



The impact of salary level on the diagnosis and treatment of children with cow's milk protein allergy: a prospective observational cross-sectional study

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Abstract

Cow's milk protein allergy (CMPA) is a type of food allergy (FA), that is, a reaction of the immune system in the gastrointestinal tract due to the ingestion of proteins such as beta-lactoglobulin, alpha-lactalbumin, and casein. This condition most substantially affects children in the early stages of their development, about 2% of the American child population, and, consequently, directly or indirectly influences the families of each of them. In the Brazilian context, the epidemiological analysis is shallow in quantitative and qualitative data. Because of this, this study aims to understand the path of patients with CMPA, from diagnosis to treatment, and how their income and their knowledge of their rights in the Unified Health System interfere throughout this process. A form was used as a method to collect data from families with CMPA patients, accounting for 107 in all, which were consulted through online communities. Facing the financial and nutritional challenges of treating a child with CMPA and, at the same time, with the results obtained, the authors of this study were able to verify that, despite the high cost of adapting the diet of this AA, the economic factor was not it was relevant within this consulted microcosm regarding treatment, but slightly influential in the diagnosis. Analyzing the knowledge of the benefit offered by SUS concerning the child's nutritional supplementation, it was possible to verify that, of a total of 44 people, about 45%, know the benefit, but do not use it, and do not perform the supplementation. So, for this and other obtained relations, the study concluded that low income is not a limiting factor for the treatment of patients with CMPA, being slightly influential in the way in which families

seek the diagnosis of this FA. In line with this view, it was possible to note the high evasion of SUS Primary Care and the non-use of the formulas offered, although they are sometimes known by the target audience.

Keyword: Cow's milk protein allergy. Allergy. Treatment. Diagnosis. Income. Supplementation.

Introduction

Clinical manifestations of cow's milk protein allergy (CMPA) usually start in the first six months of life, affecting about 2 to 5% of children up to one year of age. In about 85% of children, allergen tolerance is acquired between three and five years of age [1]. The metabolic and nutritional demands of the child are increased in the first two years of age, which corroborates an adequate food introduction for a good quality of life and development until adulthood [2].

Breastfeeding meets all nutritional needs up to the sixth month of the infant's life and prevents CMPA and other allergies [1-3]. However, from the sixth month onwards, complementary feeding becomes essential for the demand for micronutrients. The importance of breastfeeding is continuous throughout the process, as, as recommended by the WHO, exclusive breastfeeding until the sixth month and combined with adequate complementary feeding until the age of two can reduce the risk of subsequent diseases [4].

Considering the high nutritional demands of children with CMPA development, early diagnosis and professional monitoring of the disease are essential. In carrier infants, it is necessary to carry out a dietary restriction on the part of the mother, together with a supplementary diet for the child after the sixth month of

life. This supplementation should be appropriate for the food allergy subtype [5].

To recognize the etiology of the allergic reaction, the history and clinical picture should be noted. IgE-mediated reactions are immediate, that is, they occur within minutes of exposure to the allergen. These most commonly generate cutaneous manifestations, but can also cause aggression to the gastrointestinal and respiratory systems and anaphylaxis. Non-IgE-mediated (cell-mediated) reactions are called late, chronic, and present gastrointestinal signs more frequently, with inflammation of several systems (reflux, esophagitis, enterocolitis, enteropathies, and proctocolitis [1]. Recognition of the allergy subtype will designate the diagnosis, prognosis (with development of tolerance), and treatment.

Due to inequalities in information and income, some diagnoses are made late, and nutritional supplementation is performed by the family and caregivers without adequate professional monitoring. With this, it is observed that many forms of intuitive treatment are not always consistent with the real need of the child [6].

Also, food supplementation occurs through the introduction of formulas in the infant's diet, however, these are commercially restricted formulas with a high-cost value. The Unified Health System (SUS) offers formulas free of charge to children with CMPA up to two years of age and the approval process begins with the presentation of the pediatric prescription at the Basic Health Unit in the region. The process may take a few months, but it is efficient and real. However, for some reason, many families with children with CMPA do not use the benefit and rights offered by the SUS, which, added to the high cost of formulas on the market, makes it difficult to correctly maintain the diet and treat CMPA. All these factors can act to the detriment of the quality of life and development of children with CMPA [4].

Thus, the aim this study was to analyze how income can impact the diagnosis and treatment of children with CMPA, as well as the knowledge and use of nutritional formulas offered by SUS.

