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A review study on benefits of calcium supplementation on adolescent bone mineral density

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***Abstract*---**Because of the new distribution of two epidemiological investigations and one meta-examination of randomized controlled clinical preliminaries, the relationship between calcium supplementation and antagonistic cardiovascular occasions has as of late turned into a subject of discussion. The reports demonstrate that there is a critical expansion in antagonistic cardiovascular occasions following supplementation with calcium; notwithstanding, various specialists have raised various issues with these reports, for example, irregularities in endeavors to duplicate the discoveries in different populaces and questions concerning the legitimacy of the information because of low consistence, predispositions on the off chance that ascertainment, and additionally an absence of change. The reports demonstrate that there is a huge expansion in antagonistic cardiovascular occasions following supplementation with calcium; notwithstanding, these reports have been reprimanded for furthermore, the Women's Health Initiative, the Auckland Calcium Study, and a significant number of different investigations that were remembered for the meta-examination acquired information from subjects who had calcium levels that were inside the ordinary reach. Along these lines, it is indistinct whether a similar gamble profile would be seen in populaces that had low calcium admissions. Furthermore, the skeletal advantages of calcium supplementation are more noteworthy in subjects with low calcium admissions.

Subsequently, the gamble benefit proportion of calcium supplementation is probably going to contrast in light of the dietary calcium consumption as well as the dangers of osteoporosis and cardiovascular sicknesses of different populaces. The antecedents of osteoporosis are made over the course of growing up and pre-adulthood; along these lines, the pediatrician assumes a critical part in aiding the streamlining of bone wellbeing in youngsters and teenagers. The sickness known as osteoporosis, which makes bones become more delicate, is a critical supporter of horribleness and a financial weight all around the globe. The motivation behind the present clinical report was to talk about evaluation of bone wellbeing, especially as it connects with youngsters and teenagers; survey bone procurement during earliest stages, youth, and pre-adulthood; and give an update to pediatricians on methodologies to work on bone wellbeing in the pediatric age bunch. There is another conversation that spotlights on the bone wellbeing prerequisites of pregnant ladies, nursing mothers, and untimely infants. American Bone Health, a local area based, cross country association that offers instruction projects, apparatuses, and assets to the overall population to help them in better understanding bone infection and bone wellbeing, has given their blessing to this clinical report.

***Keywords*---**calcium, supplement, cardiovascular disease, adolescence, bone mineral density, calcium deficiency.

Introduction

It is indispensable to consume a satisfactory measure of calcium to keep up with bone wellbeing all through the development stages [1,2] and to safeguard bone mineral thickness in more established grown-ups [3,4]. Along these lines, calcium supplementation is frequently recommended to people who could be in danger of inadequate dietary calcium admission or osteoporosis paying little heed to progress in years to keep away from the debilitating of bone strength. This is done to guarantee that bones keep on growing ordinarily. Notwithstanding, epidemiological investigations have shown that a sizeable level of individuals all around the world don't consume the suggested day to day measure of calcium [5]. Moreover, calcium and vitamin D are given to both the benchmark group and the medication bunch in most of randomized preliminaries researching osteoporosis drugs [6-10]. Notwithstanding the fundamental capacity it plays in the digestion of bones, calcium may likewise play a part in the capacity of different kinds of tissues, which has been the subject of examination [11], particularly in more established people.

The potential for antagonistic consequences for cardiovascular wellbeing acquired on by calcium supplementation over the top sums has been getting a developing measure of consideration as of late, notwithstanding the way that this subject keeps on being argumentative. A calcium-enhanced bunch showed an expansion in the quantity of cardiovascular occasions, as indicated by the discoveries of an auxiliary investigation of an enormous report that was directed in New Zealand to

assess the impacts of calcium on bone cracks and misfortune [13]. These discoveries, notwithstanding, are as opposed to those that were found by before observational investigations [14]. As an outcome of this, an argumentative report that started in New Zealand ignited a warmed conversation that is still in the works over the appropriateness of calcium supplements. Subsequently, the focal point of this study will be on the meaning of this discussion with respect to the subject of worldwide wellbeing [15].

