International Journal of Research in Medical Sciences
Yadav BS et al. Int J Res Med Sci. 2018 May;6(5):1519-1524
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: http://dx.doi.org/10.18203/2320-6012.ijrms20181451

Original Research Article

A case control study on s. uric acid and s. creatinine level in pre-eclampsia patients of a tertiary care hospital in Jabalpur district of Central India

Bhagwan S. Yadav[1]*, Sharad K. Jain[1], Neelam A. Toppo[2], Chanchlesh Dehariya[1]

[1]Department of Pathology, NSCB Medical College Jabalpur, Madhya Pradesh, India
[2]Department of Community Medicine, NSCB Medical College Jabalpur, Madhya Pradesh, India

Received: 01 March 2018
Revised: 25 March 2018
Accepted: 28 March 2018

***Correspondence:**
Dr. Bhagwan S. Yadav,
E-mail: drbhagwan4@gmail.com

ABSTRACT

Background: Pre-eclampsia is a multisystem disorder of pregnancy which is characterized by hypertension with proteinuria after 20 weeks of gestation in previously normotensive and non proteinuric pregnant women. Pre-eclampsia associated with intrauterine growth retardation, preterm birth, maternal and perinatal death. Serum creatinine and uric acid has been shown to play a significant role in the pathogenesis of the disease and often precede clinical manifestations. This study compares the serum creatinine and uric acid in pre -eclampsia case and normal pregnant women and to assess its role in pre-eclampsia.
Methods: 158 patients of which 79 pre-eclampsia (cases) and 79 (controls) were selected randomly and were matched with their gestational age in patient who Attending ANC clinic at Department of Obstretics and Gynecology in March 2016 to August 2017. Lipid profile was estimated by the Randox imola is a compact fully automated clinical chemistry analyser.
Results: Authors observed that pre-eclampsia is more common in young age pregnant women with low socioeconomic status with strenuous activities. The mean age was 24.51±3.707 years. The mean serum creatinine and urice acid value is analysed in pre-eclampia cases and compared with control group showing significantly increase ($p<0.0001$).
Conclusions: Young age, nullyparity, low socio economic status specially labour occupation, with derangment of Serum creatinine in pregnant women were found to be more prone to develop pre-eclampsia. Proper history tacking, examination and estimation of serum creatinine and uric acid may be helpful for early diagnosis and management of pre–eclampsia in order to prevent fetal and maternal complications especially in nulliparous women.

Keywords: Pre-eclampsia, Serum reatinine, Urice acid

INTRODUCTION

Pre-eclampsia is a multisystem disorder of pregnancy which is characterized by hypertension (blood pressure >140/90mmHg) with proteinuria (urinary protein excretion of >300mg in 24 hours urine) after 20 weeks of gestation in previously normotensive and non proteinuric pregnant women. Pre-eclampsia has been associated with intrauterine growth retardation, preterm birth, maternal and perinatal death.[1]

Pre-eclampsia occurs in 7-10% of pregnancies worldwide. In India the incidence is reported to be high approx 8-10% of the pregnancies women in developed

countries have an average life time risk of dying from pregnancy related causes of between 1 in 4000 and 1 in 10000, whereas women in developing countries have a risk that is between 1 in 15 and 1 in 50.[2,3]

In non interventioned, pre-eclamptic cases may progress further to the dreaded complications like; eclampsia, HELLP syndrome, pulmonary edema, abruption placentae, postpartum circulatory collapse, acute renal failure, hepatic rupture, cerebral haemorrhage and visual disturbances including death. These conditions are also a major cause of neonatal morbidity and mortality.[4]

The increase in uric acid level appears to coincide with the increase in the blood pressure and proceed the development of proteinuria. Uric acid levels have been used for early diagnosis of pre-eclampsia. A disproportionate fall in uric acid clearance is a key feature of preeclampsia.[5] The serum level of uric acid rises as pre-eclampsia progresses; a level >5.5mg/dL is a strong indicator of the disease and a level >7.8mg/dL is associated with significant maternal morbidity. The degree of uric acid elevation correlates with the severity of proteinuria and renal pathological changes, and with fetal demise. Recent studies suggest that hyperuricemia may also play a pathogenic role by contributing to the vascular damage and hyper-tension.[6]

This study is designed to evaluate the serum creatinine and uric acid in pre-eclampsia women and compared them with normal pregnant women (control group).

METHODS

158 patients 79 pre-eclampsia (cases) and 79(controls) were selected for the present study by simple random sampling method during the study period of 1st March 2016 to 31st Aug 2017 (1year and 6 month) all patients were evaluated for the lipid profile and serum uric acid.