Methods

Study Design and Participants

This work followed the STROBE rules for a prospective observational cross-sectional study. This is a quantitative-qualitative research, in which a questionnaire was used to answer our questions, with questions created by the authors of this work, created from the "Google Forms" platform online. Due to the current scenario in which this research is being carried out (Sars-Cov2 pandemic), this form was sent in two

groups of the "Facebook" application called "cow's milk protein allergy (CMPA)" AND other allergies" where the members of these groups are parents/guardians of children who have CMPA and they answered the questionnaire. A total of 107 responses were obtained. This questionnaire was divided into two parts. The first focused on general aspects of the child's treatment in addition to a socioeconomic analysis of those responsible and the second analyzed the clinical picture and quality of life before and after treatment.

Secondary data from scientific articles found on the PubMed and Scielo platforms were also used to compose this article and guide the decisions to formulate questions and texts.

Ethical Approval

This study was analyzed and approved by the Research Ethics Committee of UNIFIPA, Catanduva, Sao Paulo, according to a substantiated opinion number of 057094/2022, and obtaining the patient's consent through the Informed Consent Form, according to CNS/CONEP Resolution 466/12.

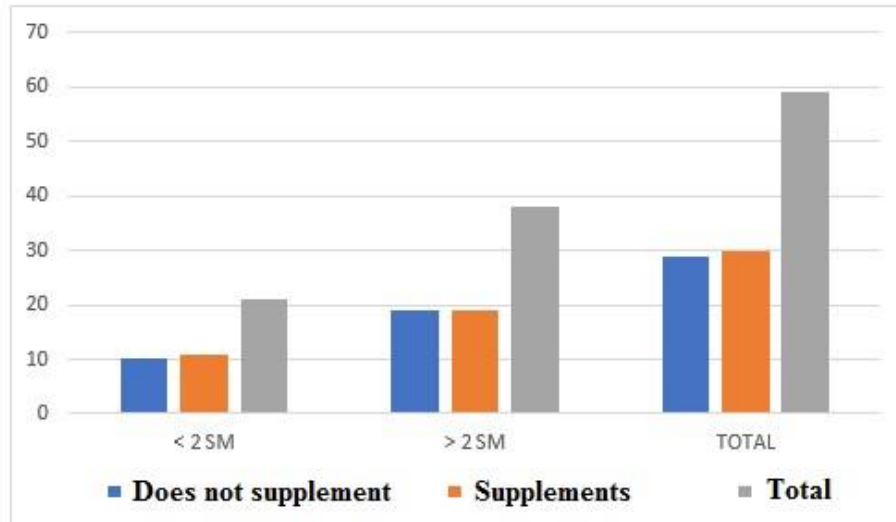
Results

After the application of the questionnaire, the following data were found on the age at which the diagnosis of CMPA occurred, of a total of 107 children analyzed, 86 had a diagnosis of 0-1 year (80.37%), 15 from the first to second year, three children aged 2-3 years, one aged 3-4 years and two children aged 4 years and over (Figure 1).

Regarding how the diagnosis was given, it was found that 87 families found out through a medical consultation, and in 85% of the situations, the consultation was private or through the health plan, and in 15%, made possible by the SUS. Still, the other 13 guardians said they had completed the diagnosis through the internet, and another 7, talking to friends or family.

When asked about prognosis and follow-up, 92 families reported being supervised by a medical professional, 9 by a physician and a nutritionist, and 6 reported not performing professional follow-up. In the appendix asking about the treatment, it was observed that: 19.6% of those responsible were treated with restriction of maternal diet (for children still in the breastfeeding phase), 15% restriction of maternal diet combined with supplementation with free amino acid formulas, 7.5 % maternal diet restriction combined with hydrolyzed protein supplementation, about 3% maternal diet restriction combined with soy protein supplementation and yet, 28% of children perform food supplementation and avoid foods with traces of milk

Figure 1. Income ratio and nutritional supplementation.



