Original Research Paper

Volume - 10 | Issue - 12 | December - 2020 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Nutritional Science

COMPARISON OF DIETARY CALCIUM INTAKE IN CHILDREN GOING TO LOW AND MIDDLE SOCIO-ECONOMIC STATUS SCHOOLS IN MUMBAI AND NAVI MUMBAI

Priya Karkera*	Chief Nutrition Officer, Fitterfly Technologies Pvt Ltd, Turbhe MIDC, Navi Mumbai – 4000705. *Corresponding Author
Harshi Thakkar	Assistant Project Manager, Fitterfly Technologies Pvt Ltd, Turbhe MIDC, Navi Mumbai – 4000705.
Neeti Gulati	Nutritionist, Fitterfly Technologies Pvt Ltd, Turbhe MIDC, Navi Mumbai – 4000705.
Zoya Anis	Data And Research Manager, Fitterfly Technologies Pvt Ltd, Turbhe MIDC, Navi Mumbai – 4000705.
Dr. Arbinder Singal	CEO & Co founder, Fitterfly Technologies Pvt Ltd, Turbhe MIDC, Navi Mumbai – 4000705.

ABSTRACT Calcium intake in childhood is crucial for bone development and for maintaining bone health later in life. Calcium intake may vary depending on food consumed across socio-economic backgrounds. This study was undertaken to explore the association of calcium intake in school going children belonging to low and middle socio-economic backgrounds. Children from 2 different schools pertaining to their socio-economic status were considered for this study. 698 children between the age of 10 to 12 years were categorized into two groups - low (n=305) and middle (n= 393) socio-economic groups. Dietary calcium intake was calculated as per Indian Council of Medical Research and Indian Foods Composition Table using Ntuitive software based on their 7 days diet recall. Calculated values were compared with RDA and further divided as ≤50%, 51% to75%, 76% to 100%, >100% of RDA. Statistical Analysis of data was performed using IBM SPSS Version 20. Statistical analysis showed no significant difference in calcium intake between low and middle socio-economic group ($p \geq 0.05$). Moreover, no significant difference ($p \leq 0.05$) was seen in all 4 categories of calcium intake percentages as per the RDA in both the groups of children. Based on these results it was interpreted that calcium intake in school going children is not affected by socioeconomic status.

KEYWORDS : Calcium, Socio-Economic Group, Low Socio Economic Group, Middle Socio Economic Group, School going Children

INTRODUCTION

During childhood, bone mineral density increases until the peak bone mass is attained. In the later life, this peak bone mass and subsequent bone loss becomes an essential determinant of osteoporosis –(Boot et al., 1997).

In 2013, it was estimated that 50 million people in India were either osteoporotic or had low bone mass (Mithal & Kaur, 2012). Research has shown that in India osteoporosis and osteopenia occur relatively at an early age(Khanna & Bhargava, 1971; Sridhar et al., 1970).

Calcium intake is one of the factors influencing the development and maintenance of bone mass (Balk et al., 2017). Dietary calcium is important during adolescent and also during adulthood. The bone mass changes are very rapid during adolescence. The skeletal gain per year is as rapid as upto 409 g for boys and 325 g for girls(Bailey et al., 1999). In adulthood bone loss occurs at an approximate rate of 1% each year i.e. roughly a 15g calcium loss each year (Heaney & Recker, 1982). Low calcium intake in diet would therefore affect the adolescent peak bone mass and retention of bone mass in adulthood (Kalusk et al., 2001).

Socio economic factors have a significant impact on dietary patterns and nutrient intake ——(Mayén et al., 2016). Survey undertaken by The United States National Health and Nutrition Examination Survey (NHANES) also stated that calcium intake of youth, children, preschool children from low economic families have been severely deficient and have been identified as a nutritional problem(Kalusk et al., 2001). Moreover, another study stated that the daily intake of calcium in each region was very different and significantly lower in low socioeconomic strata region (Lim et al., 2015). An Indian study undertaken on children and adolescents showed that the calcium intake was much lower in lower socioeconomic strata than in upper socioeconomic strata irrespective of gender (Sanwalka et al., 2010). The above stated studies imply that the calcium intake may be dependent on the socioeconomic status of the population. Thus, the current study was undertaken in order to understand the calcium intake status of school-going children in Mumbai and Navi Mumbai, India. The results from such a study will be helpful in understanding which socioeconomic group needs more attention in terms of their calcium intake.

