Journal of Cardiovascular Disease Research

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 10, 2023

A descriptive study of biochemical changes as a predictor of severity of preeclampsia and associated maternal and fetal outcome at teritiary care centre

Dr.Gopal Ashok Gawali[1], Dr.Swati Kumara[2], Dr.Tripti Gupta[3]

[1]JR-I, Department OBGY, Rohilkhand Medical College and Hospital, Bareilly
[2]JR-I, Department OBGY Rohilkhand medical college and hospital Bareilly
[3]Professor, Department of OBGY, Rohilkhand medical college and hospital Bareilly

Received Date: 10/09/2023 ***Acceptance date: 25/10/2023***

ABSTRACT

Background: Globally each year, 5-7% of pregnancies are preeclampsia affected resulting approximately 70,000 maternal and 500,000 fetal deaths. Preeclampsia adversely affects the mother and fetus causing some severe complications including fetal growth restriction (FGR), preterm delivery and perinatal death whereas, maternal complications are linked to hypertension, acute kidney damage, stroke, cardiomyopathy, liver failure, pulmonary edema and death.There are various risk factors for preeclampsia such as previous history of preeclampsia, nulliparity, obesity, chronic hypertension, older age and diabetes mellitus. Preeclampsia is specified by increased arterial blood pressure and proteinuria, whereas, eclampsia is characterized by convulsion, coma or both in preeclamptic patients. **Aim & Objective: 1.** A descriptive study of biochemical changes as a predictor of severity of preeclampsia and associated maternal and fetal outcome at teritiary care centre.2. To study the maternal and fetal outcome. **Method: Study design:** Prospective study. **Study setting:** Department of OBGY Rohilkhand Medical College And Hospital Bareilly. **Study duration:** 1 year from November 2022 to August 2023. **Study population:** All patients coming to our institute during study period according to exclusion and inclusion criteria. **Sample size:** 100. **Results:** Majority of study participants were from 26-30 years age group e.g. 30 followed by 21-25,18-20,31-35 and > 35 years age group,29,18,16 and 7 cases respectively. most of the study subjects were primiparous contributing 72 (72%) and 28 (28%) were multipara. majority of subjects delivered through NVD 59,followed by LSCS 26 and AD 15 cases. normal live births were seen in 63 (63%) cases followed by Prematurity 17%, RDS 15%, Early neonatal death 3% and Still birth in 2 cases respectively. **Conclusions:** The current study findings suggest that serum ALT, ALP, total proteins and albumin levels were significantly different between mild and severe groups of preeclampsia, and these biochemical markers can be utilized to predict and assess the severity of preeclampsia.

Keywords: Preeclampsia, Biochemical marker, Maternal and fetal outcome

Corresponding Author: Dr.Gopal Ashok Gawali, JR-I, Department OBGY, Rohilkhand Medical College and Hospital, Bareilly.
Email gopalgawali9@gmail.com

Introduction:

Globally each year, 5-7% of pregnancies are preeclampsia affected resulting approximately 70,000 maternal and 500,000 fetal deaths. [1] Preeclampsia adversely affects the mother and fetus causing some severe complications including fetal growth restriction (FGR),

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 10, 2023

preterm delivery and perinatal death whereas, maternal complications are linked to hypertension, acute kidney damage, stroke, cardiomyopathy, liver failure, pulmonary edema and death.

There are various risk factors for preeclampsia such as previous history of preeclampsia, nulliparity, obesity, chronic hypertension, older age and diabetes mellitus. [2,3] Preeclampsia is specified by increased arterial blood pressure and proteinuria, whereas, eclampsia is characterized by convulsion, coma or both in preeclamptic patients.

