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Seasonal change of the prevalence of hypertensive disorders of pregnancy

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Abstract

Objective: The pathogenesis of preeclampsia is still unclear. Recent researches show that the incidence varies depending on the seasons of conception and labor. We carried out a cross-sectional study to determine whether there is a correlation between labor season and preeclampsia prevalence in Mersin or not.

Methods: The discharge records of 9547 women who delivered in our hospital in the last 12 years were reviewed, and the discharge records of 542 hypertensive pregnant women were analyzed retrospectively. The seasons were reviewed as spring (March, April, and May), summer (June, July and August), autumn (September, October and November), and winter (December, January, February). Monthly map was established according to the distribution of the diseases.

Results: Mild preeclampsia (42.1%) was the most common condition in 542 women who delivered with the hypertensive diseases. Hypertensive pregnancy was observed most commonly in winter (27.5%). Prevalence was higher in January and July (10.2% and 10%, respectively) than other months, and it was lower in May than any other month (4.2%).

Conclusion: The prevalence of hypertensive pregnancy in women in Mersin was higher than the patients who delivered in summer and winter months, and it was lower in spring. With these results, it is seen that temperature and humidity changes in different seasons may affect preeclampsia. Cohort studies with wider populations are needed to confirm these data.

Keywords: Hypertensive disorders of pregnancy, seasonal distribution, prevalence.

Özet: Gebeliğin hipertansif bozukluklarının prevalansının mevsimsel değişimi

Amaç: Preeklampsinin patogenezi hala yeterince anlaşılmamıştır. Son araştırmalar, insidansın gebe kalma ve doğum mevsimine göre değiştiğini göstermiştir. Mersin ilinde doğum mevsimi ile preeklampsi prevalansı arasında bir ilişki olup olmadığını belirlemek için kesitsel bir çalışma yapılmıştır.

Yöntem: Son 12 yılda hastanemizde doğum yapan 9547 gebenin taburcu kayıtları incelendi; 542 hipertansif gebenin hastane taburcu kayıtlarının retrospektif analizi yapıldı. Mevsimler; ilkbahar (mart, nisan, mayıs), yaz (haziran, temmuz, ağustos), sonbahar (eylül, ekim, kasım) ve kış (aralık, ocak, şubat) olarak ele alındı. Hastalıkların dağılımına göre aylık harita çıkarıldı.

Bulgular: Hipertansif hastalıklar ile doğum yapan 542 kadının içerisinde en sık olarak (%42.1) hafif preeklampsi izlendi. Hipertansif gebelik en sık kış ayında (%27.5) gözlendi. Ocak ve temmuz ayında prevalans oranı (%10.2 ve %10) diğer aylara göre daha yüksek izlendi ve mayıs ayında prevalansı herhangi bir aya göre daha düşük (%4.2) izlendi.

Sonuç: Mersin'deki kadınlar arasında hipertansif gebelik prevalansı yaz ve kış aylarında doğum yapan hastalarda daha yüksek, ilkbahar için daha düşük saptandı. Bu sonuçlarla farklı mevsimlerde sıcaklık ve nem değişikliklerinin preeklampsiyi etkileyebileceği görülmektedir. Bu verileri doğrulamak için daha geniş kapsamlı kohort çalışmalarına ihtiyaç vardır.

Anahtar sözcükler: Gebeliğin hipertansif bozuklukları, mevsimsel dağılım, prevalans.

Introduction

Preeclampsia (PE) is a multisystemic disease of pregnancy presenting with proteinuria and hypertensive after 20 weeks of gestation. Eclampsia (E) is a serious complication presenting with seizures in a patient with preeclampsia. While PE has different prevalence rates depending on humidity, temperature and environmental factors, it is seen in 5–7% of all pregnancies. Hypertensive disorders

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of pregnancy (HDOP) are the third most common reason of maternal mortality in the USA.[1] Early diagnosis and close follow-up are important in the patients with PE. In these patients, abruptio placentae, acute kidney failure, cerebrovascular and cardiovascular complications and disseminated intravascular coagulation are associated with DIC.[2,3]

The previous studies showed that PE/E incidence has seasonal trends. It is reported that this trend may result from the ambient temperature and humidity. In their study performed on 11,000 pregnant women in South Africa, Immink et al. found that PE prevalence reaches its highest level in winter with a rate of 13.6%.[4] Mumbai carried a study in the tropical season of India, and found that the incidence of eclampsia was high during the monsoon period when temperature is lower and humidity is high.[5] Tam et al. reported in their study performed in Hong Kong that PE incidence was higher in pregnant women during June.[6]

Philips et al. investigated the correlation between delivery season and PE, and found that PE likelihood increased by 70% in women who conceived in summer months compared to those who conceived in spring months.[7] In our study, we investigated whether there is a correlation between the seasons and preeclampsia.

