

# Investigating the effects of physical activity levels, dairy products and calcium intakes on risk factors of osteoporosis prevention in female students of Islamic Azad University of Damavand, Iran

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## Annotation:

**Aim:** Osteoporosis is a serious metabolic bone disorder that often results in hip fracture and usually asymptomatic in its initial stages. Since the majority of bone formation occurs during childhood and adolescence, it is important to begin primary prevention at an early age, although the optimal way for instilling this preventive behavior in youth has not yet been defined. The purpose of this study was to investigate the effects of physical activity levels, dairy products and calcium intakes on risk factors of osteoporosis prevention in female students of Islamic Azad university of Damavand in Iran. **Methods:** This cross sectional study was conducted on 280 healthy female university students aged between 18 to 24 years old who were selected randomly from the university students of Islamic Azad university of Damavand, Iran. **Subjects** completed an informed consent form, health history questionnaire; food questionnaire was used to assess the entire dietary component intakes and physical activity questionnaire (Baecke). **Result:** The result shows that increase in physical activity and dairy product consumption, the calcium intake with a decrease in BMI, and increase in BMD. Also results shows that there were significant negative correlations between the physical activity levels, dairy product consumption, the calcium intake and risk factors of osteoporosis. **Conclusions:** Increased physical activity and dairy product consumption, the calcium intake is associated with an increase in BMD and a concomitant decrease in BMI. These findings suggest that population-level interventions to increase physical activity and dairy product consumption, the calcium intake would favorably impact bone and other health outcomes. Thus, dietary pattern coupled with higher education levels and greater physical activity favored bone health and osteoporosis prevention in middle school females.

**Мария Рехмани Гобаді, Растегар Хосейні.** Влияние уровня физической активности, молочных продуктов и потребления кальция на факторы риска и профилактики остеопороза у студенток Исламского Азад университета (Дамаванд, Иран). **Цель:** Остеопороз является серьезным метаболическим нарушением кости, что часто приводит к переломам бедра и, как правило, протекает бессимптомно в начальной стадии. Поскольку в большинстве случаев формирования костей происходит в детстве и юности, важно начать первичную профилактику в раннем возрасте. Хотя оптимальный способ в формировании в жизни людей этого превентивного поведения еще не определены. Цель данного исследования заключалась в исследовании влияния уровней физической активности, молочных продуктов и потребления кальция на факторы риска профилактики остеопороза у студенток Исламского университета Азад (Дамаванд, Иран). **Методы:** Это поперечное сечное исследование было проведено на 280 здоровых девушках в возрасте от 18 до 24 лет, которые были отобраны случайным образом из числа студенток Исламского Азад университета. Студентки выразили свое информированное согласие и заполнили анкету истории здоровья. Анкета питания и анкета физической активности были использованы для оценки диетических компонентов. **Результат:** Результаты показывают, что увеличение физической активности, потребления кальция в составе молочной продукции приводит к уменьшению индекса массы тела (ИМТ) и увеличению максимального потребления кислорода (МПК). Также результаты показывают существенные отрицательные корреляции между уровнем физической активности, потреблением кальция и факторами риска остеопороза. **Выводы:** Повышенная физическая активность и потребление кальция связаны с увеличением МПК и сопутствующим снижением ИМТ. Эти данные позволяют предположить, что действие общей направленности для повышения физической активности и потребление кальция положительно влияет на костную систему и другие показатели здоровья. Таким образом, режим питания в сочетании с более высоким уровнем обучения и большей физической активностью благоприятно влияет на здоровье костной системы в профилактике остеопороза у студенток.