Various changes in biochemical and haematological parameters are observed in preeclampsia as compare to the normal pregnancy. [4] Thus laboratory evaluation of pregnant women with hypertension is considered important to diagnosis and predict the occurrence of preeclampsia and its future consequences. The previous studies suggest that currently no individual marker is satisfactory for the prediction of preeclampsia occurrence and number of markers have been studied in search of the gold standard test that predict the severity of preeclampsia. [5]

Eclampsia is defined as the development of convulsions and/or coma unrelated to other cerebral conditions during pregnancy or in the post-partum period in patients with signs and symptoms of pre-eclampsia after 20 weeks of gestation[6] Eclampsia is an acute and life-threatening complication of pregnancy characterized by the appearance of tonic clonic seizures (convulsions), and or coma during pregnancy or labor or within 10 days of delivery, not due to epilepsy or other convulsion disorders associated with preeclampsia. [7]

In recent years, the new term "atypical preeclampsia-eclampsia" has been used to describe non-classical forms of hypertensive disorders arising during pregnancy. [8,9] Although there is no strict definition of atypical preeclampsia-eclampsia, it has come to include cases with minimal or no proteinuria, but with hypertension, or proteinuria with no or marginally elevated blood pressure (BP), or without hypertension or proteinuria.

Presentations before 20 weeks or more than 48 h postpartum, those resistant to MgSO4 therapy, and hemolytic anemia, elevated liver enzymes, and low platelets (HELLP) syndrome and its variants are also included in the atypical category usually in a woman who has developed pre-eclampsia.

Eclampsia includes convulsions and coma that happen during pregnancy but are not due to pre-existing organic brain disease[8] Approximately 1 in 2000 deliveries is complicated by eclampsia in developed countries, whereas the incidence in developing countries varies from 1 in 100 to 1 in 1700 cases[10]. Although the incidence and mortality from eclampsia has fallen dramatically over the past decades due to better antenatal care, the associated maternal and fetal morbidity and mortality is still significant[11]

Hypertensive disorders of pregnancy cause 14% of all maternal deaths globally, approximately 42,000 each year [12,13]. Nearly all of these deaths occur in low-resource settings (99%), with death in high-income settings being very rare [14]. Hypertensive disorders of pregnancy encompass chronic hypertension, gestational hypertension (newhypertension without proteinuria), pre-eclampsia (new hypertension with proteinuria or end-organ damage after 20 weeks of gestation [14], and eclampsia.

The majority of morbidity and mortality is associated with pre-eclampsia and eclampsia. It is estimated that the prevalence of preeclampsia globally is 4.6% (95% CI 2.7%–8.2%)[15].

Aim & Objective:

1. A descriptive study of biochemical changes as a predictor of severity of preeclampsia and associated maternal and fetal outcome at teritiary care centre.
2. To study the maternal and fetal outcome

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 10, 2023

MATERIAL AND METHODS

Study design: Prospective study

Study setting: Department of OBGY Rohilkhand Medical College And Hospital Bareilly

Study duration: 1 year from November 2022 to August 2023

Study population: All patients coming to our institute during study period according to exclusion and inclusion criteria

Inclusion criteria:

1. Pregnant women with a singleton pregnancy.
2. Gestational age -all in the second and third trimester , the gestational period ranging from 20 weeks and above, calculated from the first day of the last menstrual period.
3. All diagnosed to have preeclampsia based on the development of hypertension (BP greater than 140/90mmHg) in the pregnancy for the first time , proteinuria with or without oedema.

Exclusion criteria:

1. Pregnancy with renal diseases
2. Gestational trophoblastic disease
3. Pregnancy with chronic hypertension
4. Pregnancy with heart disease
5. Pregnancy with diabetes or GDM
6. Patients those who are not willing to participate in this study.

Approval for the study:

Written approval from Institutional Ethics committee was obtained beforehand. Written approval of OBGY and other related department was obtained. After obtaining informed verbal consent from all patients with the definitive diagnosis preeclampsia cases admitted to OBGY ward of tertiary care centre such cases were included in the study.

Sample Size: With reference to study by **Swain S et al (1993)[16]** He found that the 84% of preeclampsia cases developed eclampsia after delivery.

Formula for sample size = 4* P* Q / L2

Where P = 84%

Q = 100-84 = 16

L = Allowable error = 10% (Absolute error)

Sample size = 4 * 84*16/ 70.56 =76.19

Sample size Rounded to = 100

Sampling technique:

Convenient sampling technique used for data collection.

