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# Knowledge About Calcium-Rich Foods in Adolescent Girls in Charsadda – A Cross-Sectional Study

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## ABSTRACT

Calcium is a critical nutrient for adolescent bone development and overall health, yet intake often remains below recommended levels. **Objectives:** To identify and list calcium-containing foods available in Charsadda and to assess the knowledge level of adolescent girls about calcium foods and calcium nutrition. **Methods:** A cross-sectional study was conducted to list all foods and food products available in Charsadda. This study was conducted at two different time points in the same year, in the summer months and in the winter months of 2021. The purpose of the survey at two different time-points was to recognize and list all possible available calcium-rich foods in the locality throughout the year. This phase of the study was followed by cross-sectional surveys to find out pre-adolescent girls' knowledge about calcium-rich foods already identified in the first phase of the study. A multi-stage stratified sample (n=78) of pre-adolescent school-going girls completed the survey using a pre-tested questionnaire. **Results:** A high number (174) of calcium-rich foods and products were available at the local market and households of Charsadda city. Overall, pre-adolescent girls' knowledge about calcium-rich foods was poor. Only 60%, 45.3%, 46.7%, and 42.7% of the girls could identify, respectively, milk, cheese, yoghurt and lassi/malt-drink as calcium-rich foods. Most plant-based items were poorly recognized. **Conclusions:** Despite a high number of calcium-rich foods available in the local market of Charsadda, the knowledge level of school-going pre-adolescent girls was poor, warranting further community-based awareness and education programs on calcium nutrition.

## INTRODUCTION

Calcium is a critical micronutrient important for skeletal system development, especially during pre-adolescence, a time characterized by bone growth acceleration and hormonal development [1]. Proper calcium consumption during this window of development is critical in the attainment of peak bone mass and the prevention of osteoporosis, fractures, and other bone diseases in adulthood [2]. Global guidelines, like those of the World Health Organization (WHO) and the Institute of Medicine (IOM), recommend that children 9–12 years of age consume 1000 to 1300 mg of calcium each day to maximize growth and physiological functioning [3]. Nonetheless, there is evidence that calcium consumption in children living in South Asian nations, such as Pakistan, continues to be woefully inadequate, especially in rural and resource-poor populations [4]. This is further compounded by socio-economic limitations [5], restricted dietary variety [6], minimal exposure to dairy or fortified foods [7], and widespread ignorance about nutritional requirements [8, 9]. In Pakistan, where the dietary habits are predominantly cereal-based and calcium-containing foods are missing from typical diets, the risk of calcium deficiency is particularly high among young girls. Pre-adolescent female is a group of special concern because poor calcium consumption during this age can result in impaired bone structure, growth delay, and increased risk of persistent

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nutritional deficiency. Although the seriousness of this problem is considerable, little evidence supports the availability of calcium-rich foods in the semi-rural regions of Pakistan, especially KP, where socio-cultural and economic obstacles are unique. Information regarding the calcium sources in foods is critical to any nutrition policy development in addressing the common calcium deficiencies [9, 10]. The outcomes of this research are anticipated to guide specific nutrition interventions and assist with the design of culturally sensitive approaches to enhancing calcium consumption among school-age girls in comparable contexts.

This study aims to assess the knowledge level of pre-adolescent girls of Charsadda, an old traditional city of Khyber Pakhtunkhwa of Pakistan. Also to recognize and list all calcium-rich foods, as there is no such database which is necessary for diet planning and related research studies.