The role of calcium in skeletal health

Various foundational chemicals, including parathyroid chemical (PTH), vitamin D, and calcitonin, are answerable for the severe guideline of serum calcium levels. At the point when blood calcium levels drop, there is a speedy compensatory flood in the chemical parathyroid chemical (PTH), which speeds up osteoclast-intervened bone resorption [16]. This sort of bone resorption is destructive to the method involved with keeping up with bone mass. Calcium supplementation may along these lines restrain the expansion in PTH levels and forestall bone misfortune in people with a high bone turnover status, like postmenopausal females and older people. This might be the case since calcium restrains the development of a chemical called parathyroid chemical (PTH). Calcium has a suggested dietary admission of 1,200 milligrams each day for grown-up guys and females in the United States (US), while more established individuals ought to have 1,500 milligrams each day [2]. Notwithstanding, the National Health and Nutrition Examination Survey (NHANES) found that in excess of 80% of older individuals consume under a satisfactory measure of calcium from diet alone. Moreover, the overview found that roughly 43% of everybody in the United States and right around 70% of more established females in the United States use calcium supplements [17-18]. It is fundamental for know that the typical calcium consumption from food contrasts significantly in various districts of the globe (Fig. 1) [19-20]. For example, the suggested day to day recompense (RDA) of calcium in East Asian and a few Central American nations is very low; in these districts, the RDA might be just one-fifth or 33% of what it is in European and North American countries.

Calcium supplementation has been exhibited to varyingly affect bone mineral thickness relying upon the exploration bunch. Albeit the information supporting the benefits of calcium for break counteraction isn't convincing, calcium supplementation has been demonstrated to be advantageous for bone wellbeing. In perimenopausal Japanese females with an unfortunate calcium utilization, day to day supplementation with just 500 mg of calcium postpones lumbar spine bone misfortune [21]. Comparative outcomes have been found in post menopausal females from Hong Kong [22], China [23], Chile [24], Argentina [25], and Nigeria [26]. Interestingly, research directed on individuals with satisfactory calcium levels found that calcium supplementation reliably affected bone mineral thickness [27-30]. These differential impacts were obviously exhibited in a concentrate by Dawson-Hughes et al. [31], in which low-portion calcium supplementation (500 mg of rudimentary calcium/day) emphatically affected bone in subjects who had low calcium consumption however didn't have similar impact in subjects who had higher calcium admission. Similarly, the day to day organization of calcium (850 mg) to prepubertal females in Switzerland uncovered

that the best advantages were seen in young ladies whose dietary calcium admissions were under a middle of 880 mg/day [32]. This was viewed as the case despite the fact that the young ladies generally got a similar measure of calcium.

