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Calcium and vitamin D intake in allergic versus non-allergic children and corresponding parental attitudes towards dairy products

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ABSTRACT

Background: It is hypothesized that parents of children with allergic conditions believe dairy products are potentially harmful to their child.

Objectives: This study compares the calcium and vitamin D intake of allergic versus non-allergic children and parental beliefs about milk and dairy products.

Methods: A survey and food-frequency-questionnaire were administered to parents of children between 3 and 13 years, 110 with allergic disease (allergic rhinitis, asthma, food allergy, and/or atopic dermatitis) versus 110 without allergic disease. Calcium and vitamin D intake was calculated from the food-frequency-questionnaire and compared to National Institutes of Health recommendations. Associations between atopy, calcium and vitamin D intake, and beliefs were investigated using Chi-square test ($\alpha = 0.05$). Distribution across subjects was investigated using Mann-Whitney-U test ($\alpha = 0.05$).

Results: Fewer allergic (51.8%) versus non-allergic children (77.3%) met the recommended calcium intake ($p < 0.001$). Both had similar rates of insufficient vitamin D intake: 12.7% allergic and 17.3% non-allergic ($p = 0.345$). 81.7% of parents of allergic versus 94.0% of non-allergic children believe intake of dairy is important ($p = 0.009$). 23.7% of parents of allergic versus 8.0% of non-allergic children believe dairy negatively impacts their child ($p = 0.003$). 19.1% of parents of allergic children (excluding 3 with documented milk allergy) versus 2.0% of non-allergic believe their child is allergic or intolerant to dairy ($p < 0.001$).

Conclusions: Children are at risk of insufficient calcium and vitamin D intake. Atopic children may be at increased risk for insufficient intake, due in part to parent's negative beliefs regarding dairy products. Physicians should counsel on the importance of micronutrient intake and how allergic conditions do or do not entail dietary restrictions.

Keywords: Food allergy, Dairy products, Pediatrics, Calcium, Vitamin D

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INTRODUCTION

Based on in-clinic observations and conversations with parents, there are increasing concerns about potentially deleterious health effects of milk and dairy products. This is reflected by consumer behavior, with a 6% decrease in cow's milk sales and a concurrent 9% increase in alternative "milk" sales in 2017.[1] This trend is multifactorial but scientifically unfounded. Appropriate dairy product consumption provides essential nutrients and protects against obesity, diabetes, and cardiovascular disease and is not correlated with cancer onset or all-cause mortality.[2–4] Common health concerns related to dairy products include lactose intolerance and immunoglobulin E-mediated milk protein allergy (IgE-MPA). In childhood, lactose intolerance is relatively uncommon while milk allergy is common.[5] IgE-MPA accounts for the highest incidence of food allergy in infancy but is mostly outgrown by adolescence.[6] IgE-mediated food allergies are associated with reduced quality of life, comorbid allergic conditions, and significant monetary costs related to both increased food and healthcare expenditures.[6,7] While IgE-MPA generally necessitates complete avoidance, those with lactose intolerance can usually consume some or all dairy products.[8]

Overestimation of food allergy is common. Parents/caregivers may mistake food poisoning, infections, irritant contact reactions, or food aversion for allergy. In a population-based survey of US households including 38 408 children ages 0–17 years, the prevalence of IgE-mediated food allergy was determined to be 7.6%. However, 11.4% of caregivers reported a current food allergy.[7] A detailed history, allergen-specific IgE tests, and sometimes oral food challenge helps diagnose true IgE-mediated food allergy. Diagnosis can be time-consuming and expensive.[9] Food-specific IgE levels may be detectable in atopic individuals who have no food allergy. As a result, if food IgE testing is ordered when there is no clinical indication, patients may be incorrectly diagnosed with food allergy and advised to avoid foods unnecessarily based on positive IgE results.[10] Additionally, immunoglobulin G (IgG) tests to foods can be purchased directly by consumers. Such tests do not indicate food allergy but a normal immune response to a food, leading to unnecessary dietary restrictions.[11] Identifying true IgE-MPA is important as dairy products are relatively cheap nutrient sources. Calcium and vitamin D, essential nutrients, can be difficult to consume in adequate amounts via foods included in the standard American diet when excluding dairy products.[12] These nutrients are essential, especially in childhood when bone mineralization is occurring, to decrease the risk of developing osteopenia, osteoporosis, and fractures.[13–16]

This investigation studied calcium and vitamin D intake among allergic and non-allergic children between 3 and 13 years to determine if they meet recommended daily values defined by the National Institutes of Health (NIH).[17] It also investigates the behaviors and beliefs of parents/caregivers about dairy products and their consumption.

