

## **Public Health Implications of the Declining Calcium Intake in Female Adolescents from a Nigerian University**

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### **Abstract**

The importance of calcium for strong bones has long been recognized. It is now also known that adequate calcium intake helps reduce high blood pressure and lessens the symptoms of premenstrual tension as well as possibly protecting against bowel cancer. Over the last several decades, researchers have learnt a great deal about how a nutritionally balanced diet during childhood and adolescence works to prevent the onset of damaging adult diseases. One long – lasting effect of nutritional imbalance during adolescence is osteoporosis, a bone-crippling disease characterized by low bone mass and an increased bone fragility. Once recognized primarily as an elderly woman’s disease, osteoporosis is now being acknowledged as a partially preventable ‘adolescent’ disease because the occurrence of osteoporosis is influenced by bone mass attained during the first three decades of life, as well as the amount of bone lost after menopause. An optimal calcium intake during adolescence, when 50 percent of adult skeletal mass is formed decreases the risk of the crippling fractures caused by osteoporosis.

This study examines the health implications on the declining calcium intake in female adolescents from the University of Benin, Benin City, Nigeria. Well-structured, in-depth questionnaires were distributed to 500 adolescent female students to assess their calcium intake from the foods they eat. The results showed that many adolescent females avoid dairy products, the best source of calcium, because of the perception that all dairy products are fat – laden foods. Others replace milk with regular or diet soda, unconcerned about the “empty calories” or limited nutritional value of soda. Some are not aware of the serious, long –lasting health implications of inadequate calcium consumption. Most do not think they will ever become one of the 26 million women that suffer from osteoporosis today. Though the threat of osteoporosis may be in the far – off future for many female teens, this study recognizes the immediate need to reverse their inadequate calcium intake. A public health campaign geared toward increasing their calcium consumption by encouraging them to consume nature’s most calcium rich food: milk, is highly recommended.

*Keywords:* calcium intake, public health, female adolescents, implications, osteoporosis, nutritional imbalance.

### **Introduction**

Calcium is a macro mineral, present in relatively large quantity in the body. The bulk of the body’s calcium is found in the bones and teeth as calcium phosphate but a small amount is required in the blood serum for muscle contraction, mediation of hormonal response, blood clotting, nerve excitability and the activity of some enzymes (O’Brien et al, 1998).

The level of calcium in the serum is closely regulated by the body, which balances the amount lost each day with dietary calcium. Long term dietary calcium insufficiency, therefore, always results in net loss of calcium from the bones thereby decreasing the bone density.

Insufficient dietary calcium is one of the possible risk factors for osteoporosis and hence for fractures (Pinn, 1991; Brink et al, 1993). Osteoporosis is a large public health problem, it is a major cause of morbidity and mortality in the elderly. Osteoporosis is

characterized by a reduction in bone mass per unit volume (bone density) (Gaw et al, 1997). Women lose bone calcium rapidly in the post – menopausal years, because of age–related changes in parathyroid hormone, 1,25-dihydroxycholecalciferol and estrogen levels which predispose them to osteoporosis (Pinn, 1991). Heredity and environmental factors also contribute to the development of osteoporosis (O’ Brien et al, 1998).

Childhood and adolescence are periods of rapid growth and strengthening of the bones, when the maximum amount of calcium is deposited in the bones. They are also key periods in bone acquisition (Peth-Pierce, 1997; O’Brien et al, 1998; Teegarden et al, 1999). After the age of forty, bones slowly decrease in density as calcium is reabsorbed from the bone. An adequate calcium intake at this time may help to slow the loss and delay the onset of osteoporosis. After menopause, loss of bone density increases significantly as a powerful hormonal influence, estrogen, is no longer present to help keep calcium in the bone. Although an adequate calcium intake at this time may help to slow the loss and delay the onset of osteoporosis, but cannot prevent it (Bellantoni, 1996; Ben-Ari, 1997; New, 1999). Insufficient dietary calcium intake is common among girls, female adolescents and women. Female athletes often consume below recommended levels because of low energy (calorie) diets and the avoidance of dairy products (Krumbach et al; 1999).

Calcium in milk is generally considered to have a higher bioavailability than that from cereals and vegetables. Milk and milk products have been shown to be superior to vegetables with respect to calcium retention (Fairweather -Tait et al, 1989). Calcium in milk is particularly well absorbed than that in plant foods, due to the presence of substances like oxalate, phytate and fibre in plant food, which bind calcium thereby rendering it less absorbable (Kelsay et al, 1979). Moreover certain components of milk like lactose and casein have been implicated as enhancers of calcium absorption (Lee et al, 1979). The nutritional value of milk is such that as a food, it cannot be so easily dismissed ( Teegarden et al, 1999).

This study was therefore carried out to ascertain the health implications of the declining intake of calcium from foods taken by adolescent females from a tertiary institution in Nigeria.

## **Methodology**

### ***The Study Site***

The study took place at the University of Benin, Benin City, Nigeria, which is one of the 36 Universities in the country. It has a population of about 22,958 students (14,297 males and 8,661 females). Well-structured, in-depth and open-ended questionnaires were distributed to 500 adolescent female students of University of Benin, Benin City, Nigeria, to access their calcium intake from the foods they eat.

