

# Effect of seasonal changes on frequency of eclampsia in patients presenting to Ayub Teaching Hospital

Aneesa Fawad<sup>1</sup>, Bushra Zardad<sup>2</sup>, Humaira Jadoon<sup>3\*</sup>, Ayesha Ismail<sup>4</sup>

<sup>1</sup> Professor, Gynae B Unit, Ayub Teaching Hospital, Abbottabad, Pakistan

<sup>2</sup> Registrar, Gynae B Unit, Ayub Teaching Hospital, Abbottabad, Pakistan

<sup>3</sup> Assistant Professor, Gynae B Unit, Ayub Teaching Hospital, Abbottabad, Pakistan

<sup>4</sup> Postgraduate trainee, Gynae B Unit, Ayub Teaching Hospital, Abbottabad, Pakistan

## Author's Contribution

<sup>1</sup> Conception and design

<sup>2</sup> Data analysis and interpretation

<sup>3</sup> Literature review

<sup>4</sup> Data collection, data analysis and proof reading

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## Correspondence

Humaira Jadoon

drmailan@gmail.com

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## A B S T R A C T

**Introduction:** Eclampsia is an acute obstetrical emergency carrying high maternal and perinatal morbidity and mortality. High blood pressure during pregnancy after 20 weeks of gestation is associated with proteinuria and generalized tonic-clonic convulsions. The purpose of the study is to observe seasonal variation in the presentation of eclampsia in a tertiary-level hospital.

**Methods:** This is two years study conducted in the Gynae A unit, Ayub teaching hospital, Abbottabad, from January 2021 to December 2022. The study included all the patients admitted to the unit with eclampsia. It included antenatal patients and patients who developed eclampsia in labour or peripartum. Patients with a history of fits due to epilepsy or any other neurological disease were excluded from the study. Statistical analysis of data was done using SPSS version 16.

**Results:** Total number of admissions during two years period was 7166. The total number of patients admitted with eclampsia during this period was 88 (1.22 %). The majority of patients were in the age group between 21 to 35 years (78.3%). There were 52 primigravidas out of 88(59.1%). There were 46 multigravidas (40.9%). During the fall and winter seasons, 46 patients with eclampsia were admitted (52.1%). 25 admissions were in the spring months (28.4%), and 17 admissions (19.3%) during the summer months. All patients belonged to poor socioeconomic groups. All were unbooked. 78 patients out of 88(88.6 %) belonged to areas more than 25 kilometres away from a medical facility. The season was cross-tabulated with different variables, and no statistical significance was found.

**Conclusion:** Eclampsia is a severe obstetrical emergency usually involving young primigravidas with poor socioeconomic status and no antenatal care. Primary prevention is regular antenatal care. Early referral and time management will reduce maternal and perinatal morbidity and mortality. The incidence of eclampsia is more in the fall and winter seasons.

**Keywords:** Eclampsia, Seasonal variation, Maternal and perinatal morbidity

## Introduction

Eclampsia is an acute obstetrical emergency. This complication is specific to pregnancy. It is characterized by high blood pressure, proteinuria and generalized tonic-clonic convulsions. Pregnancy-induced hypertension is high blood pressure that develops denovo in pregnancy after 20 weeks of gestation. It is defined as BP 140 /90

mmHg or more on two occasions 4 hours apart. Proteinuria is a urinary protein loss of more than 300 mg in 24 hours. When combined with pregnancy-induced hypertension, it is called preeclampsic toxemia. Preeclampsia is a multisystem disorder of pregnancy. Eclampsia is a serious

complication of preeclampsia, with the patients presenting with generalized tonic-clonic convulsions.<sup>1</sup>

Preeclampsia and eclampsia are disease theories, and the exact cause is unknown. The pathogenesis lies in the ischaemic placenta, which releases vasoactive factors into general circulation. These factors give rise to endothelial-mediated end-organ damage and produce clinical manifestations of the disorder.<sup>2</sup>