METHOD

Sample Size

A total population of 698 school-going children satisfying the following inclusion/ exclusion criteria were chosen for the study.

Inclusive criteria

- Age: between 10-12 years, irrespective of their gender.
- Location: schools located in Mumbai and Navi Mumbai.
- Socioeconomic group: low and middle socioeconomic background.

Exclusive criteria

- Age: below 10 year and above 12 years
- Location: schools not located in Mumbai and Navi Mumbai.
- Socioeconomic group: high socioeconomic background.

Data Collection

Two schools located in Mumbai and Navi Mumbai, different socio economic background (low and middle) were considered for this study. A total of 305 children from low and 393 children from middle socio economic background schools were selected.

Information collected

- Basic information: Name, age, date of birth was recorded in the data sheet with nutritionists.
- Anthropometric information: Height (measured in cms), weight (measured in kg) was recorded using weighing scale and height scale available at school premises.
- BMI of the child which was calculated as per the Indian Academy of Pediatrics (IAP) (Khadilkar et al., 2015) guidelines using Ntuitive software developed by Fitterfly.
- Seven-days food recall: This data was collected by providing hard copy of food diary (Annexure 1) to fill a seven- days food recall with details like the meal time, food name and the quantity consumed.

This data was then entered in Ntuitive software wherein calcium value of each food was calculated for each child. The calculations conducted and recommendations provided by the Ntuitive software are based on information given by National Institute of Nutrition (NIN, 2017),

Indian Food Composition Table (IFCT, 2017) and U.S. Department of Agriculture (USDA)

Data Analysis

Calcium intake value of each child was compared to their recommended dietary allowance (RDA) (NIN, 2017). The calcium intake % was then divided into following categories:

1. ≤ 50% consumption of RDA
2. 51% to 75% consumption of RDA
3. 76% to 100% consumption of RDA
4. > 100% consumption of RDA

All the values were analyzed as mean ± standard deviation (SD) with statistical significance of $p \leq 0.05$. Two-way ANOVA without repeated measures was used for comparison between Low Socioeconomic group (LSE) and middle socio economic group (MSE). All the statistical analysis was performed using IBM SPSS version 20 and data collection and graph plotting was done using Windows Excel.

RESULTS

A total of 305 and 393 children from low socioeconomic (LSE) and middle socioeconomic (MSE) submitted the food diary. With the mean age (±Standard deviation) for both LSE and MSE was 11.35 yrs (±0.8). Mean dietary calcium intake as per the RDA/ day was 402.11 mg (±191.2) and 453.96 mg (±160.5) for LSE and MSE respectively.

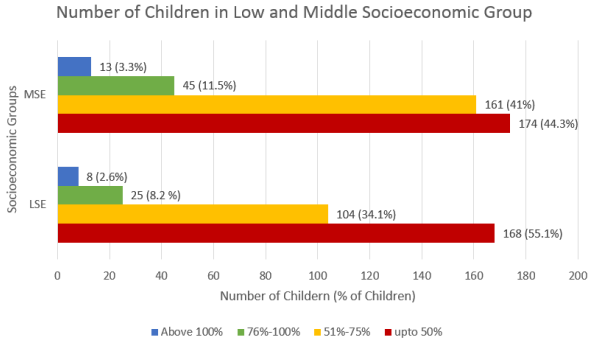

Figure 1: Comparison of number of children and their calcium intake between LSE and MSE groups.

Moreover, it was observed that there was a significant difference seen calcium consumption within all four categories ($p = 0.001$) (Figure 1). As per the Recommended Daily Allowance (RDA) (800mg/day)[13] from both the socioeconomic groups, 55.1% and 44.3% children from LSE and MSE respectively consumed upto 50% of their suggested RDA. Whereas, 34.1% children from LSE and 41% children MSE consumed 51% to 75 % of dietary calcium. 8.2% LSE children and 11.5% MSE children consumed 76% to 100% of the calcium while 2.6% LSE and 3.3% MSE children consumed above 100% of calcium intake.