Sampling method and Source of data

Patients Attending ANC clinic at Department of Obs and Gynae, N.S.C.B. Medical College and Hospital, Jabalpur, who fulfil the inclusion criteria were selected for study, after obtaining the written informed consent. Study variable included Demographic data, family and personal History of pre-eclampsia, hypertension, diabetes mellitus etc. and Investigations details was recorded in the study proforma.

After consent 5ml of blood was drawn under aseptic precaution from antecubital vein and collected in a EDTA and a plane tube.

Serum creatinine and uric acid was measured using the Randox imola is a compact fully automated bench-top clinical chemistry analyser.

Inclusion criteria

All the pre-eclampsia patient [hypertension (blood pressure >140/90mm Hg) with proteinuria (urinary protein excretion of >300mg in 24 hours urine) after 20 weeks of gestation in previously normotensive and nonproteinuric pregnant women].

Exclusion criteria

- Age >35year
- Eclampsia
- Obesity
- Family history of hyperlipidaemia.
- Diabetics before pregnancy.
- Patient with known hypertension, Renal disorders, liver disorder, thyroid disease, collagen vascular disease, patient taking drugs which alters thyroid and lipid metabolism.

Statistical analysis

The statistical analysis was carried out by using SPSS 20 software of windows. Appropriate univariate and bivariate analysis was carried out using Student's t-test and chi -square test for categorical data by a statistician.

All means are expressed as mean±standard deviation and the proportion as in percentage (%). The critical value for the significance of the results will be considered <0.05 level.

RESULTS

In this present study total 158 cases were included. 79 were presented with Pre-eclampsia and 79 included as control group with normal pregnancy. Results of different risk factors of pre-eclampsia were found as follows

Age wise distribution of pre-eclampsia

Age wise distribution of Pre-eclampsia among case and control group. These cases and controls were divided in 4 groups (<20, 20-24, 25-29, 30-34).

Table 1: Age wise distribution of Pre-eclampsia among case and control group.

Age group	Group		Total
	Case	Control	
<20 year	4(5.10%)	4(5.06%)	8(5.20%)
20-24 year	37(46.80)	43(54.43)	78(50.64%)
25-29 year	26(32.60%)	26(32.91%)	50(32.64%)
30-34 year	12(15.20%)	6(7.59%)	18(11.70%)
Total	79	79	158

χ^2=3.007; p<0.05

According Table 1 high proportion of pre-eclampsia was observed in 20-24 and 25-29 years of age group

compared to other groups. Mean age of pre-eclamptic patients was 24.51±3.70 years.

Parity in relation of pre-eclampsia

As per the Table 2, higher % of pre eclampsia was seen in nulliparous women (68.4%) compared to multiparous women (31.6%). Odd ratio 1.44 indcates nulliparous women having high risk to develop pre-eclampsia compered to multiparous women.

Table 2: Distribution of case and control according to parity.

Parity	Case	Control
Nullipara	54(68.4%)	48(60%)
Multipara	25(31.6%)	31(40%)
Total	79	79

Odd ratio (OR)=1.44, lower limit (LL)=0.7428, upper limit (UL)=2.791 Relative risk (RR)=1.20, lower limit (LL)=0.94, upper limit (UL)=1.53

Occupational status of pre-eclampsia patient

Graph 01 showing that most of the women whether Pre eclampsia or normal pregnant women mostly belonged to labour groups.

Blood pressure (diastolic and systolic)

As shown in Table 3 significant difference was observed in both diastolic and systolic blood pressure of pre-eclampsia case and control group (p<0.0001).

Table 3: Distribution of case and control as per diastolic and systolic blood pressure.

Parameter (mm Hg)	Study group (n=79) (mean±SD)	Control group (n=75) (mean±SD)	P value
Diastolic blood pressure	100.51±14.22	73.79±6.44	<0.0001
Systolic blood pressure	158.91±17.82	118.22±7.11	<0.0001

Uric acid

As per Table 4 the distribution of serum uric acid amongst pre-eclampsia and normal group. High s. uric acid >6mg/dl was observed in (92.4%) cases while, only 7.6% pre-eclampsia showed normal s. uric acid value. In normal group 51.9% cases showed normal s. uric acid value, while 48.1%cases showed high s. uric acid value. And mean s. uric acid value is also significantly high in pre-eclampsia, in comparison to the normal control group with p value is <0.0001.

