Original Research Article

Modes and timing of delivery along with maternal and neonatal conditions for preeclamptic patients of Rajshahi, Bangladesh

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ABSTRACT

Background: We studied the gynaecological, obstetrical and family history, complications arisen, timing and mode of delivery, and post-delivery maternal and neonatal health conditions for preeclamptic patients in Rajshahi, Bangladesh.
Methods: Using a cross-sectional longitudinal design, 90 women hospitalized with preeclampsia in 7 hospitals of Rajshahi, Bangladesh were considered, of which two-thirds were from tertiary referral Rajshahi medical college hospital. The data were collected by interviewing the patients, physical examinations and analyzing patients' pathological profile. For statistical analyses, SPSS software was employed.
Results: The 58% of the preeclamptic patients became pregnant earlier, of which 56% had NVD, 24 % C/S and 20% abortion. The 85% patients had history of chronic constipation, ashma, blood transfusion, UTI, hypertension, liver disease, diabetes and preeclampsia. Regarding past surgical history, 40% had Appendisectomy, DE and C, MR, left Salphingo-oophorectomy and CS. Their gestational age ranged 40-32 weeks, averaging 37 weeks. About three-fourths of the patients' deliveries were made by CS. Generally, patients' BP fell down after delivery. One patient out of 88 had died after giving birth, but her female infant (weighing 2.0 kg) was in good condition. Only one case of twin-pregnancy was recorded. After giving births, 28% of mother had no complications, whereas 56% had mild complications and 16% had severe complications. Male children dominated (60%) over female children (40%). A total of 9 (10%) neonatal deaths were recorded. Among alive infants, 42% were premature. About 28% of the newborn infants had no complications, while 16% had mild complications and 56% had severe complications including asphyxia, IUGR, etc.
Conclusions: After delivery (CS was 75%), mothers' health was good, but the infants' health deteriorated. Consequently, 1% maternal death and 10% neonatal deaths were recorded.

Keywords: Preeclampsia, Delivery, Bangladesh, Child and mother, Death rate, Hypertension

INTRODUCTION

Preeclampsia, a multi-system obstetrical disorder, is estimated to occur in 5-7% of all pregnancies and is responsible for over 70,000 maternal deaths and 500,000 foetal deaths worldwide.[1] More than 90% of these losses occur in low-and middle-income countries (LMICs), particularly those on Indian subcontinent and sub-Saharan Africa.[2] For every woman who dies, it is estimated that

another 20 suffer a life-altering morbidity.[3] But the origin of preeclampsia remains still elusive. Once preeclampsia is present, there is no definite cure other than to deliver the foetus.

The risk factors of preeclampsia are diversified that include maternally and paternally derived fatal genes, women who experienced preeclampsia earlier, extremes of maternal ages (≤20 and ≥40 years), overweight or obese as

adults, pre-gestational diabetes (type 1 and 2), women with chronic kidney disease and lupus nephropathy, nulliparous women, women who had recurrent spontaneous abortions and infertility treatment and woman having a partner aged >45 years.[4-11] It is surprising that smoking, although having adverse health effects, during pregnancy approximately halves the risk of preeclampsia.[12]

In Ghana, Adu-Bonsaffoh et al found gestational hypertension, preeclampsia, chronic hypertension and superimposed preeclampsia as 50.0%, 38.0%, 6.3% and 5.7% respectively.[13] Ye et al found the highest hypertensive disorders of pregnancy, HDP (7.44%) in northern China and the lowest HDP (1.23%) in central China.[14] They also identified a number of risk factors of HDP including twin pregnancy, age of >35 years, overweight and obesity, primipara, history of hypertension as well as family history of hypertension and diabetes.