## METHODS

This descriptive cross-sectional study was completed in two phases. Phase 1 was a market survey to recognize and enlist calcium-rich foods and food products in the study area. Phase 2 was a general survey of the pre-adolescent girls to assess their knowledge about calcium-rich foods and other related information. All the surveys conducted were cross-sectional and descriptive. For identification and enlisting calcium-containing foods, the protocol previously reported [11], a form of ethnographic techniques to determine local food sources that are available and acceptable to vulnerable communities, was used without any qualitative content analysis or any coding method involved. Briefly, the survey was completed in the following standard 6 steps with minor modifications as reported previously [11]: 1) background market survey, installation of food system data tables form; 2) key-informant interviewing and development of family food lists, food system data tables; 3) preparation for structured interviews: examination of preliminary data from key-informant interviews; preparation and pretesting of structured interview schedule about diets, with particular focus on foodstuffs and foods with calcium; 4) preparation of structured interviews: analysis of key-informant information on cultural beliefs and practices regarding xerophthalmia; preparation and pre-testing of structured interviews on the signs and symptoms of nutritional blindness; 5) structured interviews with respondents; and 6) final market survey, data consolidation, and writing of reports. For this purpose, a cross-sectional market survey was conducted at two different time points of the same year in the city of Charsadda; once in summer (May-June, 2021) and a second time in the winter months (November-December, 2021). The purpose of these two market/household surveys in different seasons of the year was to get a comprehensive picture of the calcium-rich foods available across the year to the consumers in the local market of Chasadda city. Before the survey, an exhaustive list of all potential calcium-rich foods was made by a panel of 6 researchers having expertise in the field of nutrition and dietetics. They were requested to make lists of calcium-rich foods. These lists were prepared based on their knowledge about the food composition of Pakistani dishes as previously reported [12-14]. The independent lists prepared by these experts were later combined into a single consolidated calcium-rich foods list. For the data collection procedure, a meeting with a group of student researchers (n=4) was held in June 2022. The calcium-containing food list already prepared was shared with them. All foods on the list were explained with their local names as well as English and scientific names. A food manual with coloured illustrations was prepared. The students were advised to visit a diverse range of food outlets, including supermarkets, franchise convenience stores, local grocery stores, and fresh markets, to list both packaged and fresh calcium-rich foods available to school students. Online markets were excluded due to age-based purchasing restrictions. These student researchers prepared lists of foods rich in calcium content. A record form was used to collect data on packaged items, documenting the product name, calcium content, ingredients, and nutritional label information. The same survey by the same student researchers was repeated in the winter months of 2022. In each season, all the outlets were surveyed twice in one particular season, one week apart. In this way, each outlet was surveyed four times in total. The list of foods collected by the student researchers was presented to the local expert panel (n=5), with specialized expertise in food labels and food composition. A checklist of fresh high-calcium foods, developed from three references, guided the identification of unlabeled fresh items. All products meeting the definition of "high-calcium" were identified and listed. Calcium content was obtained from labels or estimated using reference data. Products were categorized into five groups: (1) meat and meat products, (2) vegetables and fruits, (3) dairy and dairy products, (4) legumes, nuts, and seeds, (5) Starch Foods, and (6) calcium supplements. A cross-sectional survey, conducted twice in 2022: Survey 1 in January-February, 2022 and Survey 2 in June-July, 2022. The purpose of conducting surveys at two different seasons of the year was to capture a comprehensive and representative pre-adolescent girls' level of knowledge about calcium-rich foods and products at a medium-sized lower secondary school in a semi-urban area of Charsadda City, representing similar schools in the area. The study targeted students from grades 5–9 (ages 9–14). Out of 120

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students enrolled, 79 students participated after obtaining guardian consent. Given the limitations of funds available, the survey could be conducted at a single school. However, the school is the largest in the city with students from diverse urban and rural demographic backgrounds, and it was assumed to be a fair representative of the sample of interest for the current study. For the sampling and sample size, the inclusion criteria were: 1) the subject must be normal without any medical diseases or disorders at the time of the survey; 2) must be from the local community, and 3) must have parental consent to participate. Using a 70% estimated proportion (based on a pilot), a 5% margin of error, and a 95% confidence level, the minimum sample size required was 65. A total of 85 students showed willingness to participate [15]. All of these 85 students were considered for participation, taking into consideration the possibility of dropout, incomplete questionnaire or absence. The final data could be completed on 78 students out of 85 students, as 7 students were absent on the day of data collection. Whereas the computed sample size was 65, 78 students completed data collection. This was more than the needed sample and was kept to enhance the statistical power of the study and ensure robust results. Oversampling more than the minimum needed is a standard approach in survey and observational research since it compensates for possible missing or unusable data and increases the external validity of results. Oversampling can also be an insurance against unforeseen exclusions during the cleaning of data or subgroup analysis. For the data collection tools, a self-administered questionnaire was developed and validated by 6 academic experts and clinical experts (University teachers and dietitians). The questionnaire had two parts: Part 1 included demographic data (sex, age, grade, weight, height, and daily allowance). Part 2 had 44 questions. Questions 1-36 were about the names of 12 high calcium-containing foods, and the students were to report 'yes' or 'no' in front of each food item. Questions 37-44 were questions about general knowledge regarding calcium nutrition. The market survey (ethnographical analysis) was the identification and listing of foods that have an appreciable amount of calcium (low-to-high calcium content). A food providing 5% of the DV or less was a low source, while a food that provides 10–19% of the DV was considered a good source, and a food that provides 20% of the DV or more was considered an excellent source of calcium. However, for simplicity, such further classification was not reported. Foods identified were put in different categories, including a) meat/meat products, b) vegetables and fruits, c) dairy products, d) legumes/nuts/seed products, e) starch foods and f) calcium supplements. For phase 2 of the study, descriptive statistics were used for demographics and anthropometric data. Data on Student Knowledge on Calcium-containing Foods and Calcium Awareness were analyzed and reported in numbers with percentages. Foods and products familiarity and consumption were summarized. Data were analyzed using IBM SPSS Statistics for Windows, Version 26.0 (IBM Corp., Armonk, NY, USA).