All patients admitted in OBGY ward of tertiary care center from November 2022 to August 2023 with preeclampsia were included in the study.

Methods of Data Collection and Questionnaire-

Predesigned and pretested questionnaire was used to record the necessary information. Questionnaires included general information, such as age, sex, Medical history- chief complain, past history, general examination, systemic examination.

Menstrual history: LMP, EDD, Obstetrics history-marriage duration, parity,Mode of delivery, maternal complications, Type of eclampsia- antepartum, intrapartum, postpartum, No ANC visits, Gestational age at the time of admission, Mode of delivery, Maternal Outcome, ALT, ALP, total proteins, albumin and globulin levels, Maternal complications. All the procedures and

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 10, 2023

investigations conducted under direct guidance and supervision of pg guide. Proforma of preeclampsia notes maintained.

Data entry and analysis: The data were entered in Microsoft Excel and data analysis was done by using SPSS demo version no 21 for windows. The analysis was performed by using percentages in frequency tables and correlation of preeclampsia $p<0.05$ was considered as level of significance using the Chi-square test

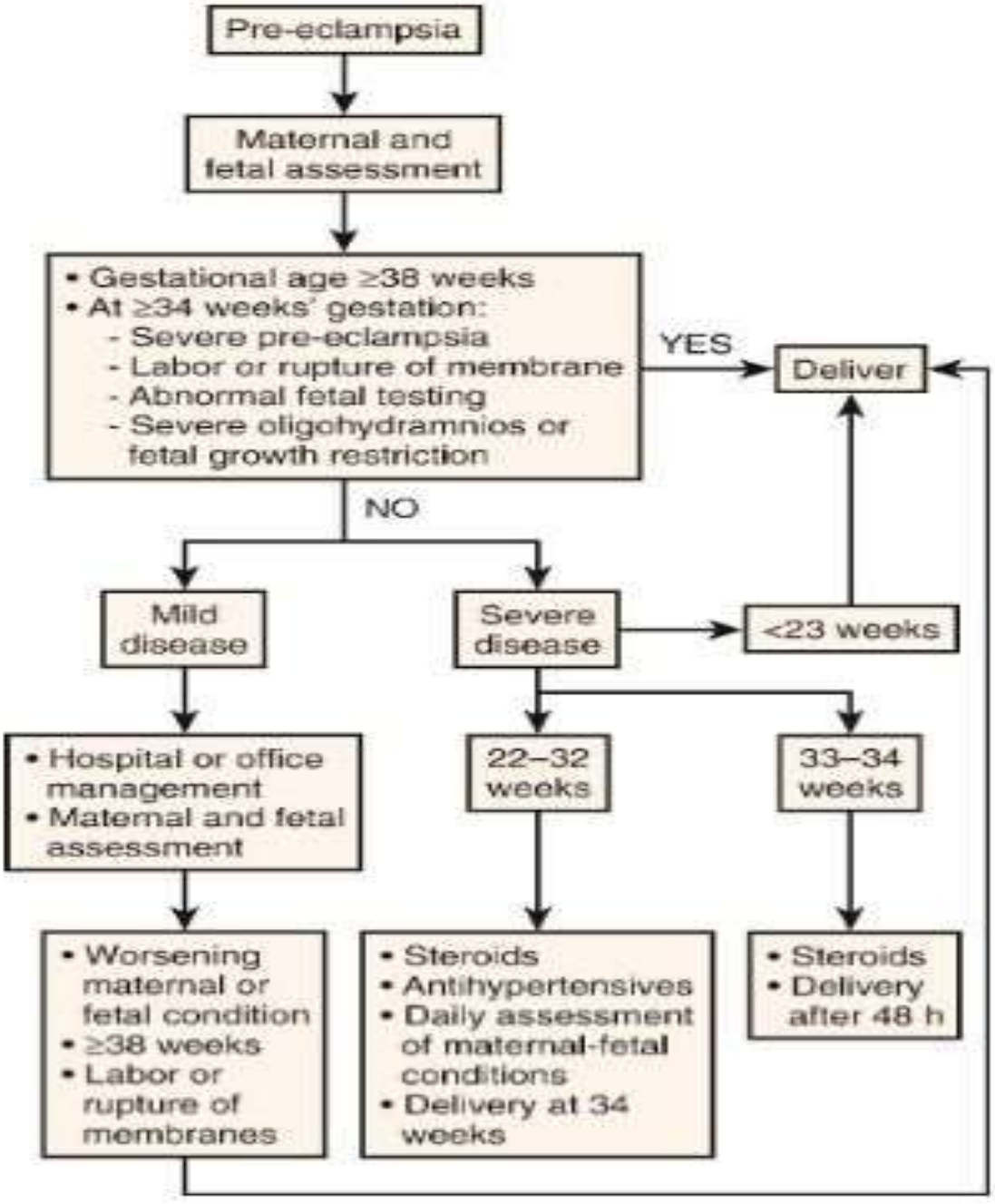

Image 1: Treatment Algorithm