Serum creatinine

According to Table 5 the distribution of serum creatinine among pre-eclampsia and normal group, high S. creatinine (>1.2mg/dl) was observed in 19.0% cases, while none were there in control group. The mean value of Creatinine showing significantly high S. Creatinine in pre-eclampsia, in comparison to the control group (P value <0.0001).

DISCUSSION

Pre-eclampsia adversely affects the maternal and fetal outcome due to its wide spread multi organ involvement. In this study authors have observed a correlation between uric acid and S.creatinine and the development of pre-eclampsia.

In this present study we found (Table 1) pre -eclampsia more prevalent among patient in age gorop20 to 25 (46.80%). Similar finding reported by Zibaeenazhad et al, Sheraz et al, Kumar et al, and Duckitt et al.[7-10]

Factor influencing the development of pre-eclampsia before 20 years of age as reported by Walker may be due to initial trophoblastic invasion and how the mother reacts to it. The failure of the normal invasion of trophoblastic cells leads to mal adaptation of the spiral arterioles, which are related to the causation of pre-eclampsia.[11]

Pre-eclampsia is often experienced by young and nulliparous women (OR=1.44, RR=1.20) whereas the older women at risk for having chronic hypertension with superimposed pre-eclampsia. The proportion of pre-eclampsia in multiparous was also varied but lower than nulliparaous (Table 1 and 2).[12]

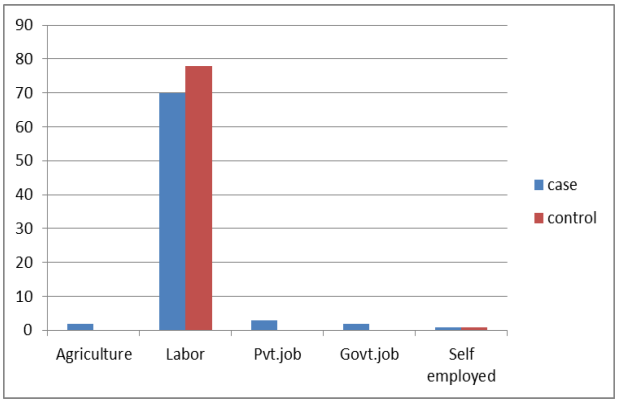

Figure 1: Occupation of case and control groups.

As per the Figure 1 study suggesting an association between the low socio-economy with pre-eclampsia as most of the women belonged to labour class. It is evident that, the labour class with strenuous work had high risk of having pre eclampsia. The possible causes of high incidence of pre-eclampsia in this group could be

illiteracy, un-awareness, and poor approach to medical aid etc.

This finding is similar to what was found by Abubakar Attahir et al, and Dlamini et al, where they also found that poverty in adults is associated with severity and risk of developing pre-eclampsia among women in developing countries.[13,14] Our finding is distinct with the studies of Gudmundsson who found that the risk and severity of pre-eclampsia is not associated with poverty among women. This study was conducted in developed country.[15]

In this study authors have observed that S. uric acid level significantly increase in pre-eclampsia patients compered to control group($p<0.001$) (Table 4).

Table 4: Serum uric acid (mean±SD) in case and control group.

Parameter (mg/dl)	Study group (n=79) (mean±SD)	Control group (n=79) (mean±SD)	T value	P -value
S. uric acid	7.34±1.68	3.86±0.72	16.2929	<0.00001

$\chi^2=127.836$; $p<0.0001$

Table 5: Serum creatinine (mean±SD) in case and control group.

Parameter (mg/dl)	Study group (n=79) (mean±SD)	Control group (n=79) (mean±SD)	T value	p-value
S. creatinine	1.21±0.47	0.90±0.29	5.99632	<0.0001

$\chi^2=15.777$; $p<0.0001$

This study results also show agreement with other studies like Nirula et al, Sharma et al, elevated serum uric acid often precedes clinical manifestations of the disease.[16,17] Bainbridge et, al observed hyperuricemia in 75% of women with clinically diagnosed pre-eclampsiasimilar to present study which was 73% (Table 6).[18]

Table 6: S. Uric acid level compression with other study in pre-eclampsia patient.

Study	Serum uric acid	P value
Niraula et al[16]	5.46±1.51	P<0.001
Sharma et al[17]	7.52±0.772	P <0.001
Present study	7.34±1. 68	P <0.001

Table 7: S. creatinine level compression with other study in pre-eclampsia patient.