Methods

The discharge records of 9547 pregnant women who delivered in the Gynecology and Obstetrics Clinic of Mersin University in the last 12 years were reviewed retrospectively. The discharge records of 228 preeclampsia cases, 143 severe preeclampsia cases, 24 superimposed preeclampsia cases, 60 cases with HELLP syndrome (hemolysis, thrombocytopenia, and elevated liver enzymes), 23 chronic hypertension cases and 147 healthy control patients were analyzed. Multiple pregnancies were excluded from the study. The patient data were analyzed by using IBM SPSS (IBM Corp., Armonk, NY, USA) version 24. Chi-squared test was used for the frequencies of HDOP patients in multiple groups. Bonferroni test was used to compare the months. The value $p<0.05$ was considered statistically significant.

Results

When HDOP patients are evaluated according to their demographic characteristics in our study, the mean age of the cases in all groups except the patients with HELLP syndrome and PE are significantly different than the control group (**Table 1**). In our study, eclampsia is seen in younger pregnant women while superimposed PE, chronic hypertension (HT) and gestational HT (GI HTI) are seen in advanced ages. In terms of fetal weight, we found statistically significant results when groups are compared among each other and to the control group. We found that fetal weight decreased as the clinical severity of the diseases increased (low birth weight <2500 g, very low birth weight <1500 g), and that the frequency of intrauterine growth retardation

Table 1. The demographic characteristics of the patients with gestational hypertension.

	PE (n=228) (33.1%)	Severe PE (n=143) (20.8%)	Superimposed PE (n=24) (3.5%)	E (n=34) (4.9%)	HELLP (n=60) (8.7%)	Chronic HT (n=23) (3.3%)	GI HT (n=30) (4.4%)	Control group (n=147) (21.3%)	
	Ort±SD	Ort±SD	Ort±SD	Ort±SD	Ort±SD	Ort±SD	Ort±SD	Ort±SD	p
Maternal age (year)	30.9±5.9	30.3±6.5	33.1±5.6	26.0±6.2	31.2±7.5	37.6±5.4	34.7±5.3	30.1±6.1	0.372
Week of gestation during delivery	35.2±3.2	33.4±3.5	34.5±4.7	33.2±3.4	33.0±3.8	36.5±3.0	36.9±2.1	38.5±0.6	<0.001
	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	n (%)	p
Oligohydramnios	20 (10.6)	23 (19.5)	2 (10)	2 (7.1)	6 (12.5)	3 (15.8)	5 (20)	0 (0)	<0.001
Anhydramnios	3 (1.6)	5 (4.2)	0 (0.0)	0 (0.0)	0 (0.0)	1 (5.3)	3 (12.0)	0 (0.0)	0.049
IUGR	83 (43.7)	58 (48.7)	6 (30.0)	15 (53.6)	27 (54.0)	4 (21.1)	13 (52.0)	0 (0.0)	<0.001
IUFD	1 (0.5)	3 (2.5)	0 (0.0)	2 (7.1)	4 (8.0)	0 (0.0)	0 (0.0)	0 (0.0)	0.094
Preterm (< 34 weeks)	58 (30.5)	61 (51.3)	6 (30.0)	15 (53.6)	29 (58.0)	4 (21.1)	2 (8.0)	0 (0.0)	<0.001

E: eclampsia; **GI HT:** gestational HT; **HT:** hypertension; **IUFD:** Intrauterine fetal demise; **IUGR:** intrauterine growth restriction; **Mean±SD:** mean ± standard deviation; **PE:** preeclampsia.

increased ($p<0.05$). However, there was no significant difference among the disease groups in terms of fetal sex.

