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Short Communication

Seasonal variation of the onset of preeclampsia and eclampsia

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Abstract

BACKGROUND: Preeclampsia is one of the three leading causes of maternal mortality. Studies have suggested that the incidence of preeclampsia may be partially dependent on the month or season of delivery. This study was conducted to evaluate whether seasonal variation has any effect on the incidence of eclampsia or preeclampsia.

METHODS: From 1999 to 2001, a cross-sectional study in Alzahra Hospital was performed using all deliveries with gestational age more than 20 weeks. Variables of maternal age, parity, occurrence of preeclampsia and eclampsia, and season were evaluated and analyzed by chi-square test in SPSS 10.

RESULTS: During the period of the study, there were 12,142 deliveries at Alzahra Hospital in Rasht. There were 2,579 (21.3%) deliveries in spring, 2,696 (22.2%) in summer, 3,645 (30%) in autumn, and 3,222 (26.5%) in winter. There was no statistically significant relationship between the age, parity and season. Hypertensive disorder was reported in 609 pregnancies (5%), with 11,533 (95%) having no hypertensive disorder. Data showed that 397 patients (3.3%) had preeclampsia and eclampsia. The highest rate of preeclampsia was in spring (3.6%), and the lowest rate was in summer (3%), but it revealed no statistical difference in the incidence of preeclampsia with season.

CONCLUSIONS: We found no correlation between preeclampsia or eclampsia and season. It may be due to relative similarities between seasons in North of Iran. For example, there are relative similarities between spring and summer, and between autumn and winter.

KEYWORDS: Pregnancy-induced hypertension, preeclampsia, eclampsia, seasonal.

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Pregnancy-induced hypertension is one of the complications that obstetricians fear most, due to its sudden appearance, its changing clinical presentations, and its rapid evolution. Eclampsia is a problem in underdeveloped countries. It is relatively uncommon in developed countries, where the incidence is about 20 times or one in every 2,000 deliveries. It accounts for approximately 50,000 maternal deaths worldwide each year [1-3]. The incidence of eclampsia and preeclampsia in Tehran was 0.1% and 3%, respectively [4]. In addition, it was associated with a five-fold increase in perinatal mortality. Because of these reasons, preeclampsia has been studied widely. Although the search for answers to many questions about its etiopathogenesis and physiopathology has led to numerous researches, after many years of studies and efforts, there still exist obscure and enigmatic aspects about them [5-7]. Today, various risk factors for the development of this entity have been identified, and a combination of different hypotheses has been proposed to try to find an approximation to the real solution for this problem; a solution that could probably lead to better therapeutic management. The following factors have been studied as being possibly related to preeclampsia: parity, maternal age, genetic factors, history of preeclampsia, diabetes, history of chronic and cardiovascular disease, smoking, BMI, race, regional variation, socio-economic

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and nutritional status [8-12]. Also, seasonal factors and humidity are said to influence the incidence of hypertensive disorders of pregnancy [13,14]. In Ghana, more cases of eclampsia have been noted in the rainy season [10], but there are some studies, however, which do not show any significant correlation between seasonal change and preeclampsia [15,16]. Several nutritional factors have been studied as possibly relating to these changes. A low calcium diet has been shown to be associated with an increased incidence of preeclampsia [17], and a number of studies showed a reduction in occurrence of preeclampsia after calcium supplementation [17,18,19]. In contrast, one recently-published study revealed no effect on preeclampsia incidence, blood pressure, or fetal outcome [17]. Fatty acids are involved in the prostaglandin metabolism, and a reduction of polyunsaturated fatty acids in preeclampsia has been demonstrated [17,20]. A shift in the balance of PGI2 and TXA2 in the anti-aggregatory direction has been found in Greenland Eskimos, which could be related to their high dietary intake of polyunsaturated fatty acids. However, a trial with supplementation of primrose oil in already established preeclampsia has shown no difference, versus the placebo group concerning blood pressure and fetal outcome [17]. Vitamin E is a potent antioxidant and attempt to add vitamin E to the treatment of patients with existing preeclampsia has revealed no significant difference in blood pressure, fetal outcome and amount of antihypertensive drugs needed for the management compared to the control group [17]. With consideration to the fact that dry and rainy seasons could have an influence on the nutritional status of women in developing countries, this study was conducted to find the seasonal variation on the incidence of preeclampsia.

Methods

This was a cross-sectional study. The data files of all women referred to Gynecologic ward, Alzahra Hospital, with a gestational age more than 20 weeks, based on reliable LMP (last menstrual period) or sonography of first half of pregnancy from 1999 to 2001, were collected. The registered information was parity, maternal age, date of birth, occurrence of hypertension (BP≥140/90), preeclampsia (BP≥140/90, and 1+ proteinuria dipstick or more than 300 mg protein in a 24-hour urine analysis) and eclampsia (preeclampsia and convulsion). The cases of chronic hypertension were excluded from the study, but the cases of superimposed preeclampsia were included. The mean temperatures of spring, summer, autumn and winter in these three years were 18.36, 25.56, 14.61 and 7.47 centigrade, respectively. The mean hours of sunny weather in spring, summer, autumn and winter in these three years were 549.7, 647.63, 305.97 and 332.87 hours, respectively. The mean rainfall of spring, summer, autumn, and winter in these three years were 181, 97 mm, 297,17 mm, 622.43 mm and 269.60 mm, respectively. Data was analyzed by chi-square test in SPSS 10 software.

