Caffeine Consumption and Incidence of Hypertension in Pregnancy

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Abstract

Objective: To study the effects of caffeine consumption on incidence of pre-eclampsia and gestational hypertension.

Materials and methods: In a case-control study, two groups of pregnant women were selected as follows: one group included 40 women suffering from hypertension in pregnancy, while the other group comprised 100 healthy pregnant women. Inclusion criteria for both groups were normal BMI (19-22) before pregnancy, no high-risk age group (18-35 years) for preeclampsia, no underlying disease, no history of abortion, and regular prenatal care. We evaluated the amount and duration of caffeine consumption in both groups.

Results: In nine (25.5%) mothers of preeclampsia group and 15 (15.8%) mothers of healthy pregnant group were observed to consume excessive amount of tea (more than four cups a day). In the preeclampsia group, excessive consumption of tea was seen, but this difference was not significant. Among 21 (51%) mothers in preeclampsia group and 64 (64.7%) mothers in the other group, there is not a significant relation in drinking different types of caffeine, like dark coca, soft drinks, or coffee with occurring of preeclampsia.

Conclusion: After evaluation the obtained data, we did not observe any relationship between the risk of preeclampsia and consumption of different types of caffeine (tea, coffee, or soft drinks). Perhaps, more holistic and broader studies in this area are required.

Keywords: Tea, Caffeine, Pre-eclampsia

Introduction

Caffeine is an alkaloid that in pure form is odorless and very bitter; in addition, this substance can be naturally extracted from plants (1). Caffeine is metabolized in the liver, but the amount that is metabolized varies in different people.

After metabolism, this substance is converted in to the following three compounds:
1- Paraxanthine- causes lipolysis, as well as increases glycerol and free fatty acid in blood plasma
2- Theobromine- causes dilatation of blood vessels and increases the volume of urine
3- Theophylline- relaxes the smooth muscles in bronchial

Each of the substances, created by the metabolism
of caffeine, can be used in the therapeutic field with considering their effects. The overall changes in the body caused by caffeine are as follows:

Caffeine stimulates the central nervous system; consequently, it affects fatigue by increasing alertness. This change is also observable in heart muscle, so the heart rate increases, gas is transferred, respiratory pathways are dilated, breathing is facilitated, and finally, a diuretic increases urine secretion (2-4).

Caffeine can be found in 60 different plants, like tea leaves, cocoa seeds and coffee beans, while in today’s world, the most available substance containing caffeine is soft drinks (5, 6).

Preeclampsia causes hypertension during pregnancy, which can be identified by reading a blood pressure of 140/90 or more twice a day in at least four hours interval, and also observing 300 mg of protein in lab result of 24-hour urine test. Another considerable sign in these patients is edema (Pitting).

Irreparable damage caused by blood pressure is mainly in the liver and kidney endothelium, which is caused by vasoconstriction. In addition, other complications are observed following preeclampsia are HELLP syndrome and birth of preterm infants.

Based on studies conducted in the past and due to the high consumption of different types of caffeine in Iran, it was deemed necessary to monitor the effects of caffeine on Iranian pregnant mothers. Of course, information and opinions in this area are many and different; in some articles, caffeine is listed as a harmful and inappropriate substance for pregnancy. Other studies have mentioned if caffeine is consumed moderately, it will not be harmful and may sometimes create desirable effects. Given that in our country is common to consume tea and coffee, soft drinks (black beverage), also the undesirable effects of preeclampsia on pregnant mothers and neonates, we decided to evaluate amount and duration of caffeine consumption and its effects on pregnant women in incidence of preeclampsia as regard to the different races.

Materials and methods

This case-control study was conducted at two different hospitals, Women Medical Center and Valiasr General Hospital, in Tehran, Iran, from Nov 2009 to Dec 2010. Pre-eclampsia women (case) and normotensive controls were recruited to the study within 48 hours after delivery. Inclusion criteria were at least 18 years of age. We excluded participants with multiparous, chronic hypertension, heart disorder, HIV positive serology, or history of IUFD or abortion. The study was approved by the Research Ethics Committees of both selected hospitals.