**Марія Рехмани Гобаді, Растегар Хосейні.** Вплив рівня фізичної активності, молочних продуктів і споживання кальцію на чинники ризику і профілактику остеопорозу у студенток Ісламського Азад університету (Дамаванд, Іран). **Мета:** Остеопороз є серйозним метаболічним порушення кістки, що часто призводить до переломів стегна і, як правило, протікає безсимптомно в початковій стадії. Оскільки в більшості випадків формування кісток відбувається в дитинстві і юності, важливо почати первинну профілактику в ранньому віці. Хоча оптимальний спосіб у формуванні в житті людей цієї превентивної поведінки ще не визначені. Мета даного дослідження полягала в дослідженні впливу рівнів фізичної активності, молочних продуктів і споживання кальцію на чинники ризику і профілактики остеопорозу у студенток Ісламського університету Азад (Дамаванд, Іран). **Методи:** Це поперечне сечіє дослідження було проведено на 280 здорових дівчатах у віці від 18 до 24 років, які були відібрані випадковим чином із числа студенток Ісламського Азад університету. Студентки висловили свою інформовану згоду і заповнили анкету історії здоров'я. Анкета харчування та анкета фізичної активності були використані для оцінки дієтичних компонентів. **Результати:** Результати показують, що збільшення фізичної активності, споживання кальцію у складі молочної продукції призводить до зменшення індексу маси тіла (ІМТ) і збільшенню максимального споживання кисню (МПК). Також результати показують суттєві негативні кореляції між рівнем фізичної активності, споживанням кальцію і факторами ризику остеопорозу. **Висновки:** Підвищена фізична активність і споживання кальцію пов'язані із збільшенням МПК і супутнім зниженням ІМТ. Ці дані дозволяють припустити, що дія загальної спрямованості для підвищення фізичної активності і споживання кальцію позитивно впливає на кісткову систему і інші показники здоров'я. Таким чином, режим харчування в поєднанні з більш високим рівнем навчання і більшою фізичною активністю сприятливо впливає на здоров'я кісткової системи в профілактиці остеопорозу у студенток.

## Keywords:

dietary, intake, physical, activity, Iran, women.

Пищевой, рацион, физическая, активность, Иран, девушки.

Харчовий, раціон, фізична, активність, Іран, дівчата.

## Introduction

Osteoporosis is a clinically-silent disease in its early stages. It can lead to hip and spine fractures later in life. According to the National Osteoporosis Association of America in 1999, 28.5 million people in the U.S., of whom 89% are women, had osteoporosis in the USA. Also, 10

million people in the U.S. were categorized as having low bone mass, exposing them to the risk of osteoporosis and osteopenia (Mark & Link, 1999; Drozdowska et al., 2004). The effect of environmental factors on bone is likely to vary across the lifespan, and length of exposure to exercise, diet, alcohol, caffeine, and smoking may have increasing impact in older women. Physical activity and exercise have been demonstrated to have positive

effects on growing bones before and during puberty, and many studies have shown the beneficial effects of high-impact weight-bearing activity on the load-bearing sites of the skeleton [McKay et al., 2000; Shibata et al., 2003]. Although bone mass achieved by early adulthood primarily reflects bone mass achieved during growth, the additional gain in bone mass that may potentially occur is likely to be dependent on lifestyle factors practiced during young adulthood these factors may include physical activity and nutrient intake, in particular calcium intake [Bonjour et al., 1991; Sowers et al., 1985]. Physical activity has been suggested as an intervention strategy to promote optimal bone density during youth and to reduce the rate of bone loss during middle and later life [Heaney et al., 2000, Kohrt et al., 1996]. Bone tissue responds to dynamic as opposed to static loading, as static loads (even those that produce fairly large stresses or strains) do not initiate osteogenesis [Lanyon et al., 1984]. For physical activity to have an osteogenic effect, the mechanical loads applied to the skeleton need to be in excess of those encountered in daily activity [Frost et al., 1988]. Nutrition could be an important modifiable factor in the development and maintenance of bone mass and the prevention and treatment of osteoporosis. Calcium and vitamin D nutrition play an important role in determining bone health. It has been shown that physical activities and sports during the growing years affect bone mass status in the perimenopausal period, and calcium intake is an additive contributing factor [Uusi-Rasi et al., 1998]. Reeker et al (3) reported that calcium intake and physical activity (PA) were significantly associated with increases in both compact and trabecular bone tissue [Reeker et al., 1992]. Also studies [Cooper et al., 1995; Uusi-Rasi et al., 1998] showed that physical activities and sports during growing years affect bone mass status in the perimenopausal period, and calcium intake is an additive contributing factor.

The studies evaluated the impact of both exercise and nutritional intake on bone mass in premenopausal young

women and results unclear [Takada, 2004], but the study involved only a small number of subjects and their results were inconsistent.

However, the associations' physical activity levels, dairy products and calcium intakes on risk factors of osteoporosis prevention in Iranian have not been thoroughly investigated. The purpose of this study was investigating the effects of physical activity levels, dairy products and calcium intakes on risk factors of osteoporosis prevention in female students of Islamic Azad university of Damavand in Iran.

