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Evaluation of Incidence and Risk Factors of Severe Preeclampsia in a Tertiary Hospital Centre

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Authors' contributions

This work was carried out in collaboration between all authors. Author EN designed the study, wrote the protocol, collected the data, interpreted the data and wrote the first draft of the manuscript. Author RH wrote the protocol, performed the statistical analysis and managed the analyses of the study. Author AB designed the study and revised the final manuscript version. Author EP managed the literature searches collected the data and wrote the first draft of the manuscript. All authors read and approved the final manuscript.

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ABSTRACT

Aims: To evaluate the incidence of severe preeclampsia, eclampsia and HELLP syndrome in a tertiary Hospital Centre of Obstetrics and Gynaecology and to identify the impact of risk factors associated with severe preeclampsia.
Study Design: Retrospective cross-sectional study.
Place and Duration of Study: University Hospital of Obstetrics and Gynaecology "Koço Gliozheni", Tirana, Albania between January 2009 and December 2013.
Methodology: To collect the data for this study we used the medical records of births of a period of five years. The standard inclusion criteria in the study were pregnant women diagnosed with preeclampsia that had delivered in this hospital after 24 weeks' gestation despite the number of the babies, fetal presentation and mode of delivery. The exclusion criteria in this study were: pregnancies with confirmed fetal anomalies non-viable, pregnancies with missing data, and pregnancies with unknown gestational age. The maternal variables collected from the medical

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records were: maternal age, parity, gestational age at delivery, multiple pregnancy, pre-existing (chronic) hypertension, pre-existing diabetes mellitus, renal diseases and preeclampsia in previous pregnancy. The data collected for the variables were compared with the statistical data for all the deliveries during the study period. Fisher's exact test, Chi-squared test and SPSS program were used as statistical methods.

Results: The study found differences between the severe preeclampsia group and the general population for the maternal risk factors: severe preeclampsia was evaluated 16.8% vs. 3.5% (P< 0.01), pre-existing hypertension 7.8% vs. 2.3% (P = 0.02), renal diseases 1.9% vs. 1.1%, diabetes mellitus 5.8% vs. 4.6% and multiple pregnancies 7.1% vs. 2.7% respectively.

Conclusion: Identification of these risk factors is very important for the calculation of risk for preeclampsia in early pregnancy and early treatment to prevent the maternal and perinatal morbidity and mortality from this disease.

Keywords: Severe preeclampsia; incidence; risk factors; chronic hypertension; renal disease.

1. INTRODUCTION

Preeclampsia is a hypertensive multisystem disorder of pregnancy that complicates up to 10% of pregnancies worldwide and is one of the leading causes of maternal and perinatal morbidity and mortality [1]. The name eclampsia comes from the ancient Greek language "εκλαμψία" and means lighting [2]. The aetiology of preeclampsia remains unknown and is still considered the "disease of theories". Many investigators have highlighted the association between preeclampsia and different causal factors that include epidemiologic factors, maternal history, and specific maternal health conditions [3]. The incidence of preeclampsia varies depending on geographic region and season. In the Nordic countries preeclampsia is more common among birth during the winter season [4].

The family history of preeclampsia increases the risk for preeclampsia [5]. The pregnant women whose mothers or sisters have had preeclampsia are at greater risk to develop preeclampsia. Many epidemiological researches have demonstrated this familial predisposition to pre-eclampsia, which has encouraged genetic research [6]. Higher rates of preeclampsia are found in women with elevated pre-pregnancy Body Mass Index (BMI) [7].

Other risk factors for developing preeclampsia are pre-existing (chronic) hypertension [8], pre-existing diabetes mellitus [9], renal diseases [10], autoimmune diseases [11] and antiphospholipid syndrome [12].

According to American College of Obstetrics and Gynecology (ACOG) diagnostic criteria, the diagnosis of severe preeclampsia includes severe hypertension (systolic blood pressure ≥ 160 mmHg or diastolic blood pressure ≥ 110 mmHg, or both), cerebral or visual disturbance, epigastric or right upper quadrant pain, oliguria, pulmonary oedema, cyanosis, impaired liver function, thrombocytopenia or intrauterine growth restriction (IUGR). Preeclampsia diagnosis no longer requires presence of proteinuria [13].