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 10, 2023

Image 2: Danger signs of Eclampsia

RESULT AND OBSERVATIONS

This prospective study was conducted among 100 cases of preeclampsia admitted in OBGY department during study period

Table No.1: Distribution of study participants as per age (n=100)

Age (in Years)	Frequency	Percentage
18-20	18	18%
21-25	29	29%
26-30	30	30%
31-35	16	16%
>35	7	7%
Total	100	100%

Above table shows that, majority of study participants were from 26-30 years age group e.g. 30 followed by 21-25,18-20,31-35 and > 35 years age group,29,18,16 and 7 cases respectively.

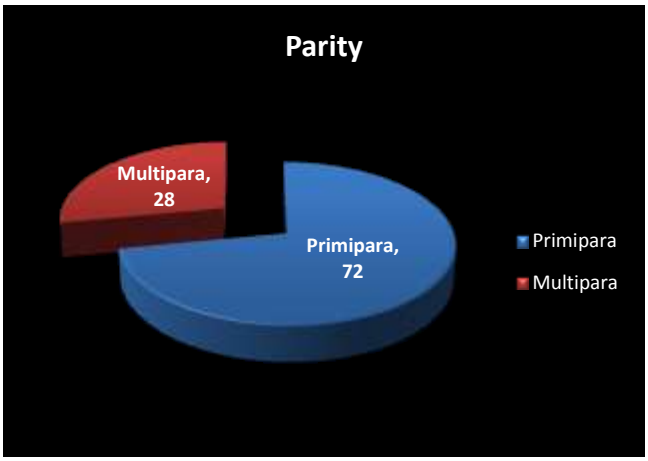

Figure No.1: Distribution of study subjects according to parity (n=100)

Above figure shows that, most of the study subjects were primiparous contributing 72 (72%) and 28 (28%) were multipara.

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 10, 2023

Table No.2: Laboratory investigations (N=100)

Lab Investigation	Sub group	Frequency	Percentage
Urine protein	1+	15	15
	2+	73	73
	3+	12	12
AST(UI/L)	<70	70	70
	≥70	30	30
Ser.Creatinine (µmol/L)	≤100	83	83
	>100	17	17
Platelets(10^3/mm^3)	≥100	20	20
	50-99	72	72
	<50	8	8

Above table shows that, 2+ proteinuria was present in most of study subjects (73%).Elevated liver enzymes (AST) was present in 30 % cases.KFT of 17 showed raised serum creatinine >100 µmol/L and thrombocytopenia was seen in 80 % of cases.