The United Nations (UN) sustainable development goal 3.1 aims to reduce the global maternal mortality ratio (MMR) to less than 70 per 100 000 live births by 2030.[15] Although MMR declined in recent decades in LMICs, it remains high in many countries in sub-Saharan Africa and Southern Asia (e.g., 480 per 100 000 live births in India, 897 per 100 000 live births in Myanmar in 2013).[16] Khan et al found that in Bangladesh, preeclampsia/eclampsia-specific mortality ratio decreased from 77 per 100 000 live births in the 2001 to 46 per 100 000 live births in 2016.[17] Although preeclampsia/eclampsia accounted for around

one-fifth of all maternal deaths in Bangladesh, they mentioned the reasons as delays in decision-making, transport, triage, treatment complication and hospital facility levels.[17]

Despite of high parental and foetal mortality rate of preeclampsia in Bangladesh, its prevalence, risk factors and life-threatening facts in Bangladesh are not well-documented, rather discrete. Therefore, we aimed to study previous gynaecological, obstetrical, family and surgical histories, the modes and timing of delivery along with maternal and neonatal conditions for preeclamptic patients of Rajshahi region of Bangladesh.

METHODS

Study area

The study was conducted in seven hospitals of four administrative Upazillas or Thanas of Boalia, Shamukhdum, Rajpara and Godagari of Rajshahi district, Bangladesh (Figure 1). These include Rajshahi medical college hospital (RMCH), Motherland hospital, Islami bank hospital, Janaseba hospital, Islami bank medical college hospital, Godagari general hospital and Godagari model hospital.

Among these, the tertiary referral hospital RMCH was the key for the investigation.

Figure 1: Study area for the investigation, (○ represents study hospital or clinic).

Respondent selection

In the investigation, the pregnant women visiting ODP or admitted into the seven hospitals followed by confirmed as 'pre-eclamtic patients' through careful screening (Figure 2) were treated as the respondents. A total of 90 preeclamptic patients of age 16-40 were the respondents of this study that were not only from Rajshahi districts, but also from other neighbouring districts, as RMCH is a tertiary referral hospital.
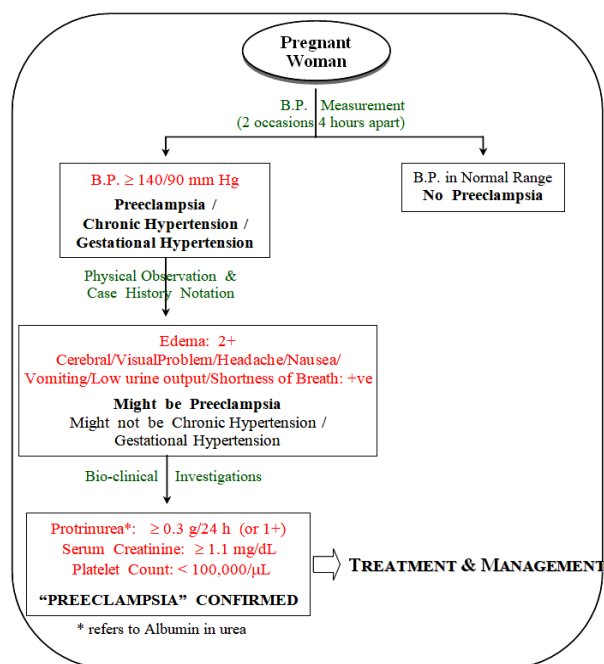

Figure 2: Flow-chart representing the screening of preeclampsia.

Questionnaire development

For keeping records and analyses, a multi-level 6-page questionnaire with annexes was developed. It contained demographic information, food habit, gynecological and obstetrical history, past medical and family history, physiological and clinical profile, confirmation and follow up, and outcome.

Sample size determination

The sample size (n) was determined for 10,000 population-based model ($n=Z^2pq/d^2$). In the study, 90 Preeclamptic patients were monitored against the estimated sample size of 87. In the study, purposive sampling techniques were followed.

Ethical consideration

The ministry of health and family welfare, the government of the People's Republic of Bangladesh allowed the study to conduct. Moreover, permissions from the authority of concerned Upazilla health complex of Rajshahi district

and Rajshahi medical college hospital, Rajshahi were taken for the study. The aim and objectives of the study along with its procedure, risks and benefits of the study were explained properly to the respondents in easily understandable language. When the participants were agreed to cooperate on voluntary basis, their written consents were taken.

Patient screening techniques

In order to screen the pregnant women (especially 20 weeks gestation) for preeclampsia, firstly patient's BP were monitored twice (4 hours apart). If BP was equal to or greater than 140/90 mm Hg, careful physical observations were made for oedema and other relevant complications (Figure 2). Then the patient's bio-clinical investigation reports were analyzed for elevated levels of proteinuria, serum creatinine and RBC count, and lower level of platelet count for confirmation of preeclampsia.[18,19] This technique is supported by the criteria established by American college of obstetricians and gynecologists.[20]

Study type and data collection

The present investigation is mainly a cross-sectional study with some longitudinal studies. The data were collected during 2016-2018 by interviewing the patients, physical examinations and analyzing patient's pathological profile.