## RESULTS

The majority of these foods were from calcium supplements (45), followed by 'meat and meat products' and 'starchy foods' (both with 30 products each), 'legumes, nuts, and seed products' (25), 'vegetables (24), and dairy product group (20). A total of 174 calcium foods were identified as shown (Table 1).

**Table 1:** Calcium Containing Foods and Products in Charsadda City

| Categories of Food Items | Number of Food Items | Calcium per Serving (mg) | Examples of Foods |
|---|---|---|---|
| Meat and Meat Products | 30 | 150–500 | Egg, red meat, white meat, fish, chicken paye, paye, kabab, kufta, |
| Vegetables and Fruits | 24 | 150–400 | Cabbage, cauliflower, Collard Greens, Lettuce, Kale, Okra, Carrots, Rhubarb, tomatoes, Broccoli, barsandi, radish, banana, apple, |
| Dairy and Dairy Products | 20 | 150–800 | Milk, cheese, lassi, yoghurt, almond milk, Cream, double, whipped cream/full custard, ice-cream, vanilla pudding, pudding pancake, waffle, cheese cake, koya, barfee, krut |
| Legumes, Nuts, and Seed Products | 25 | 200–800 | Peas, lentils, almonds, white beans, red beans, French beans, soyabean, |
| Starchy Foods | 30 | 150–800 | Pasta, rice, parata, potatoes (boiled), white Bread, whole-meal (cereals), naan |
| Calcium Supplements | 45 | 600–100 | Calce, other commercial tablets, syrups, homeopathic products, |
| Total | 174 | – | – |

The mean age of the girls who participated in the survey on the assessment of the knowledge level of pre-adolescent girls was 12.4 years. Regarding awareness of common calcium-containing foods (Q1-4), milk (60%), cheese (45.3%), and yogurt (46.7%) were identified correctly by nearly half or more of the respondents, reflecting general familiarity with dairy products. However, malt drink/lassi was identified by fewer students (42.7%), possibly due to varied formulations or misconceptions about its nutrient value. Most plant-based items were poorly recognized as calcium sources. Spinach (14.7%), cabbage (6.7%), chia seeds, sesame seeds, flax seeds, broccoli, kale, and bok choy (all 0%) show a complete lack of awareness of leafy greens and seeds as good sources. Nuts and dried fruits like Almond (2.7%), Pistachios (4%), Figs (2.7%), Raisins (8%), and Apricots (5.3%) were also largely overlooked.

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Animal-based foods beyond dairy (meat, chicken, egg, fish). These were not well associated with calcium either (all under 5%), possibly due to the common link of calcium with only dairy. Regarding Calcium Knowledge Questions (Q37, Q39, Q41, Q43, Q44), showed alarmingly low awareness: Only 2.7% knew calcium's primary function in the body. Only 5.3% correctly identified milk as a calcium source when mixed with distractors. Just 2.7% knew that calcium isn't found only in dairy products. No one could explain whether white foods are calcium-rich or how many glasses of milk are needed daily (Table 2).