2. MATERIALS AND METHODS

This is a retrospective cross-sectional study conducted in the University Hospital of Obstetrics and Gynaecology (UHOG) "Koço Gliozheni", in Tirana. To collect the data for this study we used the medical records of deliveries from January 2009 until December 2013.

This study was approved by Institutional Review Board of UHOG "Koço Gliozheni". Written informed consent was not obtained from pregnant women involved in this study, because it was a retrospective research and it was not possible to get the consent from every patient. The data collected for this study were anonymous.

The standard inclusion criteria in the study were pregnant women diagnosed with preeclampsia that had delivered in this hospital after 24 weeks gestation during the period mentioned above, despite the number of the babies, fetal presentation and mode of delivery. The exclusion criteria in this study were: pregnancies with confirmed fetal lethal anomalies (27 cases), pregnancies with missing data necessary for the study (in the medical records were not available all the data for the variables included in the study - 99 cases), pregnancies with inaccurate gestational age (the patient doesn't know the LMP and hasn't done an ultrasound examination in the first trimester - 28 cases).

The calculation of gestational age was made based on the first day of the last menstruation period (LMP – 13% of cases), on the early ultrasound examination (before 13 weeks gestation – 11% of cases) or based on the combination of both criteria (LMP and first ultrasound examination – 76% of cases). The total number of deliveries for this 5-year period (January 2009 until December 2013) was 21,795. After a careful investigation of medical records, we identified 1274 cases hospitalized with hypertensive disorders, of which 897 were diagnosed with preeclampsia. After excluding the number of above mentioned cases the total number with preeclampsia resulted into 743 cases. Based on ACOG classification criteria for the severity of the diseases we found 154 cases with severe preeclampsia (0.7% of the total births of the study period and 20.7% of all cases with preeclampsia).

Maternal age, parity, gestational age at the moment of severe preeclampsia diagnosis, gestational age at delivery, and multiple pregnancy were variables collected from the medical records. We also took into consideration the personal and family history of the patient which included: pre-existing (chronic) hypertension, pre-existing diabetes mellitus, renal diseases and preeclampsia in previous pregnancy.

The Mean ± Standard deviation of the maternal age in the study group was 28.9±6.4 years, meanwhile, the Mean ± Standard deviation of the maternal age of all women delivered in our hospital during the study period was 25.8±5.9 years.

Table 1. Maternal variables included in the study

Maternal variables
Maternal age
Parity
First day of the last menstruation (LPM)
Gestational age at the moment of severe preeclampsia diagnosis
Gestational age at delivery
Pre-existing (chronic) hypertension
Pre-existing diabetes mellitus
Renal diseases
Preeclampsia in previous pregnancy
Multiple gestation

Considering the close relationship between severe preeclampsia and iatrogenic prematurity to have a better understanding of this association we divided the study group in 4 subgroups depending on gestational age at delivery (see Table 2).

Table 2. Stratification of preeclampsia depending on gestational age at delivery

Subgroups	Number	%
Subgroup 1 (pregnancy at term ≥ 37 weeks)	157	21%
Subgroup 2 (late prematurity 34 - 36 6/7 weeks)	312	42%
Subgroup 3 (early prematurity 30 - 33 6/7 weeks)	167	22.5%
Subgroup 4 (very early prematurity < 30 weeks)	107	14.5%
Total cases with preeclampsia	743	100%

All the data were collected in excel format and were checked for their completeness and accuracy. The data collected for the variables mentioned above were compared with the statistical data for all the deliveries during the study period.

The statistical analysis was made using SPSS program, version 19. Differences between groups for categorical variables were examined with Fisher's exact test. In the situations with large numeric data of the variables we have used the "Chi-squared" test.

3. RESULTS AND DISCUSSION

The total number of births during the 5-year period was 21,795, of which 1274 cases (6%) with hypertensive disorders of pregnancy. The diagnosis of preeclampsia was found in 897 cases (4.2%). Severe preeclampsia was found in 154 cases (0.7%) of the total number of births and responsible for 20.7% of the total cases with preeclampsia (see Table 3).