Quality control

The average value of both mercury and aneroid sphygmomanometers' readings were considered for recoding patient's BP. Sometimes, it was cross-checked with the reading taken by a highly skilled surgeon. During the interview, the right answer was collected by side question or discussion, if necessary. The bio-clinical investigation reports were only accepted when those were performed by highly-skilled pathologists and the instruments were properly calibrated with r=0.998 or better.

Statistical analyses

The datasets obtained were treated separately for analyzing basic statistical parameters and for making cross-tabulations and cross-plots. The SPSS (release 20.0) and Microsoft excel (release 12.0) software were employed for the purpose. Box-and-Whisker plots were constructed using SPSS.

RESULTS

Characteristics of the studied pre-eclamptic patients

The average age of the concerned 90 participating preeclamptic patients (of 16-40 years) was 25.90±0.65 years. The youngest mothers (≤20 years), comprising about one-fourth of the total, were vulnerable for preeclampsia (Table 1). The obese and overweight patients

(68.89%) were at high risk of preeclampsia, who were associated with some additional complications such as severe oedema, severe headache, vomiting, lower abdominal pain and hyperacidity.

Table 1: Personal characteristics of the preeclamptic patients, (n=90).

Characteristic	N (%)
Age at delivery (in year)	
≤20	22 (24.45)
21-39	67 (74.44)
≥40	01 (01.11)
Average	25.90±0.65
Pregnancy BMI (kg ^{2})	
<18.5 (Underweight)	02 (02.22)
18.5-24.9 (Normal)	26 (28.89)
25-29.9 (Overweight)	26 (28.89)
≥30 (Obese)	36 (40.00)
Education level	
Illiterate	04 (04.44)
Junior high school	35 (38.89)
Upto college	33 (36.67)
Graduate and above	18 (20.00)
Socio-economic index	
10-30 (lower class)	69 (76.67)
>30 (higher class)	21 (23.33)
Parity	
Primiparous	48 (53.33)
Multiparous	42 (46.67)
Gestational age (week)	
Range	32-40
Average	37
Family demography	
Nuclear	38 (42.22)
Joint	52 (57.78)
Skin complexion	
White	55 (61.11)
Brown	12 (13.33)
Black	23 (25.56)
Smoking status during pregnancy	
No	89 (98.89)
Yes*	01 (01.11)
Alcohol consumption	
No	88 (97.78)
Yes*	02 (02.22)

*Tribal women.

Although 20.00% were graduates or post-graduates, 43.33% were under matriculated or illiterate and were not very conscious about preventing preeclampsia. About three-fourths of the concerned patients were of lower social class (Socio-economic index of <30). Most of the preeclamptic patients were Muslims (88.89%) of joint families (57.78%), serving as housewives (88.89%), having white skin complexion (61.11%). They were conscious about food, but they took less than 2.2 L of drinking water per day. One smoking and two alcohol consumption cases were recorded for tribal women. Most of the preeclamptic patients (53.33%) were primiparous.

Previous gynaecological and obstetrical histories

The preeclamptic patients' first period was in the range of 11-15 years, averaging 12.9 years. Before being pregnant, 85.45% patients' period was regular, whereas only 5.50% irregular. Although the range of bleeding duration was 3-8 days, 5-6 days were more frequent. Most experienced low to moderate pain during period duration.

The 57.78% of the patients (52 in total) became pregnant earlier. Among these, 29 (55.55%) patients had the normal vaginal delivery (NVD) and 13 (24.45%) had caesarean section (C/S) delivery. But 10 (20.00%) patients had case of abortion. Prior to be pregnant, concerned preeclamptic mothers used several contraception methods. The order of the methods are as follows: pill 43 (47.78%) >barrier 19 (21.11%) >natural 18 (20.00%) >Norplant and injection 10 (11.11%). Although prolong uses of steroid contained pills are not good, about one-half of women used it.