Study	Serum creatinine	P value
Israa A MJ et al[21]	1.045±0.14 mg/dl	P<0.05
Patil et al[22]	1.09±0.23mg/dl	P <0.05
Present study	1.21±0.47 mg/dl	P <0.001

In preeclampsia, elevations in serum uric acid beyond the normal gestational concentration are likely influenced by changes in maternal renal function (e.g., increased tubular reabsorption) and uric acid production; however, the fetus and placenta may play additional roles. One proposed mechanism by which the placenta may contribute to uric acid production is via hypoxia-induced changes in the production and activity of xanthine oxidase/dehydrogenase.[19]

Increased uric acid concentration may therefore be a better marker of poor placental perfusion and subsequent fetal hypoxia than maternal distress. There is also in vitro evidence for effects of uric acid that might contribute to adverse fetal outcomes. In these studies, uric acid reduced placental amino acid transport, trophoblast invasion, and incorporation of trophoblast into endothelial monolayers.[18,20]

We also found that S. Creatinine level in increase in pre-eclamptic patient compared to control was 1.21±0.47, which was statistically significant $P<0.0001$ (Table 5).

These results were compatible with the observations of Israa A MJ et al, and Patile et al, and Salako et al, who found that no significant difference in the mean value of creatinine in pre-eclamptic and normotensive pregnant women (Table 7).[21-23]

Increase serum creatinine observed in women with pre-eclampsia. these differences were significant compared with noromotensive pregnant women because pre-eclampsia is associated with a reduction in plasma renin activity (PRA) and plasma renin concentration (PRC) if compared with normal pregnancy while the circulating level of angiotensin II may be normal during pre-eclampsia.[24,25] Other studies found that reducing uteroplacental perfusion pressure could increase the renal sensitivity to angiotensin II through reduction in (nitric oxide) NO or prostacyclin synthesis or by enhanced formation of TXA2 and endothelin.[26]

The enhanced responsiveness leads to a significant elevation in total peripheral resistance and marked reduction in renal blood flow.[27] Recent studies showed that the systemic and renal vasoconstriction in pre-eclampsia is due to an increase in the serotonin level and enhanced sensitivity to serotonin.[28]

Other investigators found that the activity of mono amino oxidase (MAO) is lower and serotonin is higher in the placental tissue from women with pre-eclampsia as compared with placental tissue from normal pregnant women.[28,29] These factors lead to a reduction in renal perfusion in women with PIH, by an average of 20% and reduction in GFR by an average of 32% in comparison with normal pregnant women near term.[30] So, as a result of reduced GFR, serum creatinine levels rise above normal pregnancy levels.[31]