METHODS

We conducted a cross sectional study including parents/caregivers of children with or without allergic disease between ages 3–13 years. A one-time in-clinic food frequency questionnaire (FFQ) and survey (Figure, Supplemental Digital Content 1) were administered to 220 parents/caregivers of subjects between 08/06/2018–07/25/2019. The FFQ assesses the child's calcium and vitamin D intake and the parent/caregiver's behaviors and beliefs about milk and dairy products.[18] The FFQ was validated and includes questions about daily, weekly, and monthly calcium and vitamin D containing food intake. The food items included on the FFQ are commonly consumed sources of calcium and vitamin D per the NIH.[17] Calcium and vitamin D intake via supplements and calcium-containing antacids was also assessed via FFQ.

The questionnaire on parent/caregivers' beliefs and behaviors was not previously validated. These questions explore beliefs surrounding dairy products by having them agree or disagree about statements regarding these products and rate them as true, false, or unsure. They also explore behaviors regarding inclusion of dairy products in the child's diet.

Sample size was determined assuming 60% of subjects meet NIH recommendations. Within a margin of error of 5% with 95% confidence, 93 subjects provide 80% power. With a projected 15% non-response rate, adequate sample size is 110 per group. The allergic group consists of 110 parents/caregivers of children with diagnosed allergic disease (allergic rhinitis, asthma, food allergy, atopic dermatitis) who were under the care of board-certified allergists/immunologists at an outpatient clinic. Subjects in the allergic group had allergic disease diagnosed based on clinical presentation and, when indicated, testing such as IgE measurement, skin-prick testing, oral food challenge, pulmonary function testing, or skin biopsy. Specific allergic conditions were not recorded unless the child had a diagnosed IgE-MPA. The non-allergic group consists of 110 parents/caregivers of children receiving care by board-certified pediatricians at an outpatient clinic. These subjects did not have a diagnosis or symptoms suggestive of underlying allergic condition. Exclusion criteria for both groups included comorbid conditions that could affect subject diet including but not limited to eating disorders, cystic fibrosis, diabetes, gastrointestinal conditions (eg, irritable bowel disease and eosinophilic esophagitis), and disorders impacting swallowing ability (eg, neuromuscular disease). Subjects were selected consecutively. Allergic status was confirmed via physician chart review and verbal questioning. Both clinics are associated with a local academic healthcare institution. This study was approved by the Institutional Review Board (IRB) and granted certified exempt status.

The primary outcomes were dietary calcium and vitamin D intake. The subject's calcium and vitamin D intake was calculated from FFQ responses and compared to NIH recommendations.[17] The data were analyzed for differences between the allergic and non-allergic groups across demographic information, behaviors and attitudes towards dairy products, and frequency of sufficient calcium and vitamin D intake using chi-square or Fischer's exact analyses. The association between the parent/caregiver responses and child's allergic status was investigated using Chi-square or Fischer's exact test. The distribution of calcium and vitamin D intake across allergic and non-allergic children was investigated using Mann-Whitney-U and independent two-sample *t*-test. All tests were conducted with $\alpha \leq 0.05$.

RESULTS

The study included 220 respondents, 110 allergic and 110 non-allergic; demographics of each cohort are shown in Table 1. Age and sex composition of the groups were not statistically different. There was a statistically significant difference in race between the allergic and non-allergic subjects with the allergic group having a higher percentage of Caucasian respondents and a lower percentage of Hispanic/Latino and Black or African American compared to the non-allergic group.