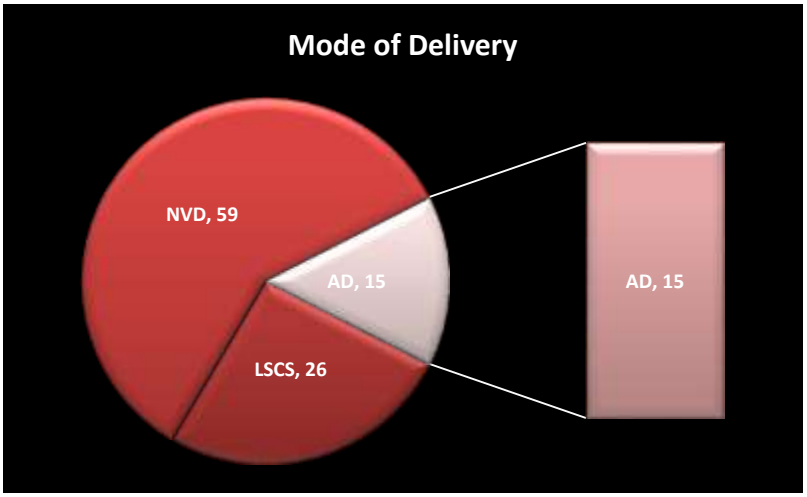

Figure No.2: Distribution of study subjects as per mode of delivery (n=100)

LSCS :Lower segment caeserian section ,NVD- Normal vaginal delivery, AD-Assisted delivery. Above figure shows that, majority of subjects delivered through NVD 59, followed by LSCS 26 and AD 15 cases.

Table No.3: Maternal complications in preeclampsia cases

Complication	Frequency	Percentage
Pulmonary oedema	**10**	**10**
PPH	**10**	**10**
DIC	**08**	**08**
HEELP Syndrome	**05**	**05**
CVA	**03**	**03**
Trauma	**03**	**03**
ARF	**02**	**02**
Hypertensive Crisis	**02**	**02**

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 10, 2023

PPH: Post partum haemmorahage, DIC: Disseminated intravascular coagulation, HEELP Syndrome: Hemolysis, Elevated liver enzymes and Low platelet, CVA: Cerebrovascular accident. ARF:Acute Renal failure

Above table shows that, Pulmonary oedema and PPH were most common complication in preeclampsia cases contributing 10 cases (10%) each followed by DIC (8%),HELLP syndrome (5%), CVA and trauma like toungue bite in 3% cases each and ARF and Hypertensive Crisis in 2% cases each respectively.

Table No.4: Perinatal outcomes in preeclampsia cases

Perinatal outcome	Frequency	Percentage
Live births	**63**	**63**
Prematurity	**17**	**17**
RDS	**15**	**15**
Early neonatal death	**3**	**3**
Still birth	**2**	**2**
Total	**100**	**100**

RDS: Respiratory distress syndrome

Above figure shows that, normal live births were seen in 63 (63%) cases followed by Prematurity 17%, RDS 15%, Early neonatal death 3% and Still birth in 2 cases respectively.

Table no: 5. Biochemical marker among mild and severe preeclampsia women

Biochemical marker	Severity of Preeclampsia		P value
Total bilirubin (mg/dL)	**Mild**	**0.53±0.34**	**1.45**
	Severe	**0.66±0.42**	
Alanine transaminase(IU/L)	**Mild**	**22.87±7.05**	**0.002**
	Severe	**41.19±39.61**	
Gamma glutamyl transferase (IU/L)	**Mild**	**14.93±9.67**	**0.67**
	Severe	**13.65±9.67**	
Alkaline phosphatase (IU/L)	**Mild**	**346.8±126.28**	**0.0001**
	Severe	**491.91±289.82**	
Total proteins (grams)	**Mild**	**7.1±1.32**	**0.0001**
	Severe	**6.18±1.24**	
Albumin (grams)	**Mild**	**3.61±0.56**	**0.0003**
	Severe	**3.21±0.56**	
Globulin (grams)	**Mild**	**3.5±0.94**	**0.010**
	Severe	**2.97±0.93**	

The above table shows significant differences were noted for, ALT,
ALP, total proteins, albumin and globulin levels between both groups ($P<0.05$)

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 10, 2023

DISCUSSION

This prospective study was conducted among 100 cases of preeclampsia to study various risk factors, maternal complications and perinatal outcomes in cases of preeclampsia at tertiary care centre. India is in the midst of a demographic and epidemiological transition characterized by a growing population, increasing urbanization and changes in lifestyle. The past decade has seen a dramatic increase in lifestyle-related non communicable diseases, including obesity, diabetes mellitus, hypertension, coronary heart disease, stroke, and cancers.