Past medical, surgical and family history

Although 15% of the preeclamptic patients had no significant past medical history, the remaining 85% had history of chronic constipation, asthma, blood transfusion, UTI, hypertension, liver disease, diabetes and previous preeclampsia. The 60% patients had no record of past surgical history, while the remaining 40% had Appendicectomy, DE and C, MR, left Salphingo-oophorectomy and previous C/S. The 83% patients have previous family history that include: hypertension >diabetes >heart disease >preeclampsia >cancer.

Complications of the preeclamptic patients

A variety of complications were observed among the preeclamptic patients. The major complications include severe edema (44%), headache and neck pain (19%), edema and hyperacidity (17%), lower abdominal and chest pain (12%), edema and vomiting (5%) and blurring of vision (3%) (Figure 3).
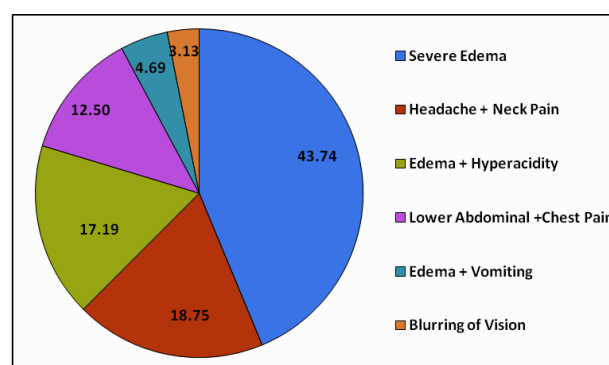

Figure 3: Complication of the preeclamptic patients.

**Table 2: Blood pressure of some preeclamptic patients before and after delivery.**

Admission (week)	Time of delivery	BP 1	BP 2	BP 3	BP 4	BP 5
38+	Before CS	160/120	140/90	200/120	180/110	180/110
	After CS	160/100	150/95	150/100	160/100	140/90
40	Before CS	165/100	160/100	200/120	180/130	210/140
	After CS	180/130	200/120	170/110	160/100	150/95
32	Before NDV	160/110	150/110	160/110	160/110	180/110
	After NVD	160/100	150/100	140/95	140/90	130/90
37	Before CS	130/95	140/100	150/110	150/120	180/110
	After CS	170/140	190/120	150/100	140/100	130/90
38+	Before CS	130/100	140/100	170/100	180/120	160/100
	After CS	160/95	140/100	140/100	140/90	130/90
40	Before CS	140/95	160/100	180/120	200/120	200/120
	After CS	160/120	160/100	140/100	150/90	140/90
39	Before NDV	140/90	140/100	150/120	140/100	160/120
	After NVD	160/100	150/100	130/95	130/100	130/90

Blood pressure pattern of preeclamptic patients

The preeclamptic patients' blood pressure fluctuated fairly, but remained in higher level. The highest blood pressure was found as 210/140 for the patient of 40 weeks gestation. For extreme cases, here BP 5 in Table 2, deliveries (either C/S or NVD) were performed. It was generally found that after delivery, the patients' BP fell down. But the trend was not uniform.

## Bio-chemical investigations of the preeclampsia patients

The bio-chemical investigations played a very vital role for proper diagnosis of the pregnant mothers for preeclampsia. These include mainly hematological tests such as hemoglobin, platelet count, random blood sugar, blood urea, serum creatinine and serum uric acid and the urinary tests included albumin, red blood cell and pus cell. For severe cases, SGPT, serum bilirubin, serum electrolyte, etc. tests performed. Bio-chemical investigation findings are reported in the Box-and-Whisker plots (Figure 4).
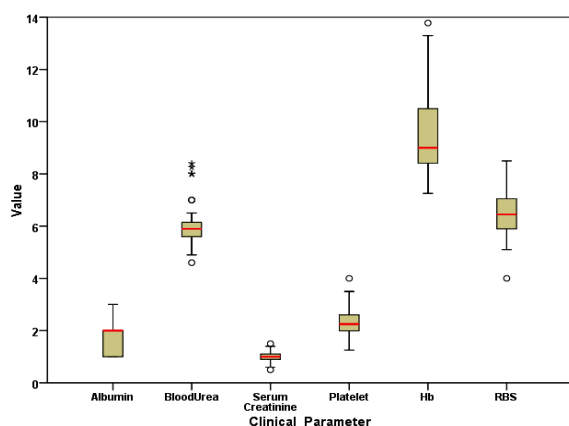
Figure 4: Box-and-Whisker plots for main bio-chemical investigations.