CONCLUSION

Authors have concluded that s. uric acid and s. creatnine level increase significantly in pre-eclampsia patients and some previous study also support this but few study showed that there is no correlation. There is need of further study that will conducted on large sample size to established these fact so that these parameter can be used in early diagnosis of pre- eclampsia and prevent maternal and fetal gravies complication, improve maternal and neonatal morbidity and mortality.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Sibai B, Dekker G, Kupferminc M. Pre-eclampsia. Lancet. 2005;365(9461):785-99.
2. Gohil JT, Patel PK, Gupta P. Lipid profile in patients of pre-eclampsia. Journal of Obstetrics and Gynaecology of India. 2011;61(4):399-403.
3. Duley L. Maternal mortality associated with hypertensive disorders of pregnancy in Africa, Asia, Latin America and the Caribbean. Br J Obstet Gynaecol. 1992;99:547-53.
4. Fernando A, Shrish ND, Amarnath GB. Hypertensive disorders of pregnancy. Practical guide to high risk pregnancy and delivery; 3rd Edition; 2008:398.
5. Saleh F, Shukar-ud-Din S, Soomro N. Serum uric acid as predictor model for preeclampsia. Pak J Surg. 2010;26(3):246-51.
6. Epstein FH, Karumanchi SA. Pregnancy and the Kidney. Nephrology Rounds 2005.Nov;3(9).
7. Zibaeenazhad MJ, Ghodsi M, Arab P, Gholzom N. The prevalence of hypertensive disorders of pregnancy in Shiraz, Southern Iran. Iranian Cardiovascular Research Journal. 2010;4:169-72.
8. Sheraz S, Shahzad S, Boota M. Eclampsia. Professional Medical Journal. 2006;13(1):27-31.
9. Kumar R, Gandhi S, Rao V. Socio-Demographic and Other Risk Factors of Pre Eclampsia at a Tertiary Care Hospital, Karnataka: Case Control Study. Journal of Clinical and Diagnostic Research. 2014;8(9):1-4.
10. Duckitt K, Harrington D. Risk factors for pre-eclampsia at antenatal booking: systematic review of controlled studies. Bmj. 2005 Mar 10;330(7491):565.
11. Walker JJ. Severe pre-eclampsia and eclampsia. Baillieres Best Pract Res Clin Obstet Gynaecol. 2000;14(1):57-71.
12. Cunningham GF, Leveno KJ, Bloom SL. William's obstetrics. 23rd Ed. Cambridge university press; 2010:706-747.
13. Abubakar A, Dikko A, Sufiyan MB, Salihu A, Rabiu A. Association between Maternal Socio–economic Status, Polygamy and Risk of Pre eclampsia in Rural Areas of Northern Nigeria Journal of Family and Reproductive Health. 2010;4(1):47-52.
14. Dlamini NJ. Factors associated with pre–eclampsia and quality care of affected teenagers during labor within health region H. in Kwa–Zulu Natal. 1997;20:16-22.
15. Gudmundsson S, Björgvinsdóttir L, Molin J, Gunnarsson G, Marsal K. Socioeconomic status and perinatal outcome according to residence area in the city of Malmö. Acta obstetricia et gynecologica Scandinavica. 1997 Apr 1;76(4):318-23.
16. Niraula A, Lamsal M, Majhi S, Khan SA, Pritha B. Significance of Serum Uric Acid in Pregnancy Induced Hypertension. Journal of the national medical association. 2017;109(3):198-202.
17. Sharma DK. International Journal of Clinical Biochemistry and Research. January-March 2015;2(1):18-21.
18. Bainbridge SA, Roberts JM. Uric Acid as a Pathogenic Factor in Pre-eclampsia. Placenta. 2008;(A):S67-72.
19. Many A, Hubel CA, Fisher SJ, Roberts JM, Zhou Y. Invasive cytotrophoblasts manifest evidence of oxidative stress in preeclampsia. Am J Pathol. 2000;156:321-31.
20. Bainbridge SA, Von Versen-Hoynck F, Roberts JM. Uric acid inhibits placental system. A amino acid uptake. Placenta. 2009;30:195-200.
21. Israa AMJ. Estimation of uric acid ,urea, creatinine and creatinine clearance in the serum of pre eclamptic women. Kerbala Journal of Pharmaceutical Sciences. 2012;4:183-9.
22. Patil S, Jyothi A, Babu A, Goud GK. A study on Liver function tests and Renal function tests in Preeclampsia. International Journal of Biomedical Research. 2016;7(10):713-7.
23. Salako BL, Odukogbe ATA, Olayemi O, Adedapo KS, Aimakhu CO, Alu FE, et al. serum albumin, creatinine, uric acid and hypertensive disorders of pregnancy. East African Medical Journal. 2003;80(8):424-8.
24. Shah DM. Role of the renin-angiotensin system in the pathogenesis of pre-eclampsia. American Journal of Physiology - Renal Physiology. 2005;288(4):614-25.
25. Irani RA, Xia Y. Renin angiotensin signaling in normal pregnancy and pre-eclampsia. Seminars in Nephrology. 2011;31(1):47-58.
26. Redman CW, Beilin LJ, Bonnar J. Renal function in pre-eclampsia J Clin Path. 2000;29(10):91-4.
27. Alexander BT, Bennett WA, Khalil RA, Granger JP. Pre-eclampsia: Linking Placental Ischemia with Cardiovascular-Renal Dysfunction. News Physiol. Sci. 2001;16:282-6.
28. Bolte AC, Geijna HP, Dekker GA. Pathophysiology of pre-eclampsia and the role of serotonin. European Journal of Obstetrics and Gynaecology and Reproductive Biology. 2001;95:12-21.

29. Davison JM, Homuth V, Jeyabalan A, Conrad KP, Karumanch SA, Quaggin S, et al. New Aspects in the Pathophysiology of Pre-eclampsia. Am Soc Nephrol. 2004;15:2440-8.
30. Reynolds C, Mabie WC, Sibai BM. Hypertensive state of Pregnancy, In: Decherney AH, Nathan L, Current obstetrics and Gynecology, 9th Ed, McGraw-Hill, USA; 2003:338-345.
31. Moldenhauer, JS. Hypertensive Disorder of Pregnancy In: Scott J, Gibbes RS, Karlen BY, Hanry AF, Danforth's obstetrics and Gynecology, 9th Ed, Lippincott Williams andWilkings, Philadelphia; 2003:257-260.

Cite this article as: Yadav BS, Jain SK, Toppo NA, Dehariya C. A case control study on s. uric acid and s. creatinine level in pre-eclampsia patients of a tertiary care hospital in Jabalpur district of Central India. Int J Res Med Sci 2018;6:1519-24.