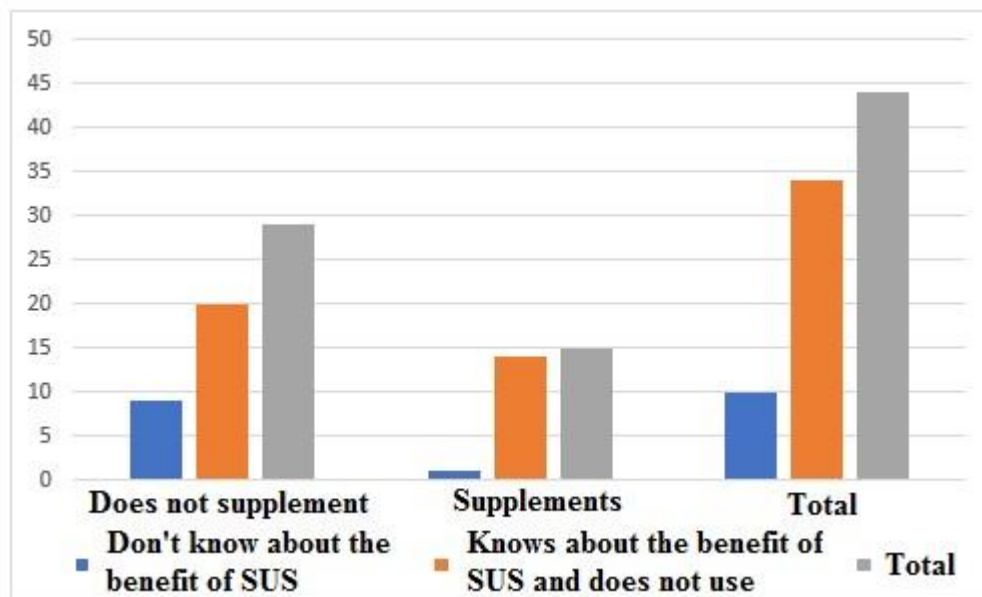
proteins and 27.1 % just avoid these foods.

The questionnaire continues with a socioeconomic approach, in which the guardians were asked about the awareness of the possibility of obtaining the formula for food supplementation through the SUS, 18 families reported not knowing this information, another 33 were aware and took advantage of this offer and 56 guardians reported knowing about the possibility and not using it.

Families were asked about their average monthly income, and 41 of them declared having an income of less than 2 minimum wages (of these, 7.3% of the families were composed of 2 people, about 44% of 3

people, 39%, of 4 people and 9.7% for 5 people or more) and the 66 others, income higher than this amount (of these, 1.5% of the families were composed of 2 people, 48.5% for 3 people, about 41%, for 4 persons and 9% for 5 persons or more). Subsequently, 10 families claimed to have no problems paying for the treatment of a child with CMPA, another 10 said they were unable to afford it, 60 guardians claimed to have difficulty paying the costs of the disease and the last 27 said they found it expensive, but able to finance the costs (Figure 2).

Figure 2. Relationship of knowledge of the benefit of Health Unic System (SUS) and nutritional supplementation.



Finally, when the data was crossed, of the people who reported having completed the diagnosis in a way other than the medical consultation, about 7.5% reported having an average monthly income below 2

MW, and 11.2%, had income above this value RR = 1.07 (95%CI = 0.478 - 2.323). In addition, of the families that do not supplement their child's diet, 10 of them had an income below 2 MW and 19 of them had an income

above the referred amount $RR = 0.952$ (95%CI = 0.545 - 1.66). Furthermore, 9 families who were not aware of the benefit granted by the SUS stopped supplementing, and another 20 families were aware of the benefit and did not supplement. $RR = 1.53$ (95%CI = 0.742 - 2.411).

Discussion

Food allergy (FA) is an immunological reaction in which immunoglobulins and T cells are involved, which may be associated in some cases. It is a reproducible immunological reaction against a specific food antigen, usually protein [3].

Cow's milk protein allergy (CMPA) is an inflammatory disease that affects the gastrointestinal tract and the skin, occurring secondary to an immunological reaction against some proteins present in cow's milk, especially beta-lactoglobulin, alpha-lactalbumin, and casein [4]. These food allergens are more frequent in the age group up to 24 months and diagnoses after this age are rare due to progressive oral tolerance to cow's milk protein [4]. According to studies carried out in North America, the prevalence of CMPA is around 2.5% in children and 0.3% in adults. Unfortunately, there are no national surveys or records to determine the prevalence of this allergy in the national territory [1,4].

CMPA can be divided into primary (usually in children from families with an atopic history) or secondary (occurring after outbreaks of acute gastroenterocolitis or consequent to transient IgA deficiency) [5]. In addition, the clinical manifestations resulting from CMPA can be subdivided into immediate IgE-mediated reactions, in which symptoms begin within 2 hours after ingestion of cow's milk and their most common manifestations are cutaneous, gastrointestinal, respiratory, and cardiovascular. or anaphylaxis, and also in late reactions not mediated by IgE, in which symptoms appear hours or days after food ingestion and most manifestations are gastrointestinal, and may also include respiratory and cutaneous symptoms [1,6].