[($\rightarrow$) indicates median; lower and upper box boundaries 25th and 75th percentiles of each distribution; Whiskers as vertical lines ending in horizontal lines at the largest and smallest observed values; (*) indicates outside value and (O) far outside value. The Platelet count values would be multiplied by 100,000].

Timing and mode of delivery

It was observed that the maximum and minimum gestational ages during delivery were 40 and 32 weeks respectively, averaging 37 weeks. The distribution of the preeclamptic patients based upon the gestational age during delivery ($p < 0.001$) is shown in Figure 5.
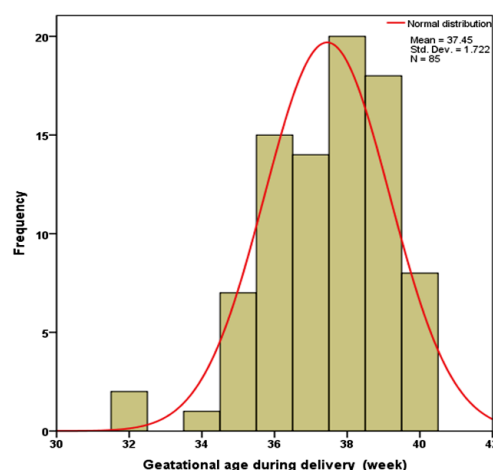
Figure 5: Distribution of delivery (based on gestational age) of the patients.
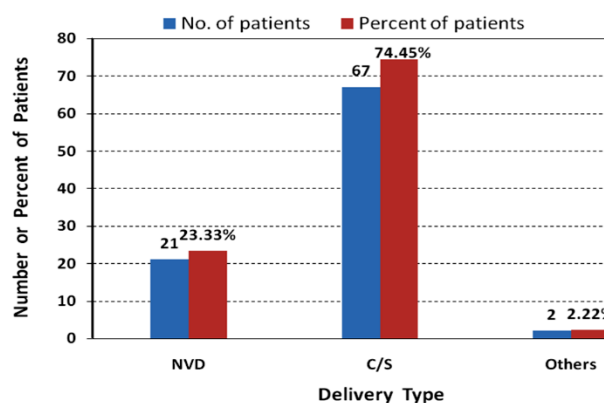
Figure 6: Delivery pattern of preeclamptic patients.

The delivery pattern for the preeclamptic mothers admitted into RMCH is represented in Figure 6. Obviously, about three-fourths of the patients' deliveries were made by CS, while the rest by NVD. Two patients were released for being admitted into other hospital.

Maternal and neonatal outcome

It was generally observed that after delivery, the concerned mothers' health conditions became good, whereas new-born infants' health conditions became bad. But before delivery, the mothers' conditions were bad (Figure 7). The details of both maternal health after giving birth and new-born infants are enlisted in Table 3.
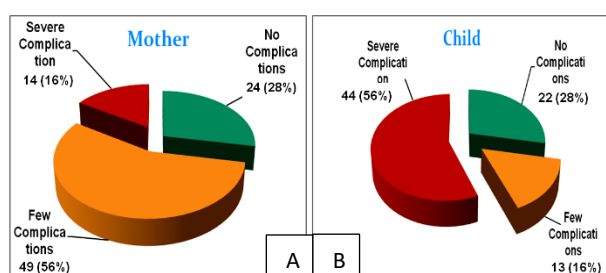

Figure 7 (A and B): The conditions of the mother and the child after delivery.

Table 3: Conditions of the mothers and infants after delivery.