**Table 2:** Student Knowledge of Calcium-Containing Foods and Calcium Awareness

| Question No. | Question 1–12: Which of the Following Items Are Sources of High Calcium? | Number of Respondents That Answered Correctly (%) |
|---|---|---|
| 1 | Milk | 45 (60%) |
| 2 | Malt Drink / Lassi | 32 (42.7%) |
| 3 | Cheese | 34 (45.3%) |
| 4 | Yogurt | 35 (46.7%) |
| 5 | Raita | 21 (28.0%) |
| 6 | Spinach | 11 (14.7%) |
| 7 | Cabbage | 5 (6.7%) |
| 8 | Almond | 2 (2.7%) |
| 9 | Pistachios | 3 (4.0%) |
| 10 | Chia Seeds | 0 (0.0%) |
| 11 | Sesame Seeds | 0 (0.0%) |
| 12 | Flax Seeds | 0 (0.0%) |
| 13 | Lentils | 2 (2.7%) |
| 14 | Brocolli | 0 (0.0%) |
| 15 | Bok Choy | 0 (0.0%) |
| 16 | Kale | 0 (0.0%) |
| 17 | Turnip Greens | 2 (2.7%) |
| 18 | Mustard Greens | 3 (4.0%) |
| 19 | Okra | 7 (9.3%) |
| 20 | Podded Peas | 3 (4.0%) |
| 21 | Soybean Sprouts | 4 (5.3%) |
| 22 | Orange | 2 (2.7%) |
| 23 | Apple | 7 (9.3%) |
| 24 | Banana | 2 (2.7%) |
| 25 | Apricot | 4 (5.3%) |
| 26 | Currant (Dried Gooseberry) | 2 (2.7%) |
| 27 | Raisins (Dried Grapes) | 6 (8.0%) |
| 28 | Figs | 2 (2.7%) |
| 29 | Meat | 2 (2.7%) |
| 30 | Egg | 3 (4.0%) |
| 31 | Chicken | 2 (2.7%) |
| 32 | Fish (Fresh Water) | 2 (2.7%) |
| 33 | What Is Calcium Mainly Used for in the Body? | 2 (2.7%) |
| 34 | Which of the Following Is a Good Source of Calcium? A) Candy, B) Milk, C) Soda, D) Potato Chips. | 4 (5.3%) |
| 35 | Calcium Is Only Found in Dairy Products. (True/False) | 2 (2.7%) |
| 36 | How Many Glasses Of Milk Do We Need to Meet Our Daily Calcium Needs? | 2 (2.7%) |
| 37 | Do You Think White Color Foods Are Good Sources of Calcium? Why? | 0 (0.0%) |

The data suggests a critical need for structured nutrition education, especially to broaden understanding of non-dairy calcium sources, improve functional knowledge of calcium's role in health, and dispel myths and misconceptions (e.g., white food as a sign of calcium, dairy exclusivity).

## DISCUSSION

A total of 174 foods and food products also including supplements were available with low-to-high calcium contents in the local market of Charsadda city. This number is higher than what is reported, for example, in a study conducted in the Thailand, where 93 foods and food products with high calcium contents were reported previously [16]. This difference in the number of calcium foods between our study and that reported by [16] may be because this included only very high calcium foods in their list, while we included all foods and food products with low-to-high calcium content to maximize the spectrum of choice from a greater variety of foods for any intervention studies in future. In our analysis majority of the available high calcium foods and food products were from calcium supplements (45), followed by meat and meat products and starch foods (both with 30 products each), legumes, nuts, and seed products (25), vegetables and fruits (24), and dairy product group (20). Calcium in the form of supplements is emerging in calcium nutrition [16]. Meat and meat products, vegetables, and legumes are all plant-based sources of calcium [17]. Worrisome is the fact that the students exhibited poor knowledge regarding calcium nutrition (Table 2). As indicated, a poor awareness of calcium-containing food and calcium function among young respondents. Although more than half had correct recognition of dairy sources such as milk (60%), yoghurt (46.7%), and cheese (45.3%), which may be a reflection of superficial knowledge influenced by traditional marketing. Only fewer identified malt drink/lassi (42.7%) as a source of calcium, possibly because formulations are variable and confusing in advertisements. The most concerning result is the virtual lack of recognition for plant-based sources of calcium. Foods like spinach (14.7%) and cabbage (6.7%) were rarely recognized, and chia, sesame, flax seeds, and leafy greens such as kale and bokchoy (Chinese palak in Urdu) were not recognized at all. Nuts and dried fruits like almonds, figs, and raisins were also mostly unrecognized, all at levels below 8%. Non-dairy animal food items like eggs, chicken, and fish were also poorly recognized. Knowledge questions also revealed the gap: 2.7% only