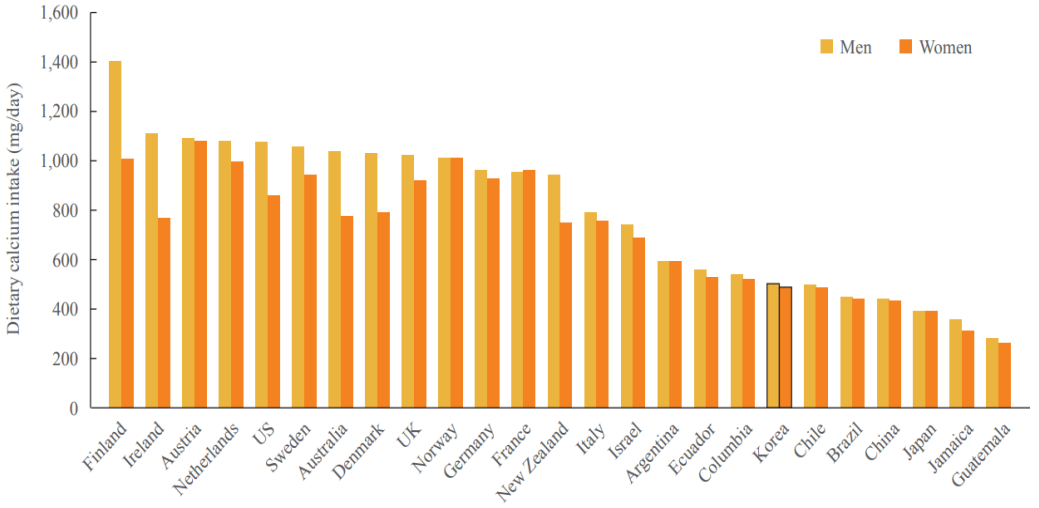

Figure 1: Worldwide distribution of dietary calcium intake

Bone acquisition during childhood and adolescence

Bone is a living construction that is comprised of a framework of collagen, precious stones of hydroxyapatite, and proteins that are not collagenous. The construction acquires its solidarity because of the mineralization of the framework, which happens when calcium and phosphate stores aggregate. Testimony of bone minerals begins all through pregnancy, with the third trimester representing 66% of the aggregate sum of bone minerals collected in utero. Top bone mass is accomplished close to the furthest limit of the second ten years of life, however there might in any case be some net bone affidavit into the third ten years of life. The bone mineral substance (BMC) grows 40-overlap from birth to development. It is assessed that somewhere in the range of 40 and 60 percent of a grown-up's bone mass is procured all through the high school years, with 25% of the pinnacle bone mass being acquired during the two years that encompass the level at which the individual has arrived at their most extreme speed of development. All things considered, 12.5 years after the fact for females and 14.0 years after the fact for young men [33]. When an individual arrives at the age of 18, they have approximately 90% of their pinnacle bone mass. Subsequently, youth and pre-adulthood are vital ages for the mineralization of the skeleton. The two guys and females have a postponement of approximately six to a year between the age at which they arrive at their pinnacle bone mass and the age at which they arrive at their pinnacle level speed [34]. This separation between straight development and bone mineral accumulation might present expanded weakness to bone delicacy and may make sense of, somewhat, the expanded pace of lower arm breaks in young men ages 10 to 14 years of age and in young ladies ages 8 to 12 years of age. Both of these age bunches are between the ages of 8 and 12 years of age. At the point when a singular arrives at their most extreme

bone mass, their bone mass starts a progressive however consistent fall that go on until they hit a hypothetical crack limit. Along these lines, the endanger of cracks sometime down the road may be expanded by any condition that keeps satisfactory pinnacle bone mass aggregation from happening. Indeed, even after the course of straight advancement has been achieved, the skeleton keeps on being a powerful organ that is consistently going through alteration. Both the development of new bone, which is interceded by osteoblasts, and the resorption of old bone, which is intervened by osteoclasts, happen at the same time all through the redesigning system. Neighborhood cytokines and circling chemicals, including as parathyroid chemical (PTH), 1,25-dihydroxyvitamin D (1,25-OH2-D), insulin-like development factor 1 (IGF-1), and calcitonin, are answerable for controlling the redesigning system. The pace of cortical bone redesigning might reach however high as 50% consistently in youngsters who seem to be still exceptionally youthful. The proportion of bone creation to bone resorption is the main component in deciding complete bone mass. On the off chance that bone creation is more noteworthy than bone resorption all through earliest stages and pre-adulthood, as it ought to be, then, at that point, net bone mass will develop. At the point when creation is outperformed by resorption, the outcome is a deficiency of bone mass [35].

Risk and benefit profile of calcium supplementation from a global health perspective

The proof that calcium supplementation is straightforwardly associated with the occurrence of cardiovascular occasions is indistinguishable and doesn't give an authoritative response. Furthermore, it has not yet been affirmed whether or whether such a peril is available in places with unfortunate calcium utilization, like East Asia. This is the sort of thing that must be researched. The typical day to day calcium admissions in South Korea, Japan, China, Thailand, and other East Asian nations range somewhere in the range of 300 and 500 mg [35], while the typical day to day calcium admissions in New Zealand and the United States, as indicated by concentrates on directed in Auckland and WHI, are 800 and 850 mg, individually. [35] South Korea, Japan, China, Thailand, and other East Asian nations additionally have calcium admissions that fall inside this reach (Fig. 1). What's more, none of the nine investigations that were remembered for the meta-examination completed by Bolland et al. [36] and only one of the 18 investigations that were remembered for the meta-examination completed by Lewis et al. [37] utilized information from Asian nations or from people of different nationalities. The review that pre-owned information from Asian nations was the one that was completed in Thailand. Most of the investigations that were assessed for incorporation in these meta-examinations included Caucasian members from the United States, the United Kingdom, France, Denmark, Australia, and New Zealand; the typical calcium consumption from diet in these nations ranges somewhere in the range of 800 and 1,200 milligrams each day. This figure is generally twofold the calcium utilization of countries in East Asia, Central America, and South America consolidated (Fig. 1). Whether taking a calcium supplement of around 1,000 milligrams each day would bring about a practically identical gamble of cardiovascular occasions in the individuals who didn't get a satisfactory measure of calcium by means of their weight control plans stays unanswered. Furthermore, the utilization paces of antihypertensive and

anticholesterol specialists in Korea are among the most minimal among the nations that are individuals from the Organization for Economic Cooperation and Development; for instance, they are not exactly half and 33% of the rates in Denmark, separately [38]. The passing rate because of ischaemic coronary illness is additionally lower in East Asian countries in contrast with the United States, nations in Oceania, and nations in Eastern Europe [39].