Factors	N	Percentage (%)
Maternal life status, (n=88)		
Alive	87	98.86
Dead	01	1.14
Maternal health status, (n=87)		
No complications	24	27.59
With few complications	49	56.32
With severe complications	14	16.09
Neonatal gender, (n=88)		
Male	53	60.23
Female	35	39.77
Neonatal life status, (n=88)		
Alive	79	89.77
Dead	09	10.23
Neonatal health status (n=79)		
No complications	22	27.84
With few complications	13	16.46
With severe complications	44	55.70
Neonatal body weight, (n=79)		
Low birth weight (<2.5 kg)	33	41.77
Standard weight (≥2.5 kg)	46	58.23

It was found that one patient out of 88 had died after giving birth (maternal morbidity rate of 1.14%), which was perhaps due to conversion to severe eclampsia or HELP syndrome. It was interesting to note that her female infant (weighing 2.0 kg) was in good condition. Only one case of

twin-pregnancy was recorded. The new-born infants were in good health conditions having weights of 3.0 and 2.5 kg. With regard to maternal heath after giving births, 27.59% had no complications, whereas 49 (56.32%) had mild complications. On the contrary, only 14 (16.09%) had severe complications (Table 3).

It was observed that male children dominated (53; 60.23%) over female children (35; 39.77%) in case of preeclamptic mothers. In the study, a total of 9 (10.23%) neonatal deaths were recorded out of 88 neonatal. Among the alive infants, 41.77% were premature having body weight of <2.5 kg, while the rest (58.23%) were with standard health (≥2.5 kg). About 28% of the newly born infants had no complications, while 13 (16.46%) had mild complications. On the contrary, 44 (55.70%) had severe complications that included asphyxia, IUGR, etc.

DISCUSSION

Among the previously pregnant preeclamptic mothers (58%), about 20% had their children. It was reported that women with history of gestational hypertension would experience subsequent gestational hypertension again (median of 21%, range 8-47%).[21-22] It is to be noted that multiple gestations are also a risk factor for preeclampsia.[2] In the study, 56% patients had normal vaginal delivery (NVD), 24% CS and 20% had the case of abortion. In Thailand, it was reported that 41% preeclamptic mothers' delivery was performed by CS.[23] Ye et al found that in China, CS accounted for 78% for mild preeclampsia, 86% for severe preeclampsia and 94% for eclampsia.[14] The frequency of CS in Iran was reported as 46%.[24]

The major complications experienced by the preeclamptic patients include severe edema, headache, lower abdominal, chest and neck pain, hyperacidity, vomiting and blurring of vision. This is in accordance with many authors.[25-26] The raw materials or drugs employed for the treatment were methyldopa, nifedipine, labetalol and Phenobarbital, whose dose and duration were dependent upon the severity of preeclampsia and gestational duration of the patients.

Regarding perinatal outcomes from preeclamptic mothers, it was found that in China neonatal asphyxia and perinatal death were 6% and 1% for mild preeclampsia and 19% and 8% for severe preeclampsia respectively.[14] Our findings resemble with the latter case. Moreover, our findings on post-delivery maternal and neonatal health are in accordance with the incidence of many countries such as Thailand, Ghana, etc.[13, 23]

CONCLUSION

The concerned preeclamptic patients had family history of hypertension, diabetes, heart disease, preeclampsia and cancer, but had no past surgical history except for Appendicectomy, DE and C, MR, left Salphingo-oophorectomy and CS. The majority of the patients

became pregnant earlier, of which 56% had NVD, 24 % CS and 20% abortion. They experienced severe edema, headache, hyperacidity, lower abdominal, neck and chest pain, vomiting and blurring of vision during pregnancy. Only one case of twin-pregnancy was recorded. The gestational age ranged 40-32 weeks, averaging 37 weeks. After delivery (CS was 75%), mothers' health became good, but the infants' health deteriorated. Hence, patients' BP fell down in an irregular pattern after delivery and 1% maternal death and 10% neonatal deaths were recorded. Male children dominated (60%) over female children (40%). The main severe complications of the newborn were asphyxia, IUGR, etc.

Limitations

Although screening of the hypertensive pregnant women for preeclampsia was challenging, we followed the criteria set by American College of Obstetricians and Gynecologists very cautiously. It was always remembered that a significant error might be introduced in primary data gathering. But in a very few cases, it was not possible to attain the desired level of maximum accuracy for some instrumental and methodical constrains. Sometimes, the right answer was derived from patients by side question or discussion. In very limited cases, semi-quantitative data was obtained. The concerned hospitals, other than RMCH, were not very efficient to keep the previous records of preeclamptic patients properly. Keeping the constrains in mind, we carried out the investigation exercising the maximum precautions.

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