In terms of the demographic characteristics of the patients, patients deliver at earlier weeks as expected when the severity of the disease increases, and the results are significantly different compared to the control group ($p<0.05$). HDOP prevalence varies according to the months. As seen in **Fig. 1**, the lowest prevalence is in May and the highest values are in summer and winter months. The prevalence peaks after May and September. This seasonal distribution is similar in most of the diseases in HDOP.

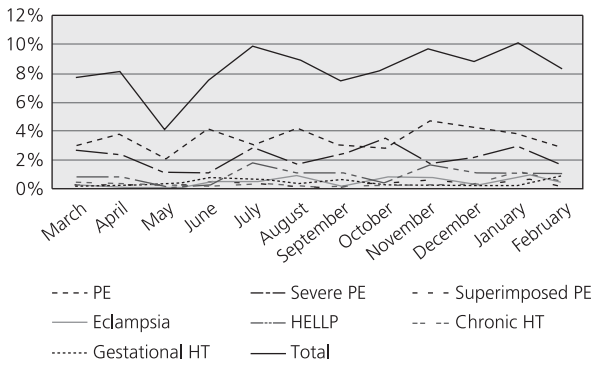

Fig. 1. Prevalence in patients with HDOP throughout the year.

Discussion

In our study, we found that HDOP has the highest values in January and July, in which HDOP presents a seasonal correlation, and has the lowest values at the end of May. There are some differences when our study is compared to the previous studies. In consistence with the previous studies, we found that HDOP incidence increased in periods when the temperature is lower.[4,5] However, the prevalence in our study had the lowest value in summer months in which humidity and temperature were the highest. This result is different than the results of other studies which found similar correlation with humidity.[7] In a study performed in Norway, it was reported the monthly prevalence of PE was the lowest in August and the highest in December.[8] We found that these results are consistent with our study. In the study of Ali et al. performed in Sudan, the authors reported higher prevalence for PE in periods with high temperature and low humidity.[9] Also, Morikawa et al. found in their study performed in Japan that HDOP was the most common in winter and early spring and the least common in summer, and concluded that this result may be associated with environmental factors.[10] These results are consistent with our study. In the city that we conducted our study, the humidity is high in summer with the highest level in August, and reaches to the lowest levels in winter and spring.

Our other purpose in this study was to group patients and to determine the prevalence by considering the conception periods of these patients as well. In months that the patients with HDOP conceived, there was consistency with the date of birth. The increases and decreases in the sub-groups of HDOP are parallel as shown in the graphs of the **Fig. 1**. Ambient temperature, the number of daylight hours, seasonal food and diet, infections and the changes of plasma volume in weather changes were asserted to explain this seasonal change of preeclampsia and eclampsia patients.[4,7]

Heat shock proteins which endanger the changes of preimplantation embryos were detected in animal experiments.[11] It was claimed that cold air may cause vasospasm.[8] In our study, the consistency with the conception date in our patients support preimplantation and/or implantation period. In summary, we found in our study that the patients who conceive and deliver in winter months such as December and in spring months HDOP prevalence is higher than the other months, while it is lower in end of summer and early autumn months. We found that our results are consistent with the results of other studies reporting the peak and the lowest prevalence.[8,12]

The seasonal trend in the preeclampsia may depend on various factors such as the maternal serum vitamin D and the duration spend in a sunny weather which affects maternal serum vitamin D.[13,14] The potential role of vitamin D in preeclampsia is a new study field. As known, the pathogenesis of preeclampsia has a number of biological processes that may be affected by vitamin D such as immune dysfunction, placental implantation, and abnormal angiogenesis.[13]

Conclusion

We found consistent results in our study compared to the previous studies. In our study, we found that the rate of HDOP was higher in winter and summer months in which humidity and temperature are low, and that it

reached to the lowest levels in spring months, particularly in May. When these patients were ranked according to the conception months, the rate graphic of all patients were consistent with the delivery week although there was no consistency in the sub-groups of HDOP. The results of our study show that HDOP rate depends on the environmental factors (i.e. humidity, temperature, vitamin D, etc.), and therefore, this is the reason to see diseases more frequently in particular periods.

Conflicts of Interest: No conflicts declared.

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