#### Materials and methods

The target population consisted entirely of female students of Islamic Azad university of Damavand in Iran. Among them 280 healthy female students with similar age and weight selected were randomly. The condition of the study was thoroughly explained to all subjects, and written informed consent was subsequently obtained. The protocol was approved by the Ethics Committee of Islamic Azad university of Damavand, Tehran, Iran. Subjects completed an informed consent form, health history questionnaire; food questionnaire was used to assess the entire dietary component intakes and physical activity questionnaire (Baecke). SPSW statistical software (version 18) was used to analyze. Both descriptive (mean and standard deviation) and inferential statistical were used to Spearman correlation coefficient were used.

#### Results

Subject age data are present in table 1. The result shows that Increase in physical activity and dairy product consumption, the calcium intake with a decrease in BMI, and increase in BMD. Also results shows that there were significant negative correlations between the physical activity levels, dairy product consumption and calcium intake with risk factors of osteoporosis (Table 2).

#### Discussion

This study focused on the investigating the effects of physical activity levels, dairy products and calcium intakes on risk factors of osteoporosis prevention in

Table 1

*Demographic characteristics of study subjects (n = 254)*

Variables	Mean SD
Age (year)	21.15±4.62
Height (cm)	162.16±5.04
Weight (Kg)	65.45±7.17
Body Mass Index	24.81±3.39

Table 2.

*Relationship between Physical Activity, Dairy production and calcium intakes*

	Physical Activity Levels		Dairy Products		Calcium Intakes	
	Pearson correlation	P Value	Pearson correlation	P Value	Pearson correlation	P Value
<b>Risk Factors of Osteoporosis</b>	-49.6	0.023	-52.7	0.004	-64.8	0.002

female students of Islamic Azad university of Damavand in Iran. The results show that significant negative correlations between the physical activity levels, with risk factors of osteoporosis. The literature demonstrates the Physical activity is necessary for bone acquisition and maintenance through adulthood. The best evidence that exercise can slow bone loss or add bone mass to the postmenopausal skeleton comes from prospective intervention studies. Even job-related physical activity is an important factor in maintaining adequate bone mass. The suppression of bone turnover is the key mechanism for the positive response of lumbar BMD to moderate walking exercise in postmenopausal women [Yamazaki et al., 2004]. The researchers found that Physical activity in childhood may provide a significant positive contribution to an osteoporosis prevention strategy (i.e., maximizing peak adult bone density) that has been endorsed by some researchers [Burry et al., 1984; Stillman et al., 1987]. Our results suggest that the skeletal status of the os calcis in young women is influenced by the modulation of mechanical stress (i.e., physical activity) in the growing years.

Also results shows, that there were significant negative correlations between the dairy product consumption and calcium intake with risk factors of osteoporosis. The major part of this dietary calcium came from plant sources, which are known to have low bioavailability. Inhibitors of calcium absorption such as phytates and oxalates are abundant in the vegetarian diet and retard the absorption of dietary calcium. Moreover, absorption of calcium could be hampered by vitamin D deficiency as

this is the major factor influencing absorption of calcium from the gut. Babarousti et al. (2005), reported that BMI, Ca intake, and time spent on physical activity affect heel BMD independently but not in an age-dependent manner [Babarousti et al., 2005]. Results with regard to the relationship between calcium intake and peak bone mass were disparate. Greater calcium intake is thought to contribute to the acquisition of a high peak bone mass. A meta-analysis showed that calcium intake correlated with BMD of all areas except in the ulna of postmenopausal women [Welten et al., 1995]. It is paradoxical that, as health researchers and educators become increasingly aware of the importance of good habits in nutrition and physical activity in the prevention of a variety of chronic diseases, children and adolescents are adopting lifestyles that act counter to these. Diets in many developing as well as industrialized countries are moving towards foods that are poor in calcium and minerals, and children gravitate to television and computer games in place of outdoor games and sports. In order to reverse this trend, it is necessary to actively promote healthy behaviors and lifestyles to adolescents. School health education programs are critical opportunities for facilitating healthy lifestyles for youth.

#### Conclusions

Our results suggest that physical activity levels, dairy products and calcium intakes during the growing years has a positive effect on osteoporosis prevention and bone density attained by female students.

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