

# EFFECT OF CALCIUM AND VITAMIN D SUPPLEMENTATION ON BLOOD PRESSURE OF PREGNANT WOMEN

By

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## SUMMARY

To study the effect of calcium and vitamin D supplementation on the blood pressure of pregnant women, 400 pregnant women were included in this study. Of these, 200 women randomly selected were put on a daily supplement of calcium (375 mg) and vitamin D (1200 I.U.) from 20-24 weeks of pregnancy onwards. Remaining 200 women served as controls. A statistically highly significant fall in both systolic and diastolic blood pressures was observed at 32 weeks and 36 weeks gestation in the supplemented group, whereas there was no difference in the blood pressure values at 24 weeks and 28 weeks gestation between the supplemented and non-supplemented groups.

## Introduction

Calcium is an essential element in normal cellular physiology (Cheung, 1980). Normal cardiovascular function is critically dependent on both extra and intracellular calcium concentrations (Johansson, 1978). Recently abnormalities of extra- and intra-cellular calcium metabolism have been identified in both human and experimental hypertension (Ayachi 1979; McCarron *et al*, 1982). Data from various epidemiologic studies indicate an inverse correlation between calcium content of drinking water and mean arterial blood pressure in human beings living in specified geographical regions (Masironi *et al*, 1976). An inverse association between the daily calcium intake and the incidence of eclampsia in pregnancy has also been described. On the basis of these

observations, it has been postulated that low calcium intake could be a factor predisposing to the development of pregnancy induced hypertension. Further, lower blood pressure was observed in calcium supplemented normotensive pregnant women (Belizan *et al*, 1983), non pregnant adults (Belizan *et al*, 1983) normotensive animals (McCarron, 1982) and spontaneously hypertensive rats (Ayachi, 1979). However, Johnson *et al* (1985) failed to observe any lowering effect of calcium supplementation on the blood pressure of normal women. This present study was conducted to determine the effect of calcium and vitamin D supplementation on the blood pressure of normotensive pregnant women.

## Material and Methods

This study was conducted on 400 pregnant women attending the antenatal clinic of the Department of Obstetrics and

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Gynaecology of Medical College and Hospital, Rohtak. Of these, 200 women randomly selected, were put on a daily supplement of calcium (375 mg) and vitamin D (1200 I.U.) from 20-24 weeks of pregnancy onwards.

At each subsequent visit, blood pressure determination was made on the subject's right arm using a standard mercury sphygmomanometer, after the subject had seated for at least 5 minutes. Diastolic blood pressure was based on the fifth Korotkoff sound.

### Results

The results of the blood pressure recordings are as shown in Table I. No statistically significant change in blood pressure was seen in the supplemented group at 24 weeks and 28 weeks of pregnancy. However, further analysis of the data revealed significantly lower systolic and diastolic blood pressure values at 32 and 36 weeks of pregnancy in the supplemented group.

produced a significant reduction in both systolic and diastolic blood pressure in normotensive pregnant women.

There is no clear explanation of the mechanisms involved in the observed relationship. Whenever the permeability of cell membrane is increased, intracellular calcium concentration is increased. This results in increased responsiveness of muscle cells. (Frank, 1980). The entrance of calcium ions into the cell seems to stimulate the release of calcium ions, from sarcoplasm, raising its concentration and initiating the mechanical response (Frank, 1980). Parathyroid hormone (PTH) level rises with low calcium intake and it has been shown that PTH increases the intracellular calcium concentration in several types of cells (Borle and Uchikawa, 1978). This effect is due to the PTH induced, increase in the permeability of cell membrane to calcium and to the PTH stimulus of adenyl cyclase activity for the formation of cyclic adenosine monophosphate (AMP). Cyclic AMP stimulates the efflux of calcium from

TABLE I  
Effect of Calcium and Vitamin D supplementation on mean blood pressure values at various gestations

Gestation in weeks	Blood pressure (mmHg)	Non-Supplemented group	Supplemented group	p value
24	Systolic	115.6 ± 8.8	115.7 ± 9.0	>0.05
	Diastolic	73.9 ± 7.2	72.6 ± 6.2	>0.05
28	Systolic	113.7 ± 8.4	112 ± 8.3	>0.05
	Diastolic	73.4 ± 8.0	71.5 ± 6.9	>0.05
32	Systolic	117.7 ± 9.7	109.6 ± 7.6	<0.001
	Diastolic	76 ± 7.7	70 ± 7.4	<0.001
36	Systolic	117.4 ± 8.6	110.1 ± 6.3	<0.001
	Diastolic	74.7 ± 7.4	70.6 ± 7.8	<0.001

### Discussion

As is evident from the results, antenatal calcium and vitamin D supplementation

mitochondrial stores, increasing cytoplasmic calcium levels. A parathormone effect on blood pressure has been supported by several reports in animals (Berthe-

lot and Gairard, 1978) although not yet confirmed in pregnancy. Calcium also plays a role in modulating prostaglandin synthesis, which influences PTH release. (Gardner *et al* 1979).

The calcium status of pregnant women in Indian population is poor and can be corrected by moderate calcium and vitamin D supplementations (Marya *et al* 1981). To maintain serum calcium levels within their narrow physiological limits, parathormone tends to increase progressively during pregnancy. With calcium and vitamin D supplementation this hyperparathyroid state is reduced, leading to lowering of blood pressure. However, the involvement of some other physiologic mechanisms cannot be ruled out, as calcium participates in several metabolic processes related to control of vascular tone.

This work corroborates the work of Belizan *et al* (1983) who observed in pregnant women that calcium supplementation is effective in reducing blood pressure. Thus high calcium intake, associated with lower blood pressure may produce a protective effect against hypertension and could reduce the incidence of pregnancy induced hypertension. In the present study, a decrease in the incidence of pregnancy induced hypertension from

9% to 6% was observed in women supplemented antenatally with calcium and vitamin D as compared to non supplemented group. However the decrease was not statistically significant.

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