

Association of dietary calcium with blood pressure and weight gain in pregnant women

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ABSTRACT

Objective: To investigate the association of dietary calcium with blood pressure and weight gain in pregnant women.

Design: This study used data collected from healthcare centres in Ardebil for 137 pregnant women aged 30–35 years. Dietary calcium intake was assessed using a single 24-hour food recall and Nutritionist IV software. Height and weight were measured after overnight fasting with all participants wearing light gowns. Blood pressure measurements were taken in the sitting position after a resting period of at least 5 min. Linear regression was used to evaluate the relationship of dietary calcium intake with weight gain and blood pressure.

Results: Mean±SD systolic and diastolic blood pressures were 150.19±50.45 and 70.18±11.16 mmHg, respectively. Mean±SD calcium intake was 784.59±33.36 mg/day. There was a significant association between dietary calcium intake and diastolic blood pressure and weight gain in pregnant women ($p\leq 0.05$). However, the association between dietary calcium intake and systolic blood pressure and weight was not significant ($p\geq 0.05$).

Conclusion: Dietary calcium intake can affect blood pressure and weight gain in pregnant women.

Keywords

Dietary calcium
Blood pressure
Weight gain
Pregnancy

Introduction

It is important to assess the role of nutritional behaviour in weight gain and blood pressure during pregnancy [1, 2] as both maternal weight and gestational weight gain have a significant influence on birthweight [3, 4]. Many observational and interventional studies have indicated that calcium consumption can contribute to a decreased risk of weight gain and high blood pressure during pregnancy [5–7]. However, reviews of the literature indicate that there are insufficient unequivocal data (which are mainly prospective or from intervention trials) to decisively conclude that increasing consumption of dairy products results in a decrease in fat mass

and related factors. Moreover, disparate results have been found between men and women and between different initial weights [8, 9]. Calcium intake was inversely associated with waist circumference and hypertension. Calcium intake can also affect blood pressure as studies have demonstrated that a diet rich in calcium maintains blood pressure in the normal range [10, 11]. As calcium intake and its association with gestational weight gain and gestational blood pressure in pregnant women from Ardebil had not previously been investigated, we conducted such a study in pregnant women recruited from Ardebil health centres.

Methods and materials

Study population

We used data from healthcare centres in Ardebil collected during a study investigating the effect of nutrition education on gestational weight gain and the nutritional status of pregnant women at 25 weeks of gestation. Data from 137 pregnant women aged 30–35 years were analyzed. Weight gain was calculated as the difference between weight at 4 weeks and weight at 36 weeks of pregnancy. Women on medication or with preeclampsia or other medical conditions were

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excluded. This study was approved by the research ethics committee of Ardebil University of Medical Sciences.

Assessment of dietary calcium intake

Trained dietitians conducted a nutritional survey in the participants’ homes using food models, two-dimensional food volumes, and containers to help participants recall nutrient intake. A qualitative food frequency questionnaire listing 63 common food items was used to obtain additional dietary information. Dietary calcium intake was assessed using a single 24-hour food recall.

Clinical and anthropometric measurements

Anthropometric measurements were performed by trained examiners. Height and weight were measured after overnight fasting with all participants wearing light gowns. Body mass index (BMI) was measured before pregnancy and was calculated as weight (kg) divided by height squared (m²). Blood pressure was taken in the sitting position after a resting period of at least 5 min at the beginning of the study. The participants self-reported age, smoking status, alcohol consumption, residential area, household income, educational level, use of dietary supplements, and extent of physical activity.

Statistical analysis

Normally distributed continuous variables are reported as mean±SD. The independent sample t-test was used to compare the means of the quantitative variables. Statistical analyses were performed using SPSS version 16.0. Linear regression was used to evaluate the association of dietary calcium with obesity and blood pressure. In all analyses, *p*<0.05 was considered significant.

Results

Characteristics of the participants

Table 1 gives the demographic characteristics of women enrolled in the study. The mean±SD age of the pregnant women was 31.15±9.44 years. Mean±SD systolic and diastolic blood pressures were 150.19±5.45 and 70.18±11.16 mmHg, respectively. Approximately 48% of the women had a normal weight.

Table 2 summarizes calcium intake and weight gain in pregnant women.

Table 3 indicates dietary calcium intake was associated with

blood pressure and weight gain in pregnant mothers in this study. There was a significant (*p*=0.012) association between dietary calcium and weight gain and a significant negative (*p*<0.05) association between dietary calcium and diastolic blood pressure.

Discussion

Nutrition in pregnancy is important for mothers and their child’s health [12]. We investigated the association between total dietary calcium intake and blood pressure and weight gain in pregnant women.

Dietary calcium intake was significantly associated with diastolic blood pressure and weight gain but not with systolic blood pressure and weight.

As weight gain in pregnancy is dependent on factors other

Age (years)	31.15±9.44
Weight (kg)	65.47±11.47
Height (cm)	159.74±5.45
BMI (kg/m ²)*	26.3±6.87
18.5	–
18.5–24.9	66 (48.2%)
25–29.9	49 (35.8%)
≥30	22 (16.1%)
Systolic blood pressure (mmHg)	150.19±50.45
Diastolic blood pressure (mmHg)	70.18±11.16
Values are mean±SD or number (%)	
*Before pregnancy	
BMI body mass index	

Table 1 - Baseline characteristics of the study population (n=137)

Variable	Mean±SD
Calcium (mg), daily intake	784.59±33.36
Weight gain (g)	1292.80±44.81

Table 2 - Dietary calcium intake and weight gain in pregnant women

Variable	<i>p</i> Value	Beta coefficient
Systolic blood pressure	0.111	–0.106
Diastolic blood pressure	0.050	–0.051
Weight gain	0.012	0.192
Weight	0.224	–0.069

Table 3 - Regression coefficients from the linear model with dietary calcium as the independent variable

than the growth of the fetus, dietary calcium may have an important effect.

Also many previous observational studies have indicated there is a significant association between calcium intake and blood pressure, although interventional trials have failed to show consistent results [13]. In the USA, a prospective study of 28,886 women showed that low-fat dairy, calcium and vitamin D intakes were each inversely associated with risk for hypertension [7, 14]. Many epidemiological studies have also shown a significant inverse association between blood pressure and dietary calcium intake [15, 16]. Gopinath *et al* indicated that calcium intake in girls was inversely associated with systolic blood pressure [17]. It has been suggested that the impact of calcium on blood pressure may be more noticeable when habitual calcium intake is low [18]. The effect of calcium intake on blood pressure may also affect stroke risk [19]. Our results did not indicate a significant association between the pregnant women's weight and their dietary calcium, although studies have indicated that a diet containing high levels of calcium reduces body fat content. Studies indicate that some proteins promote adipocyte lipogenesis and inhibit lipolysis through a mechanism that involves calcium signalling.

It was hypothesized that high calcium intake would suppress circulating concentrations of hormones, such as 25-hydroxyvitamin D, 1,25-dihydroxyvitamin D and parathyroid hormone, which normally promote calcium uptake and influx into cells, and thus reverse the adipogenic action of Agouti protein by reducing intracellular calcium concentrations [20]. In vitro studies have confirmed that vitamin D increases intracellular calcium concentrations in human adipocytes and antagonizes stimulation of lipolysis [21].

Our study is limited by its cross-sectional design and its small sample size, so we recommend that future investigations enrol more participants. Nor did we measure other factors that can affect blood pressure and weight gain. Also, our results may not be generalizable to other racial/ethnic groups or to women living in other countries.

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Conflict of interest

None.

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