People whose calcium admissions were higher than the middle worth displayed most of the antagonistic cardiovascular impacts, as announced by Reid and associates [40] in their Auckland Calcium Study. These specialists observed that there were measurable collaborations between dietary calcium consumption and antagonistic cardiovascular impacts, and that these communications were available. What's more, the skeletal advantages, as well as the gamble variables and results related with cardiovascular infection, would in general be worked on after calcium supplementation in regions that had low calcium admissions. As indicated by the discoveries of the Auckland Calcium Study [41], how much calcium supplements expected to fix one crack was 302, however how much calcium supplements expected to produce a cardiovascular occasion was 178. Albeit the ebb and flow survey couldn't ascertain these qualities in that frame of mind because of an absence of information, it is conceivable that the number expected to hurt (cardiovascular infection) versus the number expected to treat (osteoporotic break) by calcium supplementation might contrast as indicated by the dietary calcium consumption and cardiovascular sickness risk profiles in various regions of the planet. For instance, the number expected to hurt (cardiovascular infection) might be lower than the number expected to treat (osteoporotic break). An appropriate calcium supplementation routine might be profitable for the counteraction of breaks and the diminishing of mortality from all causes in individuals who live in nations or regions with unfortunate calcium admissions. This might be the situation for the individuals who take calcium supplements. Preceding the extrapolation of the outcomes acquired from a couple of studies, it is justified in the future to gather populace explicit information utilizing subjects of various sexual orientations, ages, nationalities, and hazard profiles from various regions of the planet [42]. This ought to be done before the extrapolation of the outcomes from the couple of studies.

Primary prevention: optimizing bone health in healthy children

The variables that affect bone wellbeing are illustrated in Table 1. Albeit the singular qualities that are answerable for varieties in bone mass have not been found, hereditary variables are liable for around 70% of the absolute variety in bone mass. The bone mass of male subjects is more than that of female subjects, and the bone mass of individuals of color is more noteworthy than that of white ladies who are neither of the Hispanic nationality or Asian ladies. The bone densities of Mexican-American ladies fall some place in that of non-Hispanic white ladies and individuals of color. The dietary admission of calcium, vitamin D, protein, salt, and carbonated drinks (i.e., pop), as well as actual work and way of life decisions, the support of a solid body weight, and hormonal state are variables of bone thickness that are defenseless to change. Both appropriate nourishment and customary actual activity are required, and they cooperate in a synergistic way, to work with bone development and support.

Calcium

Calcium is fundamental for bone development, and how much calcium that an individual consumes in their eating regimen all through earliest stages, youth, and pre-adulthood significantly affects how much bone mass is acquired. The skeleton contains around the vast majority of the body's absolute calcium, and calcium might be caught up in two ways: inactively by means of the gastrointestinal system and effectively through the circulatory system, with vitamin D assuming a part in both of these cycles. Milk utilization during earliest stages and pre-adulthood is connected to expanded BMC and a lower hazard of break in adulthood [43]. The American Academy of Pediatrics (AAP) concurs with the suggestions that have been reconsidered dietary reference admissions for calcium and vitamin D that have been distributed by the Institute of Medicine (IOM). These rules are expected for infants, youngsters, and teenagers. The suggested dietary recompense, frequently known as the RDA, is the degree of dietary utilization that fulfills the requirements of practically all (97.5 percent) of the total populace. The expression "satisfactory admission" alludes to a solitary worth that is utilized for children under a year, for whom RDAs have not entirely set in stone. This worth is a solitary worth that is probably going to satisfy the prerequisites of most youngsters. As far as possible is the best typical absolute day to day consumption that is considered to offer no gamble of antagonistic wellbeing ramifications for most of people in that age bunch.