In this study, preeclampsia women were identified if they experienced blood pressure of 140/90 mm Hg or higher at least twice with four hours apart after week 20 of pregnancy, as well as their lab result revealed proteinuria either with excretion of 0.3 g or more in a 24-hour urine test specimen or ≥1+ on a dipstick. The above-observations were based on the guidelines of the American College of Obstetricians and Gynecology.

Controls were normotensive pregnant women delivering during the same time as the other group in either of the selected hospitals. After excluding participants presenting incomplete data, a total of 40 cases along with 100 controls were recruited between Nov 2009 and Dec 2010.

Data were collected through an in-person interview using a structured study questionnaire. Data were completed by a trained midwife working in post partum ward. Since every mother consciously and voluntarily enrolled in our study, the data protection was remained in the possession of the researchers, and was merely used for achieving the objectives of the study. Accordingly, it did not contradict with the principles of the Medical Ethics. Eligible women were also provided with further information about the study by a research assistant. A consent form was signed by all participants. Information about lifestyle-related factors was obtained from questionnaires, demographic data, and medical history; in addition, detailed information about current pregnancy and delivery method were systematically gathered from the hospital records.

Information on the consumption of tea and other drinks was obtained through the following questions: (i) “Did you drink tea during the first trimester of pregnancy?”, (ii) “Did you drink tea during second trimester of pregnancy?”, and (iii) “Did you drink tea during third trimester of pregnancy?”. The women were addressed with the similar questions regarding consumption of coffee and cokes. For each of the questions, if the response was affirmative, the frequency (cups per day) was also recorded. Pregnant women were classified as non-drinkers (never drinking tea during pregnancy), first trimester drinker, second trimester drinker, or completed drinker (drinking tea during pregnancy).

Categories of beverage consumption were defined
based on the distribution among the controls. Tea consumption was categorized into four groups: (i) never, (ii) less than three cups per day, (iii) three to less than six cups per day, and (iv) more than six cups per day. Coffee or Caffeine consumption was categorized as: drinking or non-drinking.

The obtained data was stored in a database with statistical SPSS software, version 15. Descriptive statistics (as absolute) and relative abundance for qualitative variables, mean and standard deviation were extracted. Also, in expressing data analysis to access the causality relations for qualitative comparison, t -test was applied, while comparisons between the groups for categorical variable were performed with $X^2$ test (for Fisher exact test, where appropriate), with considering 95% significant level and 80% power.

Results

We studied 140 pregnant women who were placed into two groups as follows: one group included 40 women suffering from hypertension in pregnancy, while the other group comprised 100 healthy pregnant women. The demographic and background profile of both groups are shown in table 1.

After necessary considerations, we found that nine mothers (25.5%) suffering from preeclampsia developed a habit of drinking excessive tea (more than three cups a day), while 15 healthy mothers (15.8%) revealed the same habit of drinking excessive tea; however, this difference was not significant. (p=0.28). In trimester classification, there is no difference between different trimesters because of drinking tea, routinely.

Our obtained data illustrated that two individuals (5.1%) of preeclampsia group and three individuals (3.9%) of healthy group drank coffee, daily. We could conclude that preeclampsia is observed more in mothers drinking coffee, but again, there is no significant difference (p=0.20). In addition, these lower numbers may be due to the fact that coffee is not a common beverage in Iran in comparison to tea (table 2).

Table 1: Maternal demographic and obstetric characteristics of pre-eclamptic and normotensive women in the studied population

<table>
<thead>
<tr>
<th>Characters</th>
<th>Preeclampsia</th>
<th>Normotensive</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maternal age (year)</td>
<td>28±4.1</td>
<td>27±5</td>
<td>0.53</td>
</tr>
<tr>
<td>Education: university or more</td>
<td>2(5.1%)</td>
<td>8(8%)</td>
<td>0.01</td>
</tr>
<tr>
<td>Education: Less than UNV</td>
<td>37(94.9%)</td>
<td>92(92%)</td>
<td></td>
</tr>
<tr>
<td>Pre-gestational weight</td>
<td>71±16</td>
<td>61±12</td>
<td>0.00</td>
</tr>
<tr>
<td>Infection</td>
<td>6(15%)</td>
<td>18(18%)</td>
<td>0.67</td>
</tr>
<tr>
<td>Antibiotics use</td>
<td>7(17.5%)</td>
<td>18(18%)</td>
<td>0.94</td>
</tr>
<tr>
<td>Unwanted pregnancy</td>
<td>6(15%)</td>
<td>16(16%)</td>
<td>0.83</td>
</tr>
<tr>
<td>Birth weight</td>
<td>2860±1.0</td>
<td>3316±5.1</td>
<td>0.00</td>
</tr>
<tr>
<td>Parity</td>
<td>1.55±0.77</td>
<td>1.44±0.54</td>
<td>0.40</td>
</tr>
<tr>
<td>Gravid</td>
<td>1.84±0.99</td>
<td>1.98±0.84</td>
<td>0.76</td>
</tr>
<tr>
<td>Occupation: employed</td>
<td>4(10%)</td>
<td>12(12%)</td>
<td>0.73</td>
</tr>
<tr>
<td>Occupation: Unemployed</td>
<td>36(90%)</td>
<td>88(88%)</td>
<td></td>
</tr>
</tbody>
</table>