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knew calcium's primary function in bone health, and only 5.3% correctly chose milk from distractors. Misconceptions such as pairing all white foods with calcium remain, and no one answered related items correctly. These results necessitate culturally appropriate nutrition education to expand knowledge of calcium sources, clarify its biological roles, and dispel misinformation. Our results on the number of students with good knowledge about the calcium contents of foods are comparable with some previous studies; for example, a study conducted in India reported that only <25% of students could identify calcium-rich food sources [18]. Results of our study show that although a majority of participants knew that milk and yoghurt are good sources of calcium, they lacked much knowledge about non-dairy foods containing calcium, such as leafy green vegetables, nuts, seeds, and fortified cereals. The same outcome was found in earlier research, where people mostly identified dairy as the primary source of calcium and had low knowledge about substitutes [19]. Misconceptions about the amount of calcium in soft drinks and ready-to-eat foods were also seen, showing poor nutritional education. Conversely, studies with targeted nutrition education interventions showed considerably enhanced knowledge of dairy and non-dairy sources of calcium among the students [18]. In the present research, only 2% of participants were able to identify correctly the main role of calcium in the body, that is, its essential role in constructing and upholding strong bones and teeth. This very low rate indicates a dismal lack of fundamental nutritional understanding. These are the same results obtained in earlier research, where adolescents mainly linked calcium to overall health or were not aware of its particular role in bone development [19]. Research with populations presented to nutrition education interventions indicated substantially higher knowledge, and appropriate answers amounted to up to 40% in certain instances [20]. These contrasts highlight the necessity of integrating focused nutritional knowledge to promote awareness regarding critical nutrients such as calcium among youth populations. In this present research, awareness of certain sources of calcium was found to be very low. A mere 5.3% of the participants were able to identify milk as a good source of calcium from the available options. Equally, only 2.7% correctly answered that calcium does not occur solely in dairy foods, reflecting a widespread misunderstanding about the sources of calcium. Further, when questioned about how many glasses of milk are required for daily calcium intake, and whether white foods are good sources of calcium, only 2.7% answered correctly. These results are similar to previous studies that point to low levels of awareness of calcium-containing foods outside of dairy, as well as confusion over daily calcium needs for young adults and teenagers. These findings highlight the imperative for timely overall and context-specific nutrition education to enhance the basics of knowledge about calcium and bone health.

## CONCLUSIONS

It was concluded that despite a high number of calcium-rich foods and food products available in the local market and households of Charsadda, the knowledge level of the school-going pre-adolescent girls was poor, warranting further community-based awareness and education programs on the sources of calcium foods and their importance in human health.

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## Authors Contribution

Conceptualization: SS
Methodology: SS, AAK, IA
Formal analysis: SS, AAK, IA
Writing review and editing: SS, AAK, IA

All authors have read and agreed to the published version of the manuscript.

## Conflicts of Interest

All the authors declare no conflict of interest.

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## REFERENCES

[1] Jomova K, Makova M, Alomar SY, Alwasel SH, Nepovimova E, Kuca K *et al.* Essential Metals in Health and Disease. Chemico-Biological Interactions. 2022 Nov; 367: 110173. doi: 10.1016/j.cbi.2022.110173.

[2] Shlisky J, Mandlik R, Askari S, Abrams S, Belizan JM, Bourassa MW, Cormick G, Driller-Colangelo A, Gomes F, Khadilkar A, Owino V. Calcium Deficiency Worldwide: Prevalence of Inadequate Intakes and Associated Health Outcomes. 2022 Jun; 1512(1): 10-28. doi: 10.1111/nyas.14758.

[3] Ariyo O, Alabi O, Aleru EO, Ojo TJ. Effect of Emotion-Based Nutrition Messages on Consumption of Calcium-Rich Foods Among Early Adolescents in Ogbomoso, Nigeria. Dialogues in Health. 2023 Dec; 2: 100130. doi: 10.1016/j.dialog.2023.100130

[4] Knight F, Rana ZH, Cormick G, Belizan J, Gomes F, Bourassa MW *et al.* Could Local Foods Achieve

**DOI:** https://doi.org/10.54393/df.v5i04.167

Recommended Calcium Intakes for Nutritionally Vulnerable Populations in Uganda, Guatemala, and Bangladesh? Annals of the New York Academy of Sciences. 2023 Jul; 1525(1): 173-83. doi: 10.1111/nyas.15008.

[5] Sanwalka NJ, Khadilkar AV, Mughal MZ, Sayyad MG, Khadilkar VV, Shirole SC *et al.* A Study of Calcium Intake and Sources of Calcium in Adolescent Boys and Girls from Two Socioeconomic Strata, in Pune, India. Asia Pacific Journal of Clinical Nutrition. 2010 Sep; 19(3): 324-9.