Preadolescents and Adolescents

The Recommended Dietary Allowance (RDA) for calcium in youngsters and adolescents ages 9 to 18 years of age is 1300 milligrams each day. The typical day to day calcium utilization of high school females in the United States is 876 milligrams each day, which is 67% of the suggested day to day recompense; in any case, less than 15% satisfy the RDA. 22 In 2011, simply 14.9 percent of secondary school understudies drank at least three glasses of milk that were 8 ounces each day, while just 9.3 percent of females did likewise. There has been a descending pattern in the utilization of milk among young people, though there has been a vertical pattern in the utilization of pop. Milk items are stayed away from by a few adolescent and high school females since they accept that polishing off them would make them "fat." These misguided judgments should be cleared up. For example, one serving of skim milk (8 ounces) has no grams of fat and just around 80 calories, which is about similar measure of calories as are found in an apple. Then again, one container of pop has 140 calories in it. What's more, milk is a decent wellspring of protein as well as various other fundamental minerals, including as vitamin D, phosphorus, and magnesium, all of which add to the sound turn of events and support of bones. In any event, when enhanced with calcium, milk substitutes like soy or almond-based beverages could have a lower amount of calcium that is available to the body per glass. To additionally comprehend the mineral substance and bioavailability of these beverages, more review is required. Youngsters and teens might be lactose narrow minded, and those of African, Hispanic, and Asian plummet are bound to experience the ill effects of the condition. A portion of these youngsters and teens will actually want to deal with moderate amounts of dairy items other than milk, however most of

them will not. Others could improve lactose-diminished or without lactose milks and cheeses, notwithstanding lactase chemical enhancements.

Calcium Supplementation

There have been various investigations that have exhibited a constructive outcome of calcium supplementation on BMC in sound kids and teenagers; notwithstanding, a new meta-examination of randomized controlled preliminaries inspecting the viability of calcium supplementation in expanding BMD in solid youngsters observed that there was no impact of calcium supplementation on BMD of the lumbar spine or femoral neck; a little impact was noted on upper-appendage BMD and absolute body BMC comparable to roughly 1% of the expansion in BMC in the complete The specialists arrived at the resolution that calcium supplementation of solid young people is probably not going to bring about a clinically significant diminishing in break risk. This was their decision while checking out at the exploration from the point of view of general wellbeing. Laying out great eating rehearses with an even eating regimen that incorporates calcium utilization at or close to the suggested levels over the course of growing up and pre-adulthood ought to be the essential concentration for most of youngsters and teenagers. This ought to be done related to a solid eating regimen. Calcium enhancements ought to be deterred for dietary wellsprings of calcium. This isn't simply because dietary wellsprings of calcium have a higher bioavailability, yet additionally essentially in light of the fact that it is critical to urge people to keep up with great dietary patterns all through their lives.

Table 1: Dietary Sources of Calcium

Food	Serving Size	Calories per Portion	Calcium Content (mg)
Dairy foods			
Milk			
Whole milk	8 oz	149	276
Reduced fat milk (2%)	8 oz	122	293
Low-fat milk (1%)	8 oz	102	305
Skim milk (nonfat)	8 oz	83	299
Reduced-fat chocolate milk (2%)	8 oz	190	275
Low-fat chocolate milk (1%)	8 oz	158	290
Yogurt			
Plain yogurt, low-fat	8 oz	143	415
Fruit yogurt, low-fat	8 oz	232	345
Plain yogurt, nonfat	8 oz	127	452
Cheese			
Romano cheese	1.5 oz	165	452
Swiss cheese	1.5 oz	162	336
Pasteurized processed American cheese	2 oz	187	323
Mozzarella cheese, part skim	1.5 oz	128	311
Cheddar cheese	1.5 oz	171	307
Muenster cheese	1.5 oz	156	305
Nondairy foods			
Salmon	3 oz	76	32
Sardines, canned	3 oz	177	325
White beans, cooked	1 cup	307	191
Broccoli, cooked	1 cup	44	72
Broccoli, raw	1 cup	25	42
Collards, cooked	1 cup	49	226
Spinach, cooked	1 cup	41	249
Spinach, raw	1 cup	7	30
Baked beans, canned	1 cup	680	120
Tomatoes, canned	1 cup	71	84
Calcium-fortified food			
Orange juice	8 oz	117	500
Breakfast cereals	1 cup	100–210	250–1000
Tofu, made with calcium	0.5 cup	94	434
Soy milk, calcium fortified[a]	8 oz	104	299

(Source: Dietary Guidelines for Americans, 2010)