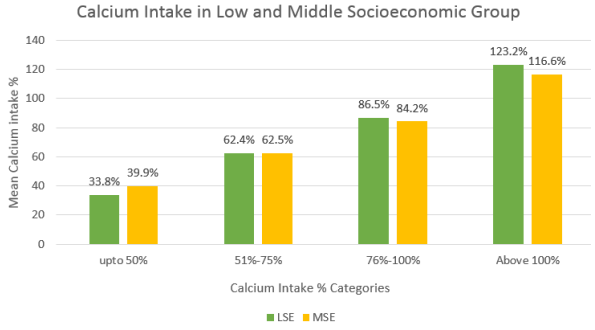

Figure 2: Mean Calcium Intake Percentage presentation within Calcium Intake percentage categories between LSE and MSE groups.

Alternatively, no significant difference was observed between low and middle socioeconomic status and their calcium intake according to the suggested RDA ($p = 0.8$) Figure 2). Overall mean calcium intake percentage (mg ± Standard deviations) was the highest and the lowest in LSE with 33.8% (985.6 mg ± 197.6) and 123.2% (270.4 mg ± 99) of the suggested RDA, respectively.

DISCUSSION

In this cross-sectional study comparing low and middle socioeconomic groups in children from Mumbai and Navi Mumbai schools, it was found that there was no significant difference between LSE and MSE groups. The calcium intake percentage categories between both the socioeconomic group showed similar calcium intake. However, when compared within the categories of the calcium intake percentages as per their RDA, significant difference was seen. Children from LSE and MSE had higher number of children that consumed Upto 50% of the suggested RDA. Whereas, children from MSE consumed more than average (51-75%) calcium intake than LSE.

In a study conducted in Pune by Sanwalka et al., in 2010 contradicts our findings, stating that lower calcium intake was observed in low socioeconomic strata than in upper economic strata. In a similar study, poor dietary calcium intake was observed in LSE group (Shahar et al., 2005). However, Lim et al., 2015 says that eating patterns differ from each region, even in a low socioeconomic group, which might be agreeable with our study.

Although, the above studies show clear evidence that LSE group children have poor calcium intake as compared to their suggested RDA, our study does demonstrate that MSE group are showing similar results. A study on calcium intake in urban western Indian children showed that the daily calcium intake was 57% of the recommended allowance. Similarly, Harinarayan et al., 2004 study showed no significance between rural (within the LSE group) and urban population (within the MSE group) in calcium intake however, inadequate calcium consumption in both populations was seen when compared to the recommended daily allowances (RDA).

Evidence suggests that with the growing trends and lifestyle changes, children tend to binge eat or disinhibit attractive foods which may be influenced by improper eating habits (Bryant et al., 2008). Thus, decreasing the quantity and quality of essential dietary nutrients, per say calcium. This further increases a mass reckoning in the calcium intake globally, regardless of their socioeconomic status, gender and age.

Although this study was meticulously designed, it is acknowledged that there were certain limitations to this study. Firstly, Food sources of calcium were not considered along with food preference (veg and non-veg). Secondly, an equal number of children from LSE and MSE should have been selected to obtain unbiased results. Lastly, their biochemical parameters were not examined in a laboratory; as it could have helped in finding better understanding between calcium intake and absorption and bone health. However, bioavailability was referred from previous literature.

CONCLUSION

The key findings of the present study highlights that irrespective of their socioeconomic strata, both, Low and Middle socioeconomic groups consumed similar amounts of dietary calcium when compared to their suggested RDA. Thus, underscoring a define impact on children globally which may be caused due to increased nutritional transitions and the quality of food consumption.

An overall awareness should be encompassed within schools and communities in a fun and interactive manner on the healthy diet habits and lifestyle practices.