Considering this reality in the microcosm presented, it was analyzed how the social and economic profile of the sample of this research is related to the CMPA. Regarding the information collected, the income data and how the diagnosis was discovered were initially crossed. The group's income was divided into two, which receive more or less than 2 Minimum Wages (SM). Regarding how the diagnosis was obtained, it was divided between the medical and non-medical forms, the latter including research on the internet and talking with friends. Thus, it was found that 19.51% of families

receiving less than 2 MW performed the diagnosis in a non-medical way, while this rate was 18.18% in the group receiving more than 2 MW. Regarding the sample of 107 people, 87 of them (81.3%) had their diagnosis under medical consultation, with 54 people (41.12%) in the income bracket above 2 MW. $RR = 1.07$ (95%CI = 0.478 - 2.323). There is a 7% greater chance of people with lower incomes seeking a non-medical form of diagnosis compared to the higher income group. Thus, it is a fact that income is a slightly limiting factor regarding the form of diagnosis of CMPA.

Food is a sine qua non-component in contemporary societies and, therefore, also influences the health area [7]. The eating habits of an individual interfere, directly or indirectly, with the habit of their companions, and this, in the family context of children with CMPA, is no different. Because of this, in addition to the data collected, it is worth understanding the impacts, such as the socioeconomic already mentioned, present throughout a patient with CMPA, and how such factors truly interfere with the quality of their treatment, within the sample of this search.

The first challenge faced involves contamination, even if minimal, of breast milk. As far as is known, breastfeeding up to six months of life corresponds to a protective and preventive factor that reduces the incidence of CMPA [8]. However, in cases of confirmed CMPA, small amounts of cow's milk protein ingested by the mother can be transferred through breast milk during breastfeeding, and because of this, some mothers need to undergo a restricted diet to avoid the risk of CMPA reactions [9].

Although minimal, and sometimes rare, the problem of diet adaptation is not restricted to the mother, much less, only to the breastfeeding period, on the contrary, the adaptive focus is the patient, in this case, the child with CMPA. And in this way, what is sought is the total isolation of cow's milk and its dairy products from the patient, whether directly or indirectly. Thus, as stated by Cardoso (2012), the focus of family concerns does not revolve only around food, but the entire environment in which the child will have contact during the treatment of CMPA. It is essential that the child not only not ingest milk and dairy products, but also not ingest anything with dairy products, even if minimal, or even consume some preparation made in containers previously contaminated by milk [10].

To supply deficiencies left by the lack of milk, the ideal treatment is done through the complete exclusion of foods that contain cow's milk protein. In addition, inhalation and skin contact should be avoided. It is also worth mentioning the nutritional recommendation that breastfed children younger than 6 months of age or older than 2 years of age may not need infant formula.

However, breastfed children aged over 6 months to 2 years of age should supplement with formula, as this is essential in their treatment [11].

Formulas are chosen depending on the severity of the patient's symptoms, IgE results, skin tests, and clinical exclusion and provocation tests. Among the existing formulas, the following stand out, formulas based on extensively hydrolyzed cow's milk protein (FeH): These are considered protein hydrolysates and are small fragments that do not induce a reaction in allergic patients. This type of formula is the most recommended for the treatment of patients with CMPA because it is 90% effective and can be used in cases of IgE-mediated or non-IgE-mediated allergy.

Synthetic Amino Acid Formulas (AAF): These are formulas developed in the laboratory to ensure freedom from allergenic residues. Formulas based on soy protein isolate: Formulas based on soy protein isolate are not recommended as nutritional therapy by some international scientific societies, however, the American Academy of Pediatrics (AAP) recommends its use in IgE-mediated allergies in children. over six months. Unfortunately, in CMPA, the digestive tract mucosa is suffering an inflammatory reaction due to the allergen, thus, there is an increase in permeability, promoting greater penetration of macromolecules, perpetuating the inflammatory process and, often, sensitizing the child to soy protein [10,11].

However, these products, despite their effectiveness, are expensive, especially concerning regular milk and even other formulas on the market. With this, they corroborate, together with the difficulty of a diet isolated from cow's milk protein, the first obstacle of the ideal treatment, the financial one [12].