Assessment of Bone Health

The computation of break risk based on longitudinal information is the methodology that ought to be utilized as the highest quality level for the assessment of clinically significant bone wellbeing. Then again, there is a deficiency of longitudinal examination that glances at the factors that impact bone wellbeing in youngsters and bases its decisions on the recurrence of bone breaks. The probability of a break is impacted by the fragility of the skeleton as well as by variables like age, weight, past cracks, and the seriousness of an occurrence. Thusly, skeletal not entirely set in stone by an assortment of attributes notwithstanding bone mass; these variables incorporate bone size, calculation, microarchitecture, and twisting strength. Skeletal mass is the most significant of these components. For example, the range of a bone decides its twisting strength, and a bigger bone will have a more noteworthy protection from break than a more modest bone, regardless of whether the two bones have a similar bone mineral thickness (BMD) and bone mineral substance (BMC). Bone mass, which is answerable for approximately 70% of bone strength, might be utilized as an intermediary proportion of bone wellbeing. This is conceivable as a result of the acknowledgment that a low bone mass in youngsters doesn't generally correspond to an expanded crack gamble.

Conclusion

The impacts of calcium supplementation on the gamble of cardiovascular infection still can't seem to be satisfactorily researched, and right now, there isn't sufficient proof to help the potential antagonistic cardiovascular results that have been portrayed by certain investigations. A few investigations have recommended that calcium supplementation might expand the gamble of death from cardiovascular infection. In actuality, most of the antagonistic occasions that have been accounted for started from concentrates on that were directed in nations with bountiful calcium. Subsequently, the issue might be restricted to deciding if supplementation with 1,000 mg of essential calcium in people whose day to day calcium consumption from diet is roughly 1,000 mg is protected. The impacts of calcium supplementation are probably going to fluctuate depending to the specific food utilization levels of the singular taking the enhancement. This is because of the way that dietary calcium admissions fluctuate extraordinarily all through the globe. While doing an investigation of the gamble benefit profiles of calcium supplementation in different networks, it would along these lines be satisfactory to think about the calcium consumption from the food of those individuals. Albeit the ebb and flow survey couldn't ascertain these qualities in that frame of mind because of an absence of information, it is conceivable that the number expected to hurt (cardiovascular infection) versus the number expected to treat (osteoporotic crack) by calcium supplementation might contrast as indicated by the dietary calcium consumption and cardiovascular sickness risk profiles in various regions of the planet. For instance, the number expected to hurt (cardiovascular infection) might be lower than the number expected to treat (osteoporotic crack). An appropriate calcium supplementation routine might be invaluable for the counteraction of cracks and the diminishing of mortality from all causes in individuals who live in nations or regions with unfortunate calcium admissions. This might be the situation for the individuals who take calcium

supplements. Preceding the extrapolation of the outcomes acquired from a couple of studies, it is justified in the future to gather populace explicit information utilizing subjects of various sexual orientations, ages, nationalities, and hazard profiles from different regions of the planet.

References

[1]. Krall EA, Dawson-Hughes B. Heritable and life-style determinants of bone mineral density. J Bone Miner Res 1993; 8:1-9.

[2]. Ross AC, Taylor CL, Yaktine AL, Del Valle HB; Institute of Medicine (US) Committee to Review Dietary Reference Intakes for Vitamin D and Calcium. DRI, dietary reference intakes: calcium, vitamin D. Washington DC: National Academies Press (US); 2011.

[3]. National Institutes of Health (U.S.). Optimal calcium in take. Bethesda: National Institutes of Health; 1994. p. 1-31.

[4]. Shea B, Wells G, Cranney A, Zytaruk N, Robinson V, Griffith L, Hamel C, Ortiz Z, Peterson J, Adachi J, Tugwell P, Guyatt G; Osteoporosis Methodology Group; Osteoporosis Research Advisory Group. Calcium supplementation on bone loss in postmenopausal women. Cochrane Database Syst Rev 2004;(1):CD004526.

[5]. Cashman KD. Calcium intake, calcium bioavailability and bone health. Br J Nutr 2002;87 Suppl 2:S169-77.

[6]. Liberman UA, Weiss SR, Broll J, Minne HW, Quan H, Bell NH, Rodriguez-Portales J, Downs RW Jr, Dequeker J, Favus M. Effect of oral alendronate on bone mineral density and the incidence of fractures in postmenopausal osteoporosis. The Alendronate Phase III Osteoporosis Treatment Study Group. N Engl J Med 1995;333:1437-43.

[7]. McClung MR, Geusens P, Miller PD, Zippel H, Bensen WG, Roux C, Adami S, Fogelman I, Diamond T, Eastell R, Meunier PJ, Reginster JY; Hip Intervention Program Study Group. Effect of risedronate on the risk of hip fracture in elderly women. Hip Intervention Program Study Group. N Engl J Med 2001;344:333-40.