REFERENCES

1. Bailey, D. A., McKay, H. A., Mirwald, R. L., Crocker, P. R. E., & Faulkner, R. A. (1999). 6. A six-year longitudinal study of the relationship of physical activity to bone mineral accrual in growing children: The University of Saskatchewan Bone Mineral Accrual Study. Journal of Bone and Mineral Research. https://doi.org/10.1359/jbmr.1999.14.10.1672
2. Balk, E. M., Adam, G. P., Langberg, V. N., Earley, A., Clark, P., Ebeling, P. R., Mithal, A., Rizzoli, R., Zerbini, C. A. F., Pierroz, D. D., & Dawson-Hughes, B. (2017). 5. Global dietary calcium intake among adults: a systematic review. In Osteoporosis International. https://doi.org/10.1007/s00198-017-4230-x
3. Boot, A. M., de Ridder, M. A. J., Pols, H. A. P., Krenning, E. P., & de Muinck Keizer-Schrama, S. M. P. F. (1997). 1. Bone Mineral Density in Children and Adolescents: Relation to Puberty, Calcium Intake, and Physical Activity 1. The Journal of Clinical Endocrinology & Metabolism. https://doi.org/10.1210/jcem.82.1.3665
4. Bryant, E. J., King, N. A., & Blundell, J. E. (2008). 18. Disinhibition: Its effects on appetite and weight regulation. In Obesity Reviews. https://doi.org/10.1111/j.1467-789X.2007.00426.x
5. Harinarayan, C. V., Ramalakshmi, T., & Venkataprasad, U. (2004). 17. High prevalence of low dietary calcium and low vitamin D status in healthy south Indians. Asia Pacific Journal of Clinical Nutrition.
6. Heaney, R. P., & Recker, R. R. (1982). 7. Effects of nitrogen, phosphorus, and caffeine on calcium balance in women. The Journal of Laboratory and Clinical Medicine. https://doi.org/10.5555/uri:pii:0022214382900282
7. Indian Food Composition Table, Copyright 2017 National Institute of Nutrition. (as accessed on 21 Oct 2020). http://www.ifct2017.com/frame.php?page=home
8. Indian Academy of Pediatrics Growth Chart. (as accessed on 21 Oct 2020). https://www.ncbi.nlm.nih.gov/pubmed/25638185
9. Kalusk, D. N., Basch, C. E., Zybert, P., Deckelbaum, R. J., & Shea, S. (2001). 8. Calcium

intake in preschool children - A study of dietary patterns in a low socioeconomic community. Public Health Reviews.
10. Khadilkar, V., Yadav, S., Agrawal, K. K., Tamboli, S., Banerjee, M., Cherian, A., Goyal, J. P., Khadilkar, A., Kumaravel, V., Mohan, V., Narayanappa, D., Ray, I., & Yewale, V. (2015). Revised IAP growth charts for height, weight and body mass index for 5- to 18-year-old Indian children. Indian Pediatrics. https://doi.org/10.1007/s13312-015-0566-5
11. Khanna, P., & Bhargava, S. (1971). 4. Roentgen assessment of bone density in North Indian population. The Indian Journal of Medical Research.
12. Lim, H.-S., Park, Y.-H., Lee, H.-H., Kim, T.-H., & Kim, S.-K. (2015). 10. Comparison of Calcium Intake Status by Region and Socioeconomic Status in Korea: The 2011-2013 Korea National Health and Nutrition Examination Survey. Journal of Bone Metabolism. https://doi.org/10.11005/jbm.2015.22.3.119
13. Mayén, A. L., Stringhini, S., Ford, N. D., Martorell, R., Stein, A. D., Paccaud, F., & Marques-Vidal, P. (2016). 9. Socioeconomic predictors of dietary patterns among Guatemalan adults. International Journal of Public Health. https://doi.org/10.1007/s00038-016-0863-3
14. Mithal, A., & Kaur, P. (2012). 2. Osteoporosis in asia: A call to action. In Current Osteoporosis Reports. https://doi.org/10.1007/s11914-012-0114-3
15. National Institute of Nutrition, Copyright 2017 National Institute of Nutrition. (as accessed on 21 Oct 2019). http://www.ninindia.org/
16. Sanwalka, N. J., Khadilkar, A. V., Mughal, M. Z., Sayyad, M. G., Khadilkar, V. V., Shirole, S. C., Divate, U. P., & Bhandari, D. R. (2010). 11. 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. https://doi.org/10.6133/apjcn.2010.19.3.05
17. Shahar, D., Shai, I., Vardi, H., Shahar, A., & Fraser, D. (2005). 15. Diet and eating habits in high and low socioeconomic groups. Nutrition. https://doi.org/10.1016/j.nut.2004.09.018
18. Sridhar, C. B., Ahuja, M. M., & Bhargava, S. (1970). 3. Is osteoporosis a nutritional disease? The Journal of the Association of Physicians of India.
19. USDA Food Composition Table, https://ndb.nal.usda.gov/ndb/search/list