Complications of eclampsia include placental abruption, acute renal failure, cerebrovascular accidents, cardiovascular complications, cardiac arrest, respiratory arrest, DIC, HELLP syndrome, and maternal and perinatal mortality. Well-recognized risk factors for preeclampsia and eclampsia include chronic hypertension, chronic renal disease, Diabetes, obesity BMI >35 kg/m<sup>2</sup>, nulliparity, past and family history of preeclampsia, SLE, antiphospholipid syndrome, and seasonal changes involving changes in temperature, humidity and barometric pressure.<sup>3</sup>

There is an association between preeclampsia and eclampsia with changing seasons and weather. Different studies have shown different results, but most studies have demonstrated the occurrence of the disorder in winter.<sup>4</sup>

## Methodology

This study was conducted in the Gynaes B unit at Ayub Teaching Hospital Abbottabad, a tertiary-level hospital. It was a two years study starting from January 2021 to December 2022. Inclusion criteria were all those antenatal patients with eclampsia and patients who developed eclampsia during labour and perpeurium. Patients with a history of fits due to epilepsy or any other neurological disorders were excluded from the study. The diagnosis was based on typical history and clinical examination. After admission, patients were managed according to the set protocol of the unit for eclampsia. Data were collected retrospectively from hospital records on a previously designed proforma.

### Statistical analysis:

Data was entered in SPSS version 16 and analyzed. The chi-square test was applied, and a P value <0.05 was considered significant. Means and medians were calculated for numerical variables, and percentages and frequencies were calculated for categoric variables.

## RESULTS

Over two years, 88 patients with eclampsia were in 7166 obstetric admissions (1.22%). Most patients were aged 21 to 25 years (29.5%), the mean age was 26.13 years and its median was 23 years. There were 52 primigravidas (59.1%) and 36 multigravidas (40.9%). In 63 patients (71.6 %), the gestation period at the presentation time was 29 to 36 weeks. 26 patients (29.5%) were admitted in the winter months.

The 20 patients (22.7%) were received in autumn. Only 17 patients (19.3%) were received in the summer months. 78 patients (88.6%) belonged to areas more than 25 kilometres away from the hospital. 60 patients (68.1%) needed operative delivery. Crosstabulation of the season was done with different variables, and the P value was found to be statistically non-significant.

**Table 1: Age-wise data**

Years	Frequency	Percentage
20 or less than 20	18	20.5
21 to 25	26	29.5
26 to 30	20	22.7
31 to 35	23	26.1
35 to 40	1	1.1
Total	88	100.0

Crosstabulation of the season with age showed the P value to be 0.186 (statistically not significant).

**Table 2: Parity-wise data**

Years	Frequency	Percentage
Primipara	52	59.1
parity 2 and 3	26	29.5
para 4 and above 0	20	11.4
Total	88	100.0

Crosstabulation of the season with parity showed the P value to be 0.287 (statistically not significant)

**Table 3: Gestation-related data**

Years	Frequency	Percentage
Less than 28 weeks	8	9.1
29 to 36 weeks	63	71.6
More than 36 weeks	17	19.3
Total	88	100.0

Crosstabulation of the season with gestational age showed a P value to be 0.107 (statistically not significant).

**Table 4: Season-wise data**

Weathers	Frequency	Percentage
Winter (Dec, Jan, Feb)	26	29.5
Spring (March, April, May)	25	28.4
Summer (June, July, Aug)	17	19.3
Autumn (Sep, Oct, Nov)	20	22.7
Total	88	100.0

**Table 5: Distance-related data**

Distance	Frequency	Percentage
Less than 25 km	10	11.4
More than 25 km	78	88.6
Total	88	100.0

Crosstabulation of the season with hospital distance showed the P value to be 0.517 (statistically not significant).