[8]. Neer RM, Arnaud CD, Zanchetta JR, Prince R, Gaich GA, Reginster JY, Hodsman AB, Eriksen EF, Ish-Shalom S, Genant HK, Wang O, Mitlak BH. Effect of parathyroid hormone (1-34) on fractures and bone mineral density in postmenopausal women with osteoporosis. N Engl J Med 2001;344:1434-41.

[9]. Delmas PD, Bjarnason NH, Mitlak BH, Ravoux AC, Shah AS, Huster WJ, Draper M, Christiansen C. Effects of raloxifene on bone mineral density, serum cholesterol concentrations, and uterine endometrium in postmenopausal women. N Engl J Med 1997;337:1641-7.

[10]. Cummings SR, San Martin J, McClung MR, Siris ES, Eastell R, Reid IR, Delmas P, Zoog HB, Austin M, Wang A, Kutilek S, Adami S, Zanchetta J, Libanati C, Siddhanti S, Christiansen C; FREEDOM Trial. Denosumab for prevention of fractures in postmenopausal women with osteoporosis. N Engl J Med 2009;361:756-65.

[11]. Baron JA, Beach M, Mandel JS, van Stolk RU, Haile RW, Sandler RS, Rothstein R, Summers RW, Snover DC, Beck GJ, Bond JH, Greenberg ER. Calcium supplements for the prevention of colorectal adenomas. Calcium Polyp Prevention Study Group. N Engl J Med 1999;340:101-7.

[12]. Lappe JM, Travers-Gustafson D, Davies KM, Recker RR, Heaney RP. Vitamin D and calcium supplementation reduces cancer risk: results of a randomized trial. Am J Clin Nutr 2007;85:1586-91.
[13]. Hofmeyr GJ, Duley L, Atallah A. Dietary calcium supplementation for prevention of pre-eclampsia and related problems: a systematic review and commentary. BJOG 2007;114:933-43.
[14]. Bolland MJ, Barber PA, Doughty RN, Mason B, Horne A, Ames R, Gamble GD, Grey A, Reid IR. Vascular events in healthy older women receiving calcium supplementation: randomised controlled trial. BMJ 2008;336:262-6.
[15]. Bostick RM, Kushi LH, Wu Y, Meyer KA, Sellers TA, Folsom AR. Relation of calcium, vitamin D, and dairy food intake to ischemic heart disease mortality among postmenopausal women. Am J Epidemiol 1999;149:151-61.
[16]. Paik JM, Curhan GC, Sun Q, Rexrode KM, Manson JE, Rimm EB, Taylor EN. Calcium supplement intake and risk of cardiovascular disease in women. Osteoporos Int 2014; 25:2047-56.
[17]. Parfitt AM, Gallagher JC, Heaney RP, Johnston CC, Neer R, Whedon GD. Vitamin D and bone health in the elderly. Am J Clin Nutr 1982;36(5 Suppl):1014-31.
[18]. Allain TJ, Dhesi J. Hypovitaminosis D in older adults. Gerontology 2003;49:273-8.
[19]. Bailey RL, Dodd KW, Goldman JA, Gahche JJ, Dwyer JT, Moshfegh AJ, Sempos CT, Picciano MF. Estimation of total usual calcium and vitamin D intakes in the United States. J Nutr 2010;140:817-22.
[20]. Fulgoni VL 3rd, Keast DR, Bailey RL, Dwyer J. Foods, fortificants, and supplements: where do Americans get their nutrients? J Nutr 2011;141:1847-54.
[21]. EFSA Panel on Dietetic Products, Nutrition and Allergies (NDA). Scientific opinion on the tolerable upper intake level of calcium. EFSA J 2012;10:2814.
[22]. Weaver C, Heaney RP. Calcium in human health. Totowa: Humana Press; 2006. Chapter 8, Dietary calcium; p. 105-28.
[23]. Wang Y, Li S. Worldwide trends in dairy production and consumption and calcium intake: is promoting consumption of dairy products a sustainable solution for inadequate calcium intake? Food Nutr Bull 2008;29:172-85.
[24]. US Department of Health and Human Services. Bone Health and Osteoporosis: A Report of the Surgeon General. Rockville, MD: US Department of Health and Human Services, Office of the Surgeon General; 2004.
[25]. Osteoporosis prevention, diagnosis, and therapy. NIH Consens Statement. 2000;17 (1):1–45.
[26]. Abrams SA. Vitamin D supplementation during pregnancy. J Bone Miner Res. 2011;26(10):2338–2340.
[27]. Abrams SA; Committee on Nutrition. Calcium and vitamin D requirements of enterally fed preterm infants. Pediatrics. 2013;131(5). Available at: www.pediatrics. org/cgi/content/full/131/5/e1676
[28]. Abrams SA. In utero physiology: role in nutrient delivery and fetal development for calcium, phosphorus, and vitamin D. Am J Clin Nutr. 2007;85(2):604S–607S
[29]. Bonjour JP, Theintz G, Buchs B, Slosman D, Rizzoli R. Critical years and stages of puberty for spinal and femoral bone mass accumulation during adolescence. J Clin Endocrinol Metab. 1991;73(3):555–563