The questions asked included:

Do you take milk; how often do you take milk; are you allergic or intolerant to milk; do you take calcium and vitamin D supplements; what are your favourite foods and drinks; do you take regular or diet soda; how often do you take yoghurt and cheese. The data collected were assessed statistically, by determining their percentiles.

## **Results**

Over 50% of the respondents were between 20-24 years of age, while less than 20% were between 15-19 years and 25-29 years (Table 1). Less than 40% consumed milk daily while 33% consumed milk occasionally. Others either consumed milk weekly, monthly or

do not at all (Table 2). Their preferred drinks were soft drinks and diet soda, although they occasionally took yoghurt and cheese (Table 3).

Calcium supplements were taken by only 6% of the respondents, while 40% took them occasionally and most of respondents do not take Vitamin D supplements either (Table 4). The reasons given by respondents showed that majority knew that milk was good for health, although they did not know the exact importance of milk intake in adolescence, especially as related to calcium content and avoidance of osteoporosis later in life. (Table 5).

## Discussion

Studies have shown how important it is for adolescent females to take plenty of calcium in their diets in order to avoid osteoporosis later in life (Bellantoni, 1996; Ben-Ari, 1997). The daily intake of calcium required for adolescent females to attain a higher peak bone mass in order to minimize bone loss in later years is between 1,200 to 1,500mg daily, and this can be obtained from milk and other calcium rich foods (Mckenna et al, 1997; Horwath et al, 2001). For individuals who do not consume dairy products, green leafy vegetables such as broccoli or kale provide less calcium than milk but are also important sources (Dunford, 2002).

Peth-Pierce (1997), observed that most adolescents do not take milk, rather they prefer taking other drinks which do not contain calcium. The results of this study correlated with those of Peth-Pierce, where about 34% of the respondents said that milk is really very fatty and is not good for the health (Tables 6). The respondents were not allergic or intolerant to milk. The most preferred foods by the respondents are energy-rich foods such as rice and beans which are not calcium-rich foods (Table 4). Moreover, these foods are from plant origin, therefore their calcium contents are not fully available to the body (Fairweather-Tait et al, 1989). Most of the respondents do not take calcium supplements to make up for the insufficient calcium in their diets (Table 5).

Though the threat of osteoporosis may be in the far-off future for many female adolescents, this study recognizes the immediate need to reverse the inadequate calcium intake of the respondents from this study. A public health campaign to encourage adolescent females to increase the daily calcium intake in their diet, by increasing their consumption of milk and other dairy products is highly recommended. The “fat-conscious” adolescents who perceived dairy products as only fatty foods should be educated on the effects of a dangerously low calcium intake, the resultant bone loss and the eventual onset of osteoporosis later in life. Moreover, low-fat milk yoghurt and cheese are acceptable choices for weight-conscious female adolescents (Horwath et al, 2001).

**Table 1: AGE DISTRIBUTION OF RESPONDENTS**

AGE GROUP	N	n(%)
15-19	82	16.4
20-24	253	50.6
25-29	72	14.4
Unknown	93	18.6

*Total population (N) = 500*  
*n = number of respondents*

**Table 2: MILK CONSUMPTION BY RESPONDENTS**

<b>Frequency Of Consumption</b>	<b>n</b>	<b>n(%)</b>
Daily (in form of yoghurt/ice cream due to hot tropical climate)	178	35.6
Weekly	137	27.4
Monthly	10	2.0
Occasionally	165	33

*Total population (N) = 500*

*n = number of respondents*

**Table 3: PREFERENCE OF DRINKS BY RESPONDENTS**

<b>Drinks</b>	<b>n</b>	<b>n(%)</b>
Milk	113	22.6
Soft drink	497	99.4
Beverage without milk	212	42.4
Beverage with milk	58	11.6
Diet soda	253	50.6
Soy milk	17	3.4
Yoghurt (occasionally)	480	96
Cheese (occasionally)	264	52.8
None	55	11

*Total population (N) = 500*

*n= number of respondents*

*Respondents showed preferences for more than one type of drink.*

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**Table 4: CONSUMPTION OF CALCIUM AND VITAMIN D SUPPLEMENTS BY THE RESPONDENTS.**

**i. Calcium**

<b>Frequency Of Consumption</b>	<b>n</b>	<b>n(%)</b>
Daily	30	6
Weekly	5	1
Monthly	5	1
Occasionally	200	40
None	260	52

**ii. Vitamin D**

<b>INTAKE &amp; NON-INTAKE OF VITAMIN D SUPPLEMENTS</b>	<b>n</b>	<b>n (%)</b>
Intake	62	12.4
None	438	87.6

*Total population (N) = 500*

*n = number of respondents*

**Table 5: REASONS GIVEN BY RESPONDENTS WHY MILK INTAKE IS GOOD FOR HEALTH.**

- ◆ Contains Protein (25.4%)
  - ◆ Gives Energy (4.8%)
  - ◆ Required for growth (19.2%)
  - ◆ Ensures strong bones (17.2%)
  - ◆ Essential for a healthy look (24.6%)
  - ◆ Provides strength (2%)
  - ◆ Repairs body tissues (6.8%)
  - ◆ Source of vitamins (15%)
  - ◆ Provides calcium and other minerals (6.8%)
  - ◆ For healthy teeth (10.2%)
  - ◆ It's refreshing (6.8%)
  - ◆ Children need it most (1.4%)
  - ◆ Really fatty and not good for health (34%)
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