

## ORIGINAL ARTICLES

# Effect of Calcium Supplementation on Serum Lipid Concentration in Normal Older Women : A Randomized Controlled Trial

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### Summary:

*The study was done to determine the effect of calcium supplementation on circulating lipid concentration in normal older women. One hundred and ten postmenopausal women were randomly assigned to receive calcium supplementation. Sixty of them received calcium carbonate 1 gm per day and fifty of them received no calcium for six months. None of them were receiving therapy for hyperlipidaemia and osteoporosis. Fasting total cholesterol, low density lipoprotein, high density lipoprotein and triglyceride were obtained at base line serum*

*lipid concentrations and at sixth month. After six months HDL cholesterol increased by 5% and LDL cholesterol decreased by 7% in the calcium group in comparison to the group without calcium. Total cholesterol and triglyceride level revealed non-significant decline. In conclusion calcium supplementation causes a beneficial changes in circulating lipids in postmenopausal women. This suggests that a reappraisal of the indications for calcium supplementation is necessary.*

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### Introduction:

Calcium supplementation is recommended and used widely among postmenopausal women for prevention of osteoporosis. There is consistent evidence from randomized controlled trials that calcium supplementation slows postmenopausal bone loss and there is some evidence that it prevents fracture in postmenopausal women<sup>1</sup>. Other benefits from the use of calcium supplements have been suggested. These include favourable effect on colon cancer, blood pressure and serum lipids<sup>2</sup>.

The suggestion that calcium intake might affect serum lipid concentrations has arisen from human and animal studies demonstrating that calcium binds to fatty acids and bile acids in the gut, leading to malabsorption of fat<sup>3,4</sup>. These observations are consistent with suggestions that calcium supplementation has beneficial effect on circulating lipid concentrations. However, the studies were small and short-term and most have not assessed effects on the levels of high density lipoprotein (HDL) cholesterol and low density lipoprotein (LDL) cholesterol separately<sup>4</sup>.

It is possible that changes in serum lipids resulting from the use of calcium supplements could be as important for

postmenopausal women as are its effects on osteoporosis. The present study was done to determine the effect of calcium supplementation (in the usual dose used to prevent osteoporosis) on lipid levels in older women<sup>5</sup>.

### Methods:

This randomized controlled trial of calcium supplementation was done on postmenopausal and older ladies attending Medicine Department, Shaheed Suhrawardy Hospital for a period of 4 years from January 1999 to December 2002. Women having menopause for more than five years and older than 55 years were included in this study. Subjects having significant renal, liver and kidney disease were excluded from the study. None of the subjects were using hormone replacement therapy (HRT) for hyperlipidaemia, anabolic steroids, glucocorticoids or bisphosphonates during the previous six months. One hundred and ten patients were included in the study, sixty of them received calcium 1 gm per day, and fifty received no calcium. Diet and physical activity were assessed by using validated questionnaires. Compliance were assessed by tablet counts.

Fasting serum levels of total cholesterol, High-density lipoprotein cholesterol and triglyceride were measured at baseline and at six month, using a Roche-Hitachi 747 autoanalyzer (Mannheim, Germany). Low-density lipoprotein levels were calculated using the Friedewald's formula.

The prespecified hypothesis that the changes in each of the lipid parameters over six months would be different in those treated with calcium and in those without calcium. This was tested by comparing the available data between groups using student 't' test

### Results :

Baseline clinical and lipid data were similar in the calcium and without calcium group. None of the subjects were

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**Table I**

| <i>Clinical characteristics of the study subjects.</i> |                        |                                 |         |
|--|------------------------|---------------------------------|---------|
| Characteristics.                                       | Calcium<br>group(n=60) | Without calcium<br>group (n=50) | P value |
|  | Mean $\pm$ SD          |                                 |         |
| Age (years)  | 62 $\pm$ 4             | 62 $\pm$ 5                      | 0.99    |
| Years since menopause,                                 | 16 $\pm$ 3             | 17 $\pm$ 3                      | 0.99    |
| Weight (Kg)  | 58 $\pm$ 11            | 57 $\pm$ 10                     | 0.15    |
| Height (centimeter)                                    | 158 $\pm$ 6            | 159 $\pm$ 6                     | 0.99    |
| Compliance (%)   | 95%                    | 97%                             | 0.99    |
| Physical activity.                                     | Moderate               | Moderate                        |         |