For the determination of the incidence of preeclampsia and severe preeclampsia according to gestational age as well as maternal age we evaluated the study population of 743 remaining cases with preeclampsia, after the exclusion of 154 cases according to the criteria specified in the material and method. The data from the graphic shows that increasing of the

gestational age was associated with a decline of severe preeclampsia rates in relation to all cases with preeclampsia. For example, in the subgroup of very early prematurity (< 30 weeks), severe preeclampsia is present in 32.7% of the cases with preeclampsia for this gestational age, meanwhile for the other subgroups 30-33 6/7 weeks, 34-36 6/7 weeks and ≥ 37 weeks the relative rates are respectively 25.1%, 19.5% and 10.2%.

To evaluate the distribution of the incidence of preeclampsia in relation to the maternal age, we stratified the study population in four subgroups (see Fig. 2). The results show higher rates of severe preeclampsia in the subgroups < 20 years and > 40 years, 1.1% and 0.96% respectively. The same trend was found even in the distribution of the incidence of preeclampsia in relation to maternal age, with higher rates in the extreme age groups.

Table 3. Incidence of hypertensive disorders

Years	Total number of births (n)	Hypertensive disorders of pregnancy	Preeclampsia (n=897; 4.2%)	
			Non-severe preeclampsia	Severe preeclampsia
2009	4090	245	143	28
2010	4222	250	147	30
2011	4509	252	158	32
2012	4433	246	134	30
2013	4541	281	161	34
Total	21,795	1,274 (6.0%)	743 (3.5%)	154 (0.7%)

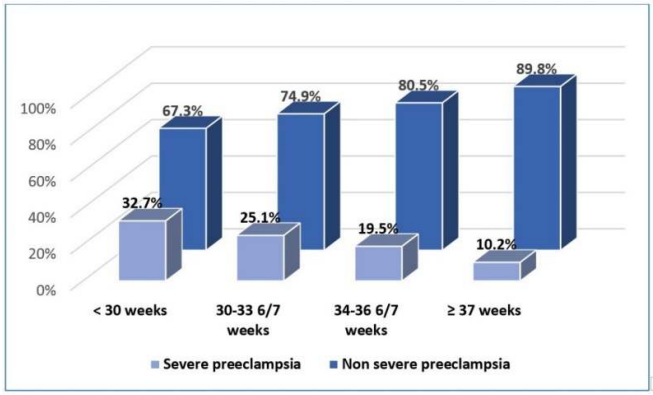

Fig. 1. Rates of non-severe preeclampsia and severe preeclampsia in relation to gestational age

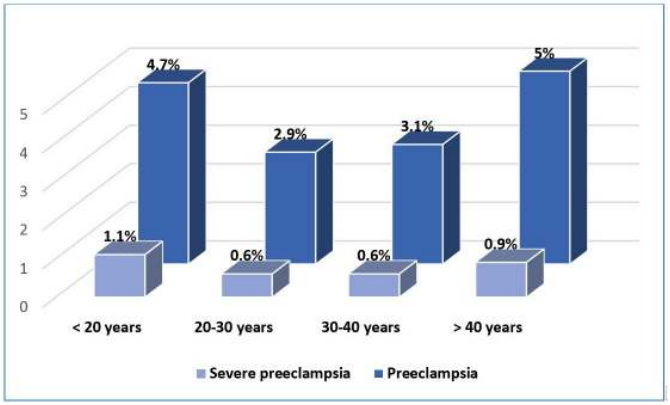

Fig. 2. Distribution of incidence of severe preeclampsia and all cases with preeclampsia in relation to maternal age

Table 4. Risk factors of severe preeclampsia

Risk factors	Severe preeclampsia n (%)	Total number of births n (%)	*P* value
Previous preeclampsia	26/154 (16.8%)	743/21,795 (3.5%)	*P*< 0.01
Pre-existing hypertension	12/154 (7.8%)	504/21,795 (2.3%)	*P* = 0.02
Diabetes mellitus	9/154 (5.8%)	1005/21,795 (4.6%)	*P* = 0.64
Parity			
Nulliparous	79/154 (51.3%)	7715/21,795 (35.4%)	*P* = 0.055
Multiparous	75/154 (48.7%)	14,080/21,795 (64.6%)	*P* = 0.14
Renal diseases	3/154 (1.9%)	237/21,795 (1.1%)	*P* = 0.65
Multiple pregnancies	11/154 (7.1%)	588/21,795 (2.7%)	*P* = 0.078

For the identification of risk factors for preeclampsia we evaluated the obstetrical history (parity, previous preeclampsia), maternal clinical situation (pre-existing hypertension, renal diseases, diabetes mellitus), as well as the information from the actual pregnancy (multiple gestation, gestational hypertension). The results obtained after the evaluation of these variables were compared with the statistical data of the total population of women delivered at the same period in UHOG "Koço Gliozheni".