Characteristic	Allergic (N = 110)	Non-Allergic (N = 110)
Age–yr		
Median (Range)	7 (3–13)	6 (3–13)
Sex–% (no.)		
Male	58% (64)	47% (52)
Female	42% (46)	53% (58)
Race–% (no.)		
Caucasian	56% (62)*	26% (28)*
Hispanic/Latino	10% (11)*	24% (26)*
Black or African American	12% (13)*	25% (27)*
Asian	7% (8)	9% (10)
Native American	2% (2)	0% (0)
Multiracial	11% (12)	16% (17)
Unspecified	2% (2)	2% (2)

Table 1. The demographic composition of the study population. *$p \leq 0.05$

Parents/caregivers were surveyed on behavior and beliefs about dairy products; responses are shown in Fig. 1. All respondents were given the same questionnaire but not all questions were completed by each respondent, leading to less than 110 total responses for some questions. Three children (2.7%) in the allergic group had physician-diagnosed milk allergy and their parent/caregiver responses were excluded from this analysis. Significantly fewer parents/caregivers of allergic children responded that they included dairy products in their child's diet compared to those of non-allergic children (86.0% allergic vs 93.6% non-allergic, $p = 0.035$). When parents/caregivers were asked if they thought dairy products are important, 83.3% (75/90) of parents/caregivers of children with allergic conditions responded "Yes", significantly less than non-allergic parent/caregiver counterparts ($p = 0.019$). While only 2.7% (3/110) allergic subjects had diagnosed milk allergy, 21.7% (20/92) of parents/caregivers in this group believed their child has milk allergy. In the non-allergic group, 0% (0/110) of subjects had physician-diagnosed milk allergy and 2% (2/100) of parents/caregivers believed their child had milk allergy. Significantly more parents/caregivers of allergic children believed their child is allergic to dairy products versus parents/caregivers of non-allergic children ($p = 0.003$). When parents/caregivers were asked if their child is in any way negatively affected by dairy products, 21.1% (19/90) of parents/caregivers of children with allergic conditions versus 8.0% (8/100) of non-allergic children believed their child was negatively affected by the consumption of dairy products ($p = 0.010$).

Of the 21 parents/caregivers (15 from the allergic group, excluding 3 milk-allergic children, 6 from the non-allergic group) who did not regularly include dairy products in their child's diet, 57.1% (12/21) believed their child was negatively affected by these products and of these, 75% (9/12) believed their child was allergic to these them. Among the parents/caregivers of allergic children who did not include dairy products in their child's diet, 53.3% (8/15) believed their child was allergic to dairy products and 60.0% (9/15) believed their child was negatively impacted by them. Among the parents/caregivers of non-allergic children who did not include dairy products in their child's diet, 33.3% (2/6) believed their child was allergic

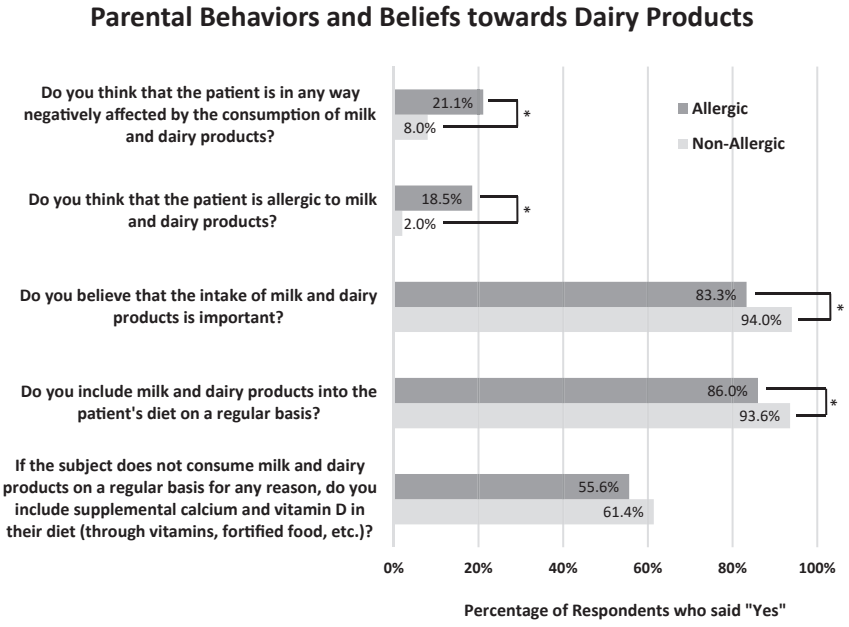

Fig. 1 Parent and caregiver behaviors and beliefs about milk and dairy products. The percentage of parents/caregivers who responded "Yes" to questions about their behaviors or beliefs about milk and dairy products. *$p \leq 0.05$

