, 2009; 3(1): 1-5.
2. Brown MA, Lindheimer MD, de Swiet M, Assche AV, Moutquin J-M. The classification and diagnosis of the hypertensive disorders of pregnancy: statement from the International Society for the Study of Hypertension in Pregnancy (ISSHP). *Hypertension in pregnancy*, 2001; 20(1): ix-xiv.
3. Khan KS, Wojdyla D, Say L, Gulmezoglu AM, Van Look PF. WHO analysis of causes of maternal death: a systematic review. *Lancet (London, England)*, 2006; 367(9516): 1066-74.
4. Report of the National High Blood Pressure Education Program Working Group on High Blood Pressure in Pregnancy. *American journal of obstetrics and gynecology*, 2000; 183(1): S1-S22.
5. Helewa ME, Burrows RF, Smith J, Williams K, Brain P, Rabkin S. Report of the Canadian Hypertension Society Consensus Conference: Definitions, evaluation and classification of hypertensive disorders in pregnancy. *Canadian Medical Association Journal*, 1997; 157(6): 715-25.
6. Hutcheon JA, Lisonkova S, Joseph KS. Epidemiology of pre-eclampsia and the other hypertensive disorders of pregnancy. *Best practice & research Clinical obstetrics & gynaecology*, 2011; 25(4): 391-403.
7. Kaaja R. Predictors and risk factors of pre-eclampsia. *Minerva ginecologica*, 2008; 60(5): 421-9.
8. Duckitt K, Harrington D. Risk factors for pre-eclampsia at antenatal booking: systematic review of controlled studies. *BMJ (Clinical research ed)*, 2005; 330(7491): 565.
9. Roberts JM, Hubel CA. The two stage model of preeclampsia: variations on the theme. *Placenta*, 2009; 30: 32-7.
10. Than NG, Romero R, Meiri H, Erez O, Xu Y, Tarquini F, et al. PP13, maternal ABO blood groups and the risk assessment of pregnancy complications. *PloS one*, 2011; 6(7): e21564.
11. Baudouy D, Mocerri P, Chiche O, Bouvier P, Schouver ED, Cerboni P, et al. B blood group: A strong risk factor for venous thromboembolism recurrence. *Thrombosis research*, 2015; 136(1): 107-11.
12. Franchini M, Mengoli C, Lippi G. Relationship between ABO blood group and pregnancy complications: a systematic literature analysis. *Blood transfusion = Trasfusione del sangue*, 2016; 1-8.
13. Vasan SK, Rostgaard K, Majeed A, Ullum H, Titlestad KE, Pedersen OB, et al. ABO Blood Group and Risk of Thromboembolic and Arterial Disease: A Study of 1.5 Million Blood Donors. *Circulation*, 2016; 133(15): 1449-57.
14. Golovachev GD, Slozina NM. ABO system and the various clinical forms of

- pregnancy toxicoses. *Akusherstvo i ginekologiya*, 1973; 49(12): 20-3.
15. Mittiga M. Nephropathies in pregnancy and materno-fetal incompatibility in Rh and ABO factors. *La Clinica ostetrica e ginecologica*, 1952; 54(5): 271-8.
 16. Wu O, Bayoumi N, Vickers MA, Clark P. ABO(H) blood groups and vascular disease: a systematic review and meta-analysis. *Journal of thrombosis and haemostasis: JTH*, 2008; 6(1): 62-9.
 17. Hiltunen LM, Laivuori H, Rautanen A, Kaaja R, Kere J, Krusius T, et al. Blood group AB and factor V Leiden as risk factors for pre-eclampsia: a population-based nested case-control study. *Thrombosis research*, 2009; 124(2): 167-73.
 18. Lee B, Zhang Z, Wikman A, Lindqvist P, Reilly M. ABO and RhD blood groups and gestational hypertensive disorders: a population-based cohort study. *BJOG: An International Journal of Obstetrics & Gynaecology*, 2012; 119(10): 1232-7.
 19. Harlap S, Davies AM. Letter: Maternal blood group A and pre-eclampsia. *British medical journal*, 1974; 3(5924): 171-2.
 20. Clark P, Greer IA. The influence of maternal Lewis, Secretor and ABO(H) blood groups on fetal growth restriction. *Journal of thrombosis and haemostasis: JTH*, 2011; 9(12): 2411-5.
 21. Clark P, Walker ID, Govan L, Wu O, Greer IA. The GOAL study: a prospective examination of the impact of factor V Leiden and ABO(H) blood groups on haemorrhagic and thrombotic pregnancy outcomes. *British journal of haematology*, 2008; 140(2): 236-40.
 22. Clark P, Wu O. ABO(H) blood groups and pre-eclampsia. A systematic review and meta-analysis. *Thrombosis and haemostasis*, 2008; 100(3): 469-74.
 23. Spinillo A, Capuzzo E, Baltaro F, Piazzini G, Iasci A. Case-control study of maternal blood group and severe pre-eclampsia. *Journal of human hypertension*, 1995; 9(8): 623-5.
 24. Lee BK, Zhang Z, Wikman A, Lindqvist PG, Reilly M. ABO and RhD blood groups and gestational hypertensive disorders: a population-based cohort study. *BJOG: an international journal of obstetrics and gynaecology*, 2012; 119(10): 1232-7.