**Table 6: Delivery states**

Mode of Delivery	Frequency	Percentage
Vaginal delivery	28	31.8
Caesarean section	26	29.5
Hysterotomy	34	38.6
Total	88	100.0

**Table 7: Neonatal outcomes**

Neonatal Outcome	Frequency	Percentage
Alive	43	48.9
Stillbirth	36	40.9
Neonatal death	9	10.2
Total	88	100.0

**Table 8: Maternal outcome**

Maternal Outcome	Frequency	Percentage
Discharged home alive and healthy	79	89.8
Maternal mortality	9	10.2
Total	88	100.0

## Discussion

Most of our patients were young and in the age group (21-35 years). Most of them (52%) were primigravidas. One year study conducted in Liaquat University Hospital Jamshoro Hyderabad by Fouzia Sheikh and her team analyzed 188 patients of eclampsia among 4979 obstetrical admissions. The frequency of eclampsia was common in young primigravidas (78%) with a lack of antenatal care. <sup>4</sup> Kirsten Duckit, in a study, described the risk factors for preeclampsia and eclampsia and mentioned these conditions to be more common in teenage pregnancies and primigravidas.<sup>5</sup>

Most patients belonged to the poor socioeconomic group and were brought to the hospital from far-flung mountainous areas where the approach to the hospital is difficult. 78 patients out of 88 (88.6%) belonged to areas more than 25 kilometres away from the facility. There is a lack of awareness to avail antenatal services and their importance for the health of the mother and baby during pregnancy. Poverty and illiteracy aggravate the situation. Presentation is usually delayed. Initially, patients are taken to local doctors or hospitals and referred to tertiary-level hospitals with intensive care facilities. Such delays worsen the patient and baby's condition and adversely affect management's outcome. Surrayya Halimi and her colleagues also mentioned these risk factors in a study conducted at Saidu Teaching Hospital Swat.<sup>6</sup> The population's weather conditions and social circumstances are the same in Swat as in the Hazara division.

Preeclampsia and eclampsia are still the leading cause of maternal and fetal morbidity and mortality in our country after haemorrhage. The etiology of this condition is multifactorial, and the incidence is increasing with time despite improvements in the provision of antenatal services. Environmental factors, dietary factors, lifestyle measures, weather and climate influence disease frequency.

We received 88 patients with eclampsia over the period of 2 years. There were 7166 obstetrical admissions (1.22%). The 26 patients were admitted in the winter season and 20 in the fall, so 46 patients with eclampsia were received in cold weather. 25 patients out of 88 (25%) were admitted in the spring months, and 17/88 (19.3 %) of patients were received in the summer months. A study conducted by Fauzia Fahim and her colleagues in Lady Reading Hospital Peshawar also analyzed the season's effect on eclampsia frequency. A 4 years study from 2005 to 2008 analyzed 810 patients of eclampsia in 20, 132 births. The frequency of eclampsia was highest in winter (4.925%) in December; it declined during spring and was lowest in summer (3.29%).<sup>7</sup>

Within our country, studies from different provinces yield different results regarding the effects of seasons on preeclampsia and eclampsia. Interesting results are shown in a study conducted at Jinnah postgraduate medical centre Karachi by Raana Jamelle. Data were collected from 4 large government teaching hospitals in four provinces of Pakistan. All four provinces have different climate conditions with wide variations in temperature and humidity. In Sindh and Punjab, the summer is harsh and prolonged, and the frequency is more in the hot season, while in KPK and Balochistan, where winter is more severe, the frequency is more in cold weather.<sup>8</sup>

Pregnancy-induced hypertension, preeclampsia and eclampsia are progressive manifestations of the same pathophysiologic condition. The disorder is more common in developing countries with poverty, illiteracy and lack of antenatal care. These are the prime factors to be addressed to reduce the incidence of this disorder. Early diagnosis and timely management will always make the difference.<sup>9</sup>

A study conducted by Utpal Gosh and his team in eastern India studied the effects of season and weather conditions on the incidence of eclampsia. That part of India has a high incidence of eclampsia. The study included the patients' data over the period of 36 months from 2010 to 2012 and analyzed that the incidence of eclampsia was highest in winters(39.21%), followed by monsoon and post-monsoon season (35.87%)and lowest in hot weather (24.09%).<sup>10</sup>