Statement	Response	Allergic–% (no.) (N = 110)	Non-Allergic–% (no.) (N = 110)
They are related to higher risk of certain cancer(s).	True	4.1% (4)	2.0% (2)
	False	53.6% (52)	63.4% (64)
	Uncertain	42.3% (41)	34.7% (35)
They help prevent bone disease like osteoporosis and fractures.	True	89.0% (89)	79.2% (80)
	False	6.0% (6)	9.9% (10)
	Uncertain	5.0% (5)	10.9% (11)
They are more often to be harmful than beneficial.	True	11.0% (11)	5.9% (6)
	False	66.0% (66)	73.3% (74)
	Uncertain	23.0% (23)	20.8% (21)
They more often cause unhealthy weight gain.	True	19.0% (19)	9.2% (9)
	False	64.0% (64)	70.4% (69)
	Uncertain	17.0% (17)	20.4% (20)
They may cause people to develop lactose intolerance.	True	32.0% (32)	25.0% (25)
	False	39.0% (39)	42.0% (42)
	Uncertain	29.0% (29)	33.0% (33)
Having an allergic disease predisposes people to lactose intolerance.	True	13.0% (13)	5.0% (5)
	False	39.0% (39)	42.0% (42)
	Uncertain	48.0% (48)	53.0% (53)
They are inherently bad for the stomach.	True	14.0% (14)	6.9% (7)
	False	62.0% (62)	66.3% (67)
	Uncertain	24.0% (24)	26.7% (27)
The patient does not need to consume these products.	True	20.2% (20)	11.9% (12)
	False	70.7% (70)	71.3% (72)
	Uncertain	9.1% (9)	16.8% (17)
I prefer the patient to consume alternative products to maintain their vitamin and mineral health.	True	28.0% (28)	22.0% (22)

(continued)

Statement	Response	Allergic–% (no.) (N = 110)	Non-Allergic–% (no.) (N = 110)
	False	62.0% (62)	67.0% (67)
	Uncertain	10.0% (10)	11.0% (11)
The patient does not like the taste or texture of these products.	True	12.0% (12)	5.0% (5)
	False	85.0% (85)	92.0% (92)
	Uncertain	3.0% (3)	3.0% (3)
I do not think that calcium and vitamin D replacement is important.	True	7.0% (7)	7.9% (8)
	False	85.0% (85)	85.1% (86)
	Uncertain	8.0% (8)	6.9% (7)

Table 2. (Continued) Parents/caregivers were asked to respond to the following statements about milk and dairy products. In questions, "the patient" refers to the respondent's child. Answer choices were "True," "False," and "Uncertain." *$p \leq 0.05$. Not all raw numbers add up to 220 as a result of non-responses

to dairy products and 100% (6/6) believed their child was negatively impacted by them.

Parents/caregivers were instructed to decide whether they believed the statements about milk and dairy products listed in Table 2 were true, false, or uncertain. Responses did not differ significantly.

Subject's calcium and vitamin D intake was calculated based on FFQ responses and compared to NIH recommendations.[17] The calcium and vitamin D daily recommended intake values cover 98% of the healthy population, so some below the daily recommended intake may still be meeting their individual requirements. Fig. 2A shows the percent of each group that met the daily recommended intake of calcium and vitamin D. The NIH recommends children between 1 and 3 years consume 700 mg calcium daily, 4–8 years 1000 mg, and 9–13 years 1300 mg.[17] The recommended calcium intake was achieved by 77.3% (85/110) of non-allergic and 51.8% (57/110) of the allergic group ($p < 0.001$). For children between 1 and 13 years, the NIH recommends 600 IU (15 mcg) vitamin D consumption daily.[17] Both groups had inadequate vitamin D intake, with 12.7% (14/110) of allergic and 17.3% (19/110) of non-allergic group meeting the daily recommendation ($p = 0.345$). Given that achievement of daily recommended intake is binary (ie, yes or no) but nearly meeting the daily recommendation is quite different from being very far below, we felt an additional representation of the data was important. As such, to reflect how close patients were getting to the daily recommendation, each subject's intake was compared to their daily recommended intake to calculate the average percent of goal intake achieved (Fig. 2B). On average, the allergic group consumed 125.4% ± 8.0% (mean ± standard error) of the daily recommended calcium versus 187.7% ± 13.1% in the non-allergic group ($p < 0.001$). This indicates that although attainment of daily recommended calcium is not achieved by 100% of either group, on average, subjects are consuming above the daily recommended value. The allergic group consumed 44.7% ± 4.3% of the daily recommended vitamin D versus 56.7% ± 4.3% in the non-allergic group ($p = 0.003$). Fig. 2C depicts the average percent of daily recommended calcium achieved by age based on the different recommended amounts per NIH guidelines. On average, the only group that did not meet recommended calcium intake was allergic patients between 8 and 13 years. Nutrient sources (ie, food versus supplementation) was evaluated by the FFQ. The average percent of calcium intake from food was 92.4 ± 1.01% in allergic versus 98.1 ± 0.54% in the non-allergic group ($p < 0.001$). The average