Results

During the period of the study, there were 12142 deliveries at Alzahra Hospital in Rasht. There were 2,579 (21.3%) deliveries in spring, 2,696 (22.2%) in summer, 3,645 (30%) in autumn, and 3,222 (26.5%) in winter. The classification of seasons was based on solar calendar. Because of the influence of age and parity in occurrence of preeclampsia and eclampsia, we analyzed these variables according to the season, and our results showed that there was no statistically significant relationship between the age groups and parity with season (table 1 and table 2). In fact, there was similar distribution of age groups and parities among seasons. Among 12,142 parturients, 609 (5%) had hypertensive disorders (BP>149/90), and 11,533 (95%) had no hypertensive disorder. Data showed that 397 patients (3.3%) had preeclampsia and eclampsia, and 17 patients (0.1%) had eclampsia. The highest rate of preeclampsia was in spring (3.6%) and the lowest rate was in summer (3%), but it revealed no statistically significant difference in the incidence of preeclampsia with season (table 3).

Table 1. The age group distribution among seasons.

Season / Age (year)	Spring	Summer	Fall	Winter	χ^2 test
	No (%)	No (%)	No (%)	No (%)	
<16	13 (0.5)	20 (0.7)	27 (0.7)	22 (0.7)	
16-35	2389 (92.6)	2486 (92.2)	3338 (91.6)	2976 (92.4)	*NS*
>35	177 (6.9)	190 (7)	280 (7.7)	224 (7)	
Total	2579 (100)	2696 (100)	3645 (100)	3222 (100)	

Table 2. The distribution of parities among seasons.

Season / Parity	Spring	Summer	Fall	Winter	χ^2 test
	No (%)	No (%)	No (%)	No (%)	
Primipara	1242 (48.2)	1305 (48.4)	1744 (47.8)	1545 (48)	
Multipara	1337 (51.8)	1391 (51.6)	1901 (52.2)	1677 (52)	*NS*
Total	2579 (100)	2696 (100)	3645 (100)	3222 (100)	

Table 3. The relative frequency of preeclampsia and eclampsia according to the season.

Season / Preeclampsia and Eclampsia	Spring	Summer	Fall	Winter	χ^2 test
	No (%)	No (%)	No (%)	No (%)	
Yes	92 (3.6)	80 (3)	119 (3.3)	106 (3.3)	
No	2487 (96.4)	2616 (97)	3526 (96.7)	3116 (96.7)	*NS*
Total	2579 (100)	2696 (100)	3645 (100)	3222 (100)	

Discussion

The results of this study showed that there was no statistical significant difference among incidences of preeclampsia in four seasons. The highest incidence rate of preeclampsia was in spring (3.6%) and the lowest rate was in summer (3%). Yet, primary prevention of preeclampsia is not possible since the causes are largely unknown [21]. One of the stated hypotheses in occurrence of preeclampsia is the role of environmental and nutritional factors. During pregnancy, the fetus is exposed to nutrients and may be exposed to infectious agents through the mother. Dietary intake and risk of infection varies with season. In addition, ambient temperature and the amount of daylight can show relatively large seasonal variations. The pathophysiologic changes that occur in the early part of pregnancy, may be related to preeclampsia in delivery stages, so infection or nutrition deficiency in spring may cause preeclampsia in the late fall or winter [20,22-24]. Another hypothesis is the influence of temperature. Cold weather could lead to the kind of vasospasm and subsequent ischemia that is a part of the pathogenesis of preeclampsia [25,26]. Neela et al supported the speculated relationship between increasing humidity and a lower temperature range with the increased incidence of eclampsia [2]. Wacker et al found an increased incidence of preeclampsia at the end of dry season and in the first months of rainy seasons [20]. Magnus et al reported a systematic seasonal variability in occurrence of preeclampsia with a peak in the winter months and a minimum in the summer [21]. Agobe et al

stated that that the incidence of eclampsia varies significantly with the weather. Protective action by arid conditions is consistent with the known effect of dehydration on convulsions of differing etiologies and is attributable to increased pulmonary transpirational water loss [27]. In contrast, Magann et al indicated no statistical correlation between preeclampsia and meteorological changes [16]. This lack of correlation between meteorological factors and hypertensive disorder of pregnancy were also reported in Makhseed study [28]. Phillips et al identified a seasonal variation in preeclampsia that appears to be more strongly related to timing of conception than to the timing of delivery. Conception during the summer months had the highest risk (incidence 2.3%) compared with the spring (incidence 1.4%). Fall (1.7%) and winter (1.6%) conceptions were associated with intermediate rates of preeclampsia [29]. Jamelle in Karachi found an increase in eclampsia cases from April to June and in September; otherwise the incidence remained stable [1]. In Peshawar and Quette, with more severe cold and dry winter, the incidence peaked in winter and summer months. However, his statistical analysis revealed no significant relationship of incidence of eclampsia with temperature [1]. The results of current study revealed no statistical difference between incidence of preeclampsia and seasonal changes. However, it should be considered that this study was performed in a temperate meteorological condition, so there were not various climatic conditions. It may be due to lack of significant difference in respect of temperature or humidity among seasons in this area. For example, spring and summer are slightly similar, and autumn and winter are slightly similar too. This study was not able to evaluate all deliveries of Guilan Province in these three years, so further studies with a larger sample size in Guilan and other areas is recommended.

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