[30]. Faulkner RA, Bailey DA, Drinkwater DT, McKay HA, Arnold C, Wilkinson AA. Bone densitometry in Canadian children 8-17 years of Age. Calcif Tissue Int. 1996;59(5): 344–351
[31]. Glastre C, Braillon P, David L, Cochat P, Meunier PJ, Delmas PD. Measurement of bone mineral content of the lumbar spine by dual energy x-ray absorptiometry in normal children: correlations with growth parameters. J Clin Endocrinol Metab. 1990;70(5):1330–1333
[32]. Katzman DK, Bachrach LK, Carter DR, Marcus R. Clinical and anthropometric correlates of bone mineral acquisition in healthy adolescent girls. J Clin Endocrinol Metab. 1991;73(6):1332–1339
[33]. Theintz G, Buchs B, Rizzoli R, et al. Longitudinal monitoring of bone mass accumulation in healthy adolescents: evidence for a marked reduction after 16 years of age at the levels of lumbar spine and femoral neck in female subjects. J Clin Endocrinol Metab. 1992;75(4):1060–1065
[34]. Recker RR, Davies KM, Hinders SM, Heaney RP, Stegman MR, Kimmel DB. Bone gain in young adult women. JAMA. 1992; 268(17):2403–2408
[35]. Bailey DA, Martin AD, McKay HA, Whiting S, Mirwald R. Calcium accretion in girls and boys during puberty: a longitudinal analysis. J Bone Miner Res. 2000;15(11):2245– 2250
[36]. Bachrach LK. Acquisition of optimal bone mass in childhood and adolescence. Trends Endocrinol Metab. 2001;12(1):22–28
[37]. Khosla S, Melton LJ III, Dekutoski MB, Achenbach SJ, Oberg AL, Riggs BL. Incidence of childhood distal forearm fractures over 30 years: a population-based study. JAMA. 2003;290(11):1479–1485
[38]. Faulkner RA, Davison KS, Bailey DA, Mirwald RL, Baxter-Jones AD. Sizecorrected BMD decreases during peak linear growth: implications for fracture incidence during adolescence. J Bone Miner Res. 2006;21(12):1864–1870
[39]. Heaney RP, Abrams S, Dawson-Hughes B, et al. Peak bone mass. Osteoporos Int. 2000;11(12):985–1009
[40]. Kalkwarf HJ, Khoury JC, Lanphear BP. Milk intake during childhood and adolescence, adult bone density, and osteoporotic fractures in US women. Am J Clin Nutr. 2003;77(1):257–265
[41]. Institute of Medicine. 2011 Dietary Reference Intakes for Calcium and Vitamin D. Washington, DC: National Academies Press; 2011
[42]. Abrams SA. Building bones in babies: can and should we exceed the human milk-fed infant's rate of bone calcium accretion? Nutr Rev. 2006;64(11):487–494
[43]. US Department of Agriculture, US Department of Health and Human Services. Dietary Guidelines for Americans, 2010. 7th ed. Washington, DC: US Government Printing Office; 2010:60–95
[44]. Suryasa, I. W., Rodríguez-Gámez, M., & Koldoris, T. (2021). Health and treatment of diabetes mellitus. *International Journal of Health Sciences*, *5*(1), i-v. https://doi.org/10.53730/ijhs.v5n1.2864
[45]. Mukhtar, A. U. S., Budu, B., Sanusi B, Y., Mappawere, N. A., & Azniah, A. (2022). The effect of reproductive health education with multimedia video learning on the improvement of fluor albus prevention behavior young woman pathologist. *International Journal of Health & Medical Sciences*, *5*(1), 75-79. https://doi.org/10.21744/ijhms.v5n1.1841