In present study, majority of study participants were from 26-30 years age group e.g. 30 followed by 21-25,18-20,31-35 and > 35 years age group,29,18,16 and 7 cases respectively. Similar result found in the study conducted by **Sarma HK et al**[17] found that, most (60 %) of the patients were between 20 – 25 years.

In current study Most of the study subjects were primiparous contributing 72 (72%) and 28 (28%) were multipara. A study by **Sarma HK et al(2014)**[17] found that, most of the preeclamptic patients were primigravida (85%).

In present study majority of subjects delivered through NVD 59,followed by LSCS 26 and AD 15 cases. A similar study by Akhtar R et al (2011)[18] revealed that, 63 % delivered by LSCS.

In present study found maternal complications Pulmonary oedema and PPH were most common complication in preeclampsia cases contributing 10 cases (10%) each followed by DIC (8%),HELLP syndrome (5%), CVA and trauma like toungue bite in 3% cases each and ARF and Hypertensive Crisis in 2% cases each respectively. similar result reported by **Ganesh KS et al (2010)**[19]

In Present study perinatal outcome revealed that, normal live births were seen in 63 (63%) cases followed by Prematurity 17%, RDS 15%, Early neonatal death 3% and Still birth in 2 cases respectively. Eclampsia not only kills mother but also kills fetus. A study by **Akhtar R et al (2011)**[20] showed that, among neonatal outcome 18 % baby were still born and 9 % were early neonatal death.

In current study significant differences were noted for, ALT, ALP, total proteins, albumin and globulin levels between both groups ($P<0.05$).The current study findings suggest that serum ALT, ALP, total proteins and albumin levels were significantly different between mild and severe groups of preeclampsia, and these biochemical markers can be utilized to predict and assess the severity of preeclampsia.

Our findings are in accord with the study conducted by **Martin et al**[21] that found the importance of selected parameters in assessing the risks of patients for significant maternal morbidity. The researchers found that the serum lactate dehydrogenase, aspartate aminotransferase (AST), ALT, uric acid, creatinine and 4+ urinary protein were able to distinguish the preeclamptic patients with greater severity.

RECOMMENDATIONS

Lack of antenatal care, poverty, illiteracy are needs to be addressed to prevent this serious complication of pregnancy. Eclampsia basically is a preventable disease if the pregnant women get regular antenatal care, avoidance from obesity and proper health education. Biochemical markers may be helpful in predicting and assessing the severe consequences of preeclampsia.

Therefore to achieve this goal, early antenatal booking, regular and careful follow up, awareness towards the disease and effort to detect early complication are most essential**.**

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 10, 2023

However, further case control trials are recommended to explore various risk factors for preeclampsia.

CONCLUSIONS

The current study findings suggest that serum ALT, ALP, total proteins and albumin levels were significantly different between mild and severe groups of preeclampsia, and these biochemical markers can be utilized to predict and assess the severity of preeclampsia.