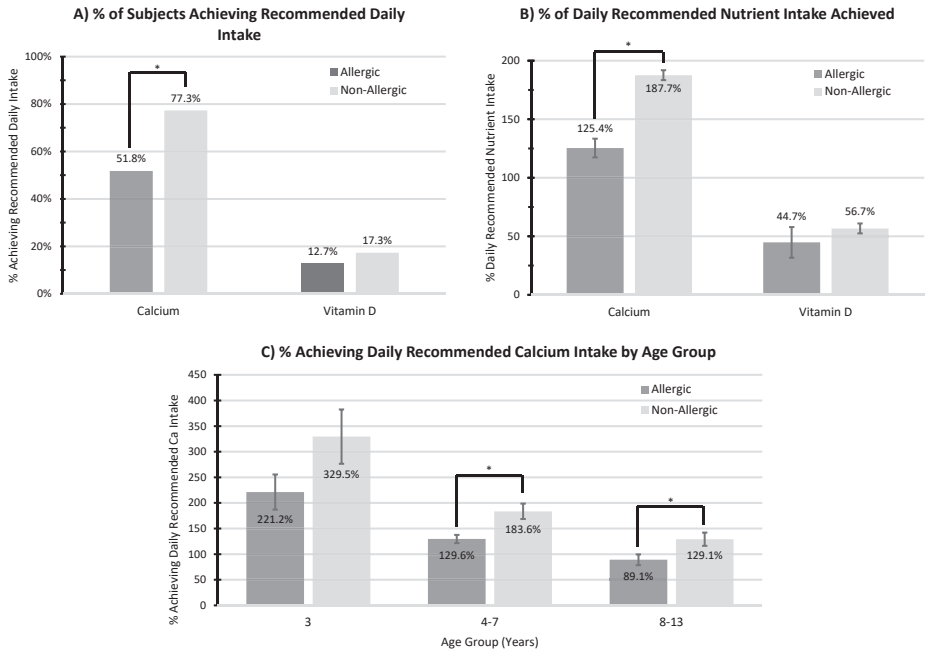

Fig. 2 Calcium and Vitamin D Intake. Calcium and vitamin D intake of subjects, as determined from the food frequency questionnaire. A: displays the percent of subjects in both the allergic and non-allergic groups that met the NIH's daily recommended intake of calcium or vitamin D. B: shows the average percent of subjects' calcium or vitamin D intake compared to the recommended intake. C: shows the average percent of calcium intake compared to the recommended intake broken down by age group. *$p \leq 0.05$

percent of vitamin D intake from food was $78.8 \pm 3.40\%$ in allergic versus $81.9 \pm 2.89\%$ in the non-allergic group ($p = 0.890$).

DISCUSSION

This study explores behaviors and beliefs towards milk and dairy products in parents/caregivers of allergic versus non-allergic children and corresponding calcium and vitamin D intake. Fewer parents/caregivers of allergic children believe dairy products are important and correspondingly include less dairy products in their child's diets compared to parents/caregivers of children without allergic diseases. Some factors contributing to the non-incorporation of dairy products by parents/caregivers of allergic children include the belief that their child is negatively affected by and/or allergic to dairy products. Accordingly, allergic children are at a greater risk for insufficient intake of nutrients such as calcium and vitamin D. Additionally, in accordance with past studies, overestimation of milk allergy was observed in our surveyed population of parents/caregivers of allergic children.[7]