A study was conducted in the tropical climate of Mumbai, India, by Vidya Subramaniam—the aim was to assess the correlation between preeclampsia and eclampsia between monsoon and dry weather. Monsoon was cold and humid, with low barometric pressure than the rest of the year. Data was collected from a large maternity centre in Mumbai over 36 months (1993 to 1996). There were 29562 deliveries. Among them, there were 34 patients with eclampsia (11%). The incidence was highest in monsoon (2%). Low temperature and high humidity were identified as triggering factors for eclampsia.<sup>11</sup>

In the review of global literature, it was evident that different seasons and weather conditions affect disease incidence and progression. A study from Iran by Fatemeh Janani and Farah Naz Changae showed their results after analyzing 8000 pregnant women admitted to hospital in labour. The overall prevalence of preeclampsia was 3.8 %. The highest prevalence rate of 4.5% was observed in summer, and the lowest (2.7%) in winter. Prevalence was highest in July. The incidence of pregnancy-induced hypertension and preeclampsia was more elevated in mothers having delivery in the summer months.<sup>12</sup>

Seasonal variation affects cardiovascular morbidity and mortality in the general population due to its effects on temperature and humidity. In hot weather, there is a fall in blood pressure due to vasodilatation and loss of fluid and electrolytes from the body in excessive sweating. The body has vasoconstriction and retention of fluids and electrolytes in cold weather. These are the mechanisms by which the weather affects the frequency of preeclampsia and eclampsia.<sup>13, 14</sup>

Sunlight affects vitamin D serum levels. Vitamin D deficiency in early pregnancy is a risk factor for preeclampsia and eclampsia in later pregnancy. Sunlight is the source of 90 % of vitamin D in the body. Pregnancies conceived in the summer months have a low incidence of preeclampsia and eclampsia.<sup>15, 16</sup> Seasonal changes influence maternal health globally and are particularly important for women in developing countries who suffer from anaemia, infections, preeclampsia and eclampsia.

A paper by Tina Hlimi reviewed 23 published studies. It showed a statistically significant link between these maternal disorders and seasonality in developing countries in sub-Saharan Africa, central and south Asia. Anaemia

and eclampsia are principally exacerbated in teenage primigravidas. Food insecurity, lack of antenatal care, poverty, anaemia and environmental factors play a crucial role in the predisposition of these disorders.<sup>17</sup>

Some authors have studied the effects of temperature and humidity at the time of conception on the frequency of preeclampsia and eclampsia later in pregnancy and concluded that eclampsia is more common in pregnancies conceived in the summer months. This is due to the direct effect of temperature and humidity on hemodynamic status.<sup>18, 19</sup>

Dehydration protects the brain from convulsions in hot and dry weather and promotes insensible loss of fluid from the body. Dry season-related dehydration may play a protective role in eclampsia.<sup>20</sup> In contrast, overhydration and hyponatraemia are well known to be associated with triggering seizures. Hyponatremia causes a direct influx of fluids into the neurons. Neurons are swollen and susceptible to injury and excitation.<sup>21</sup> Chakrapani and colleagues have confirmed that the incidence of hyponatremia in hospital patients is significantly high in monsoon months. Low temperature, high humidity and low barometric pressure are linked with eclampsia.<sup>22</sup>

A study from Texas, USA, by Kristen Wellington and Zuber D Mulla, did a retrospective analysis of hospital discharge records of 312,207 patients who delivered in Texas in 2007. Data was collected from the Texas Department of state health services. The highest prevalence was detected in the winter season (4.1%) and more so in January.<sup>23</sup>

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## Conclusion

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The prevalence of hypertensive disorders of pregnancy is higher in autumn and winter. A systematic literature review was conducted to examine all the studies of seasonal variation in the prevalence of gestational hypertension, preeclampsia, and eclampsia by Megan R W. Objective was to test the hypothesis that prevalence rates are higher during winter months in non-tropical regions and during wet and humid periods in a tropical climate. Studies included were published between 1938 and 2010. Out of 60 abstracts and articles, only 20 met the final criteria. The conclusion was that prevalence of preeclampsia and eclampsia was highest in the winter season in non-tropical regions and during monsoon and

post-monsoon in the tropics. Seasonal variation, infectious diseases, environmental triggers, sunlight exposure, physiological response to cold weather, health care access and nutritional deficiencies all play a role.

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