Table 2: The associations between tea, coffee, and caffeine consumption during pregnancy and risk of pre-eclampsia

<table>
<thead>
<tr>
<th>Factor</th>
<th>pre-eclampsia</th>
<th>Normotensive</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tea</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>≤3 cups/day</td>
<td>35(87.5%)</td>
<td>87(87%)</td>
<td>0.93</td>
</tr>
<tr>
<td>&gt;3 cups/day</td>
<td>5(12.5%)</td>
<td>13(13%)</td>
<td>0.93</td>
</tr>
<tr>
<td>Coffee</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never</td>
<td>38(95%)</td>
<td>97(97%)</td>
<td>0.56</td>
</tr>
<tr>
<td>Yes</td>
<td>2(5%)</td>
<td>3(3%)</td>
<td>0.56</td>
</tr>
<tr>
<td>Caffeine(tea, coffee, and cock)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never(≤3cups/day)</td>
<td>19(47.5%)</td>
<td>36(36%)</td>
<td>0.20</td>
</tr>
<tr>
<td>Yes(&gt;3cups/day)</td>
<td>21(52.5%)</td>
<td>64(64%)</td>
<td>0.20</td>
</tr>
</tbody>
</table>
Our findings showed that 21 people (51.3%) of preeclampsia group and 64 people (64.7%) of healthy group drank caffeinated drinks, such as soft drinks, coffee, tea, etc. The obtained data revealed that the percentage of healthy mothers drinking caffeinated beverages was higher, but there is no significant correlation between drinking caffeinated beverages and preeclampsia (p=0.56).

Discussion

In our study, 140 pregnant women were studied in two groups, the first group included 40 pregnant women with preeclampsia, and the second group consisted of 100 healthy pregnant women. Excessive consumption of tea, more than the daily limit of four cups, was observed more in mothers with preeclampsia, which showed no significant correlation. In an article by Fraser et al. (2009) has mentioned that continuous tea consumption during pregnancy may be associated with an increased risk of preeclampsia (7). In our study, the daily consumption of coffee by pregnant women and incidence of preeclampsia did not show a significant correlation. According to a research completed by Lynch et al. (2008), in spite of public media information about coffee consumption, this substance does not interfere with miscarriages during pregnancy (8). Nevertheless, in a study carried out by Khoury et al. (2004) has showed that excessive consumption of coffee may increase the risk of miscarriage during pregnancy; furthermore, smoking cigarette and coffee consumption, simultaneously, may decrease the risk of preeclampsia (9).

In our research, consumption of caffeine or theophylline was more common in preeclampsia mothers. Although this relationship was not significant, various studies have shown different effects of caffeine on pregnancy. In another article by Klebanoff et al. (2009), they have shown that theobromine consumption (one of the caffeine ingredients in chocolate) has a contrary result in preeclampsia incidence (10). In a different article by Savitz et al. (2008), they have revealed that there is no relationship between caffeine consumption during pregnancy and miscarriage (11). Also, a study conducted by Blumar et al. (1997) has indicated that consumption of high caffeine level (more than 500mg per day) in 45% of women of reproductive age is associated with possible risk of infertility (12).

Conclusion

After evaluation the obtained data, we did not observe any relationship between the risk of preeclampsia and consumption of different kinds of caffeine (tea, coffee, or soft drinks). Perhaps, more holistic and broader studies in this area are required.

Acknowledgments

There is no conflict of interest in this article.

References