REFERENCES

1. Rana S, Lemoine E, Granger JP, Karumanchi SA. Preeclampsia: pathophysiology, challenges, and perspectives. Circulation Res 2019; 124(7):1094-112.
2. Armaly Z, Jadaon JE, Jabbour A, Abassi ZA. Preeclampsia: Novel Mechanisms and Potential Therapeutic Approaches. Frontiers Physiol 2018;9(973).
3. Khidri FF, Waryah YM, Ali FK, Shaikh H, Ujjan ID, Waryah AM. MTHFR and F5 genetic variations have association with preeclampsia in Pakistani patients: a case control study. BMC Med Genetics 2019;20(1):163.
4. Khidri FF. Various presentations of preeclampsia at tertiary care hospital of Sindh: A Cross-Sectional Study. Curr Hypertension Rev 2020;16(3):216-22.
5. Paçarizi H, Begolli L, Lulaj S, Gafurri Z. Blood urea nitrogen/creatinine index is a predictor of prerenal damage in preeclampsia. J Health Sci 2012;2(1):61-5
6. Health E. balancing the scales: expanding treatment for pregnant women with life-threatening hypertensive conditions in developing countries. A report on barriers and solutions to treat preeclampsia and eclampsia. Engender Health. 2007
7. Dutta DC. Text book of Obstetrics including Perinatology and Contraception, New Central book agency India ; 2004 6th edition: 222
8. Mattar F, Sibai BM. Eclampsia VIII. Risk factor for maternal morbidity. Am J Obstet Gynecol. 2000; 182: 307–12.
9. Lubarsky SL, Barton JR, Friedman SA, Nasreddine S, Ramaddan MK, Sibai BM. Late postpartum eclampsia revisited. Obstet Gynecol. 1994; 83:502–5.
10. Sibai BM, Stella CL. Diagnosis and management of aypical preeclampsia-eclampsia. Am J Obstet Gynecol. 2009; 200:481.e1–481.e7.
11. Stella CL, Sibai BM. Preeclampsia: Diagnosis and managment of the atypical presentation. J Maternal - Fetal and Neonat Med. 2006; 19:381–6.
12. World Health Organization. Trends in maternal mortality: 1990 to 2015. Estimates by WHO, UNICEF, UNFPA, The World Bank and the United Nations Population Division. Geneva:World Health Organization; 2015 [cited 2019 Mar 6].
13. Say L, Chou D, Gemmill A, Tunçalp Ö, Moller A-B, Daniels J, et al. Global causes of maternal death: a WHO systematic analysis. Lancet Glob Health.2014;2(6):e323–33. pmid:25103301
14. Knight M, Nair M, Tuffnell D, Kenyon S, Shakespeare J, Brocklehurst P, et al., editors. Saving lives, improving mothers' care—surveillance of maternal deaths in the UK 2012–14 and lessons learned to inform maternity care from the UK and Ireland Confidential Enquiries into Maternal Deaths and Morbidity 2009–14. Oxford: Nuffield Department of Population Health; 2016.

ISSN: 0975-3583,0976-2833 VOL14, ISSUE 10, 2023

15. Tranquilli AL, Dekker G, Magee L, Roberts J, Sibai BM, Steyn W, et al. The classification, diagnosis and management of the hypertensive disorders of pregnancy: a revised statement from the ISSHP. Pregnancy Hypertens. 2014; 4(2):97–104.
16. Swain S, Ojha KN, Prakash A, Bhatia BD. Maternal and perinatal mortality due to eclampsia. Indian Pediatr. 1993 Jun;30(6):771-3. PMID: 8132257.
17. Sarma HK, Talukdar B. Eclampsia: a clinical prospective study in a referral hospital. Journal of Obstetrics & Gynaecology. February 2014;1(1): 57 – 61.
18. Mohamed Shaker El-Sayed Azzaz A, Martínez-Maestre MA, Torrejón-Cardoso R. Antenatal care visits during pregnancy and their effect on maternal and fetal outcomes in pre-eclamptic patients. J Obstet Gynaecol Res. 2016 Sep;42(9):1102-10
19. Ganesh KS, Unnikrishnan B, Nagaraj K, Jayaram S. Determinants of Pre-eclampsia: A Case-control Study in a District Hospital in South India. Indian J Community Med. 2010 Oct;35(4):502-5.
20. Akhtar R, Ferdous A, Bhuiyan SN. Maternal and fetal outcome of eclamptic patients in a tertiary hospital. Bangladesh J Obstet Gynaecol. 2011; 26(2): 77-80.
21. Martin JN, May WL, Magann EF, Terrone DA, Rinehart BK, Blake PG. Early risk assessment of severe preeclampsia: Admission battery of symptoms and laboratory tests to predict likelihood of subsequent significant maternal morbidity. Am J Obstet Gynecol 1999; 180(6):1407-14.