Existing literature on attitudes towards milk and dairy products in parents/caregivers of children, regardless of allergic status, is lacking. Our study aimed to evaluate such attitudes and did not identify any significant differences in beliefs regarding milk and dairy products between parents/caregivers of allergic and non-allergic respondents. However, both groups had a significant amount of negative perceptions or uncertainty regarding milk and dairy products. For example, over 20% of respondents in both groups were uncertain whether milk and dairy products were more often harmful than beneficial and were uncertain whether these products are inherently bad for the stomach. Additionally, at least 25% of both groups believed that milk and dairy products may cause development of lactose intolerance. Studies have been conducted in subsets of adult populations exploring perceptions towards dairy products. Such a study of 20 subjects with asthma revealed that 10 of them perceived that their asthma was exacerbated by ingestion of dairy products despite negative skin-prick tests to cow's milk and no evidence of bronchoconstriction on spirometry after its consumption.[19] Additionally,

one study found a potential link between vegetarian lifestyle and negative perceptions towards milk and dairy products.[20] Otherwise, the scant existing literature mainly focuses on the impact of advertisement and perceptions of consumers from a marketing standpoint.[21,22] More studies are needed on the relationship between allergic status and perceptions towards dairy products.

Reasons for milk and dairy product exclusion were explored in this study. Significantly more parents/caregivers of allergic versus non-allergic children believed their child was negatively affected by and/or allergic to dairy products. This likely accounts for some exclusion of these products from their child's diet. Approximately 19% of parents/caregivers of allergic children believed their child had a milk allergy despite the lack of clinical evidence for the same. While some subjects could have a not-yet-diagnosed milk allergy, it is unlikely the figure reaches 19%, especially given that the population is between 3 and 13 years and milk allergy usually presents earlier in life, most often in infancy, and frequently resolves with age.[8,23] Not all parents/caregivers who excluded dairy products from their child's diet believed their child was negatively affected and/or allergic to dairy products. This indicates that there are other reasons contributing to exclusion of milk and dairy products, not successfully elucidated in this study.

This study also determined if subjects meet the recommended daily intake of calcium and vitamin D as defined by the NIH using a FFQ (Figure, Supplemental Digital Content 1,[17]). The FFQ surveyed respondents on intake of multiple food products with significant calcium and/or vitamin D content. Food items such as milk, hot chocolate, dairy-containing foods (chowders, cream soups, milkshakes, mac and cheese, etc.) were sources of both calcium and vitamin D. Some food products, such as buttermilk, cheese and cheese-containing pastas/pizzas, and yogurt products, were high in calcium but lower in vitamin D; likewise, there were foods high in vitamin D and lower in calcium including but not limited to salmon and sardines. During prior validation, the FFQ underestimates vitamin D and overestimates calcium intake, but neither effect is significant.[18] While neither group completely met the daily recommendation, significantly more non-allergic versus allergic children had sufficient calcium intake. Allergic children whose parents/caregivers do not include milk and dairy products in their diet were most at risk for poor calcium intake. Similar results were found in a study of bone mineral density in children with cow milk allergy. Prepubertal children with cow milk allergy were found to have significantly lower calcium intakes, lower lumbar spine bone mineral density, and significantly increased rates of low bone mass than their non-allergic counterparts.[24] Additionally, there have been case reports of fractures and rickets in children with milk allergy who do not receive appropriate calcium supplementation.[25,26] Both groups had similarly poor dietary vitamin D intake. While vitamin D can be derived via exposure to UVB rays, the quantity attained varies depending on latitude, season, skin type, area exposed, and use of sunscreen. Production of vitamin D is significantly reduced with small exposure area or when sunscreen is used appropriately.[27] Additionally, children are spending less time outside. Among 8950 US preschool-aged children, only 51% went outside at least daily with a parent.[28] Given the numerous factors impacting vitamin D production from skin, dietary intake is important in maintaining adequate vitamin D levels. Children who do not have adequate vitamin D intake may not only be at increased risk for future osteopenia, osteoporosis, and fractures but also suboptimal immune function, insulin resistance, and cardiometabolic disease.[29,30]

The percent of micronutrient intake derived from food versus supplements was also investigated in this study. A significantly larger proportion of calcium intake was derived from supplementation in allergic versus non-allergic children. However, a larger portion of vitamin D intake, as compared to calcium intake, in both allergic and non-allergic children, comes from supplementation. Children with milk allergy may require supplementation to ensure adequate consumption of calories, fat, protein, calcium, vitamin D, and riboflavin.[31]. If parents/caregivers are restricting diets due to negative perceptions of dairy products, their children may require similar supplementation. Physicians should counsel parents/caregivers on the importance of

adequate nutrient consumption and either reassure parents of the safety of dairy product consumption by their child or discuss alternative dietary sources