[6] Martinez Y, Banna JC, Ballejos ME, Bruhn C, Cluskey M, Gunther C *et al.* Evaluation of Messages to Promote Intake of Calcium-Rich Foods in Early Adolescents. Journal of Community Engagement and Scholarship. 2022 Jul; 9(2). doi: 10.54656/FKGP5837.

[7] Knight F, Ferguson EL, Rana ZH, Belizan J, Gomes F, Bourassa MW *et al.* Including Calcium-Fortified Water or Flour in Modeled Diets Based on Local Foods Could Improve Calcium Intake for Women, Adolescent Girls, and Young Children in Bangladesh, Uganda, and Guatemala. Annals of the New York Academy of Sciences. 2023 Aug; 1526(1): 84-98. doi: 10.1111/nyas.15032.

[8] Nguyen B and Murimi MW. Lack of Calcium Rich Foods in the Diet, Low Knowledge on Calcium Level Recommendations and Severe Food Insecurity Predicts Low Calcium Intake Among Vietnamese Women. Appetite. 2021 Aug; 163: 105242. doi: 10.1016/j.appet.2021.105242.

[9] Miller GD, Jarvis JK, McBean LD. The Importance of Meeting Calcium Needs with Foods. Journal of the American College of Nutrition. 2001 Apr; 20(2): 168S-85S. doi: 10.1080/07315724.2001.10719029.

[10] Cormick G and Belizán JM. Calcium Intake and Health. Nutrients. 2019 Jul; 11(7): 1606. doi: 10.3390/nu11071606.

[11] Reka SM, Vijayanchali SS, Rani VE. Minimization of Calcium Deficiency among Children and Adolescents Using Sesbania Grandiflora Leaves. Journal of the Asiatic Society of Mumbai. 2022; 1.

[12] Akhter P, Baloch NZ, Mohammad D, Orfi SD, Ahmad N. Assessment of Strontium and Calcium Levels in Pakistani Diet. Journal of Environmental Radioactivity. 2004 Jan 1;73(3):247-56. doi: 10.1016/j.jenvrad.2003.08.011.

[13] Khan MR, Darwaish AM, Tahir U. Sodium, Potassium, Iron, Calcium and Phosphorus Content of Some Pakistani Condiments. Scientific Inquiry and Review. 2018 Jan; 2(1): 16-22. doi: 10.32350/sir/21/020103.

[14] Alshahrani F, Alassafi MT, Owaiwid LN, Alageel NA, Alanazi FH, Alsogami LS *et al.* Assessment of Calcium Intake and Recognition of Calcium-Rich Food Sources Among the Saudi Population. Archives of Osteoporosis. 2023 Oct; 18(1): 130. doi: 10.1007/s11657-023-01337-4.

[15] Rahman MM. Sample Size Determination for Survey Research and Non-Probability Sampling Techniques: A Review and Set of Recommendations. Journal of Entrepreneurship, Business and Economics. 2023 Feb; 11(1): 42-62.

[16] Jaisaard R, Kanjanarach T, Chanaboon S, Ban B. Consumption of Calcium and Knowledge About Calcium Sources and Nutrition Labels Among Lower Secondary School Students in Thailand. Risk Management and Healthcare Policy. 2021 Sep: 3829-40. doi: 10.2147/RMHP.S312264.

[17] Gómez AL, Kraemer WJ, Maresh CM, Lee EC, Szivak TK, Caldwell LK et al. Resistance Training and Milk-Substitution Enhance Body Composition and Bone Health in Adolescent Girls. Journal of the American College of Nutrition. 2021 Apr; 40(3): 193-210. doi: 10.1080/07315724.2020.1770636.

[18] Mead SJ. Dietary Calcium Intakes and Major Contributing Food Sources of Adolescent Males in New Zealand (Doctoral dissertation, University of Otago). 2021.

[19] Patimah S. Effect of School-Integrated Interventions on Improvement of Nutrition-Health Knowledge and Nutritional Status among Adolescent Girls: A Quasi-Experimental Study. Current Research in Nutrition and Food Science. 2023; 11(2): 880-93. doi: 10.12944/CRNFSJ.11.2.35.

[20] El-Abbassy AA, Ahmed H, Diab SS, El-Nagar SA. Nutrition Intervention Based on Health Belief Model for Promoting Dietary Calcium Intake among Adolescent Girl Students. International Egyptian Journal of Nursing Sciences and Research. 2022 Jan; 2(2): 307-25. doi: 10.21608/ejnsr.2022.212467.