**Table II**

| <i>Effects of calcium supplementation on serum lipid level.</i> |                  |                 |                 |   |         |
|---|------------------|-----------------|-----------------|---|---------|
| Measurement<br>(mg/dl)  | Group            | Baseline        | 6 months        | Percentage change<br>(Baseline to 6 months) | P Value |
| HDL Cholesterol   | With Calcium.    | 45.34 $\pm$ 9.4 | 42.50 $\pm$ 8.6 | +5%   | 0.01    |
|   | Without Calcium  | 44.25 $\pm$ 9.1 | 43.46 $\pm$ 8.2 | +2%   |         |
| LDL Cholesterol   | With calcium     | 154 $\pm$ 28    | 142 $\pm$ 25    | -7.26%                                      | 0.04    |
|   | Without Calcium. | 148 $\pm$ 27    | 149 $\pm$ 24    | -1.2%                                       |         |
| Total Cholesterol   | With Calcium     | 196 $\pm$ 56    | 194 $\pm$ 52    | -5%   | 0.52    |
|   | Without calcium  | 192 $\pm$ 58    | 200 $\pm$ 35    | -3%   |         |
| Triglyceride  | With Calcium     | 227 $\pm$ 67    | 217 $\pm$ 85    | -4%   | 0.48    |
|   | Without Calcium  | 270 $\pm$ 106   | 265 $\pm$ 95    | -3%   |         |

alcoholic or smoker. Lipid profile were almost similar in both groups at the beginning of the study.

In the calcium group, mean HDL cholesterol level increased about 5% above baseline at six months, whereas LDL cholesterol level declined about 7%. Total cholesterol level showed a nonsignificant decrease of 5%. Triglyceride level also showed a nonsignificant decrease of 4% at the end of the study. Mean body weight did not show any significant change in any of the groups at the end of the study

#### **Discussion :**

The study findings indicate that the use of calcium carbonate in a daily dose containing 1 gm elemental

calcium increases serum HDL cholesterol level with reciprocal changes in LDL cholesterol level. Increase in HDL cholesterol of this magnitude may be associated with 20-30% reduction in the rates of cardiovascular events. Since atherosclerosis is the most common cause of death in postmenopausal women, the hypolipidemic effects of calcium could have greater effects on morbidity and mortality in these women than on osteoporosis.

The hypolipidemic effects of calcium was observed in earlier reports. Two substantial studies have been reported in adults. Bell et al<sup>7</sup> randomly assigned 56 hypercholesterolemic patients to placebo or calcium 1.2 gm/day (as carbonate) for six weeks, followed by

a crossover. Low density lipoprotein cholesterol level decreased by 4% and those of HDL cholesterol increased by 4%, consistent with this study. The smaller sizes of the changes they found may be related to shorter duration of their study or to the lower bioavailability of calcium.

There is also observational evidence that calcium intake is inversely associated with cardiovascular disease. In the Iowa Women's Health study, for example cardiovascular mortality was one-third lower among women whose calcium intake (diet or supplements) were in the highest quartile in comparison with those in the lowest quartile<sup>8</sup>. This reduction in event rate is very similar to that predicted from lipid changes that was observed in this study. Knox reported a strong inverse relationship between calcium intake and standardized mortality ratios for ischaemic heart disease in patients in the United Kingdom<sup>10</sup>.

The effects of calcium supplementation on lipid concentration are likely to result from calcium binding to fatty acids and bile acids in the gut, thus interfering with lipid absorption<sup>4</sup>. However, other mechanisms may also be involved. There is evidence that parathyroid hormone and 1, 25 dihydroxycholecalciferol (active form of vit. D) regulate adipocyte activity. Calcium supplementation suppresses circulating concentration of parathyroid hormone, thereby possibly promoting lipolysis<sup>12</sup>. Studies have shown that calcium supplementation can increase lipolysis and body temperature as well as reduce fatty acid synthesis and body weight. These direct effects on adipocyte may contributed to the weight loss that has been reported with the use of calcium supplements<sup>12</sup>.

#### **Conclusion :**

In conclusion, results of this study, together with those of previous studies, suggest that calcium intake has effect on intermediary metabolism that results in beneficial changes in serum lipid level. This study

provide reasons to encourage more wide use of calcium supplementation in postmenopausal women.

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