We found differences between the results of severe preeclampsia group with the results of general population for all the variables evaluated. In 16.8% of cases with severe preeclampsia we found previous preeclampsia in maternal history, compared with only 3.5% of the total population (*P*< 0.01). As well, we found a statistically significant difference between the two groups for the pre-existing hypertension (7.8% vs. 2.3%, *P* = 0.02).

Diabetes mellitus was present in 5.8% of cases with severe preeclampsia and in 4.6% of the total population. This difference was not statistically significant. The same differences were seen for the parity between the severe preeclampsia group and the total population (51.3% vs. 35.4% for nulliparous, and 48.7% vs. 64.6% for multiparous respectively). Renal diseases and multiple pregnancies were more frequent in the severe preeclampsia group (1.9% vs. 1.1% and 7.1% vs. 2.7%, respectively), but this differences were not statistically significant.

According to the world literature, preeclampsia complicates about 3% of pregnancies [3], varying from 2-8% depending on the geographic position and socio-economic status of the country. In our study the incidence of preeclampsia is 4.2%, comparable with world literature data. Also, the incidence of hypertensive disorders during pregnancy in our study is about 6%, and severe preeclampsia is 0.7%.

The incidence of severe preeclampsia in our study is higher than the incidence referred to the literature because, we have evaluated this incidence in UHOG "Koço Gliozheni", which is a tertiary reference centre for all the regional hospitals. The diagnosis of severe preeclampsia has many complications for the mother, fetus or infant, and is usually treated in a tertiary centre, which influence the increase of this incidence.

The characteristics of the population that influence the decrease or the increase of preeclampsia are parity, maternal age and the personal history [14]. In our study we found higher rates of nulliparous in the severe preeclampsia group than in general population, but this difference was not statistically significant. Regarding to the maternal age, we found higher rates in the extreme group ages (< 20 years and > 40 years), which is consistent with the literature [15].

The greatest difference was found for previous preeclampsia variable (16.8% vs. 3.5%; *P*< 0.01). Patients that have in their personal history a previous preeclampsia, have a higher risk to have again preeclampsia in their future pregnancies. This finding is consistent with many studies of literature and for this reason is recommended to have a careful follow-up in the subsequent pregnancy [16].

As well, we found higher risk of severe preeclampsia in pregnant women with pre-existing hypertension (7.8% vs. 2.3%), and this difference was statistically significant and consistent with literature data [9].

In our study, severe preeclampsia resulted in higher rates in pregnancies less than 30 weeks. Therefore, with the increase of gestational age we found a decline in the severe preeclampsia rates. According to the literature the incidence of preeclampsia increases with the gestation age

(early preeclampsia < 34 weeks vs. late > 34 weeks, respectively 0.38% vs. 2.72%) [17]. Highest rates of severe preeclampsia in early gestational age are due to the fact that early preeclampsia less than 34 weeks has higher risk for maternal complications as eclampsia, HELLP syndrome, etc. and higher risk for stillbirths [17].

4. CONCLUSION

Hypertensive disorders of pregnancy continue to be a major problem for maternal and perinatal health. Many studies conducted during the last decade aim to understand the preeclampsia physiopathology and to prevent preeclampsia. Identification of these risk factors is very important for the calculation of preeclampsia risk in early pregnancy and for early treatment to prevent the maternal and perinatal morbidity and mortality from this disease [18,19].

CONSENT

Written informed consent was not obtained from pregnant women involved in this study, because it was a retrospective research and it was not possible to get the consent from every patient. The data collected for this study were anonymous.

ETHICAL APPROVAL

This study was approved by Institutional Review Board of University Hospital of Obstetrics and Gynaecology “Koço Gliozheni”.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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