Through the data collected by the research, it was possible to analyze and establish crosses between groups of income lower and higher than 2 MW and children who receive or do not supplementation in their diet. The relationship considered the types of treatment that involve only the child's diet, since in the treatment that involves the mother's diet, there is breastfeeding and, if the child is up to 6 months old, breastfeeding meets their nutritional needs without a supplement. Therefore, the total sample of this relationship consisted of 59 children, 30 (50.84%) of whom receive supplementation and 29 (49.15%) do not, that is, they only have a restricted diet of traces of milk. If the income groups are compared, of the 21 guardians who receive less than 2 MW, 10 (16.94%) do not include supplementation in the child's diet and 11 (18.64%) do. Furthermore, in the group that received more than 2 MW, 19 (32.2%) children received supplementation and 19 did not. RR = 0.952 (95%CI = 0.545 - 1.66). From the statistical analysis, it can be said that there is about

a 5% less chance of a child not receiving supplementation if they belong to the lowest income group compared to the group that receives more than 2 MW. This time, it can be noted that low income is not a factor that acts to the detriment of the child's treatment, as the proportion of non-supplementation was even higher in the group with higher income.

On the other hand, despite the economic factors of keeping completely isolated from milk, or even buying formulas for an ideal treatment, not representing a problem for the selection of people consulted, there are still free alternatives available to the population. High-cost formulas are provided by the government to low-income families, and such access is provided by the Unified Health System [12].

Data regarding the presence or absence of supplementation in the child's diet and about the lack of knowledge of the benefit offered by the SUS and its knowledge, however, not used, were crossed. Again, regarding the type of treatment, only the children's treatments were considered, and not added to the mothers' diet. In addition, concerning knowledge of the SUS benefit, only data from people who did not know and who knew and did not use it were considered. It can be noted that the data of families that use the benefit to supplement the child's diet were not analyzed, since all those who use it, 15 responsible, carry out the supplementation. Thus, the total sample of the data crossing had 44 people. From the relationship, it was found that, of 10 guardians who did not know the benefit, 9 (20.45%) do not supplement and only 1 (2.27%) performs supplementation. Within the group that knew about the benefit, but did not use it, 20 (45.45%) did not supplement and another 14 (31.81%) included the supplement in the child's diet. RR = 1.53 (95%CI = 0.742 - 2.411). In agreement with the statistical data, there is a 53% chance that the child will not receive supplementation if he belongs to the group that does not know the benefit offered concerning the group that knows and does not use it.

The SUS guarantees equal quality treatment to the population, and as can be seen in this research, the majority of the sample, belonging to the target audience of this benefit, does not seek such rights. This situation contains other obstacles to ideal treatment: low adherence to Primary Health Care and the bureaucratization of the process of seeking rights. According to Rati, Goulart, Alvim, and Mota (2013) [13], the hospital-centric view between parents and legal guardians is the majority, therefore, the search for help in the health treatment of their children is usually done in the Urgency and Emergency wards of the hospitals. This fact is directly reflected in the problem of CMPA, considering that the care with the condition and

the medical indication for the free receipt of high-cost formulas is done in the SUS Primary Care. That is, in the USF or UBS service, where caregivers will truly receive instructions on specific care and where the correct forms will be filled out to guarantee the necessary formulas free of charge.

This thought of escaping from Primary Care is aggravated when the necessary bureaucracy is added to the process. According to the analysis by Costa and Neves (2013) [14], the practice of isomorphic bureaucratic mechanisms, in particular, normative, represents the main form of health management in Brazil, which represents a distance from the public in situations of easily adaptable need. Thus, treatment by abstaining from allergenic foods is preferable to the public and, in case of accidental ingestion, emergency therapy [15], because of unusual ways in the use of Health, to achieve good treatment free.

Conclusion

From the information collected in the research, it can be concluded that, concerning the form of diagnosis of CMPA, low income proved to be slightly influential, tending to a diagnosis in a non-medical way. However, as a central objective of the research, the analysis found that income does not harm the child's treatment, since supplementation or not in the diet also depends on other factors. One of the limiting factors found was the lack of adherence to SUS Primary Care, which leads to an evasion to use the right offered by the free supplementation system up to two years of age.

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Not applicable.

Ethics approval

This study was analyzed and approved by the Research Ethics Committee of UNIFIPA, Catanduva, Sao Paulo, according to a substantiated opinion number of 057094/2022, and obtaining the patient's consent through the Informed Consent Form, according to CNS/CONEP Resolution 466/12.

Informed consent

The patient signed the consent form.

Data sharing statement

No additional data are available.

Conflict of interest

The authors declare no conflict of interest.

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