This study has limitations. Data that could impact diet and reporting, such as education level of the parent/caregiver, socioeconomic status, and religion, were not collected. Notably, the allergic and non-allergic groups had statistically significant differences in racial composition with a higher proportion of Caucasian patients and a lower proportion of Hispanic/Latino and Black or African American patients in the allergic group compared to the non-allergic group. This is likely due in part to the difference in practice type with the allergy clinic being a private practice affiliated with the university and the general pediatrics clinic being a public-university run clinic. Relationships between race, nutrient intake, and attitudes towards milk and dairy products were not explored. The specific allergic conditions of subjects, number of allergic conditions, history of resolved food allergy, and allergic conditions of family members were not recorded unless a subject had a current diagnosis of IgE-MPA. This could have influenced results, as the parent of a child with resolved IgE-MPA or IgE-MPA in another child would likely exhibit different behaviors and beliefs towards dairy products than a parent/caregiver of a child with asthma. Investigation of level of inclusion of dairy products (i.e., strict avoidance, consumption in moderation, or inclusion only in baked goods) and consumption of fortified alternative milk products was not conducted.

Additionally, the FFQ employed was previously validated in a population of adolescent girls with anorexia nervosa.[18] There is no previously validated FFQ for assessing calcium and vitamin D intake in 3–13 year old children. The food items included on the questionnaire and corresponding calcium and vitamin D contents are derived from NIH guidelines.[17] Using FFQs to determine calcium and vitamin D intake is validated in other populations including adolescents, adults, and Caucasian females.[32-34] Furthermore, the use of FFQs to accurately capture a person's overall diet is validated across various age groups, races, socioeconomic status, and levels of education.[35-38] FFQs completed by parents/caregivers are a reliable and reproducible means of estimating macro- and micro-nutrient intake in children across multiple age and ethnic groups.[39-42] While the FFQ used was not validated for our population, FFQs are reliable and reproducible in determining dietary nutrient intake.

CONCLUSION

This study determined calcium and vitamin D intake using a FFQ. Both allergic and non-allergic children are at risk for insufficient calcium and vitamin D intake. More non-allergic versus allergic children meet the daily recommended calcium intake, but both do not meet the daily recommended doses of vitamin D. Parents/caregivers of allergic children have more negative beliefs about milk and dairy products and a fewer parents/caregivers of allergic children include these products in their diets. Overestimation of milk allergy prevalence occurs among parents/caregivers of allergic children. It is important that physicians discuss true IgE-MPA with parents of allergic children who have not been found to have this condition in order to avoid unnecessary fear and avoidance of such products. Parents/caregivers of both allergic and non-allergic children face significant uncertainty and/or hold negative beliefs towards milk and dairy products. As such, all parents/caregivers, regardless of child's allergic status, should receive education on the importance of calcium, vitamin D, and other micronutrient intake whether from dairy products or alternative dietary sources. Physicians treating allergic children should thoroughly educate parents/caregivers on how the child's allergic condition does or does not necessitate dietary restrictions and together with dieticians, should educate parents/caregivers about possible alternatives and/or supplements to ensure sufficient calcium and vitamin D intake.

Abbreviations

IgE-MPA, immunoglobulin E-mediated milk protein allergy; IgG, immunoglobulin G; NIH, National Institutes of Health; FFQ, food frequency questionnaire; IRB, Institutional Review Board.

Author consent for publication

All authors have reviewed and approve the manuscript for publication; they certify that data was collected under appropriate ethical guidelines and regulatory approval and that the work on this manuscript is original. The authors

have no conflicts of interest to disclose. There were no sources of financial assistance for this study. This study has not been previously published.

Author contributions

R.F.L., A.C.S., and M.P.C., were responsible for study conception, design, implementation logistics, and research team recruitment and subsequent supervision. A.H.D., M.P.C., S.D.G., S.F.P., conducted survey administration, data collection, and data management. R.S.M. assisted in data management and conducted data analysis. A.H.D. was responsible for initial drafting of the manuscript; all authors provided critical feedback and edits to assist in the writing of the manuscript.

Availability of data and materials

The data that support the findings of this study are available from the corresponding author (A.H.D.) upon reasonable request.

Ethics approval

This study was approved by the University of South Florida Institutional Review Board (IRB) and granted certified exempt status (Pro00039554).

Declaration of competing interest

The authors have no conflicts of interest to disclose.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.waojou.2021.100579.

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