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Clinical Study

Camel Milk Is a Safer Choice than Goat Milk for Feeding Children with Cow Milk Allergy

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Abstract

Background. Various sources of mammalian milk have been tried in CMA. **Objectives.** To determine whether camel milk is safer than goat milk in CMA. **Methods.** Prospective study conducted at Hamad Medical Corporation between April 2007 and April 2010, on children with CMA. Each child had medical examination, CBC, total IgE, cow milk-specific IgE and SPT. CMA children were tested against fresh camel and goat milks. **Results.** Of 38 children (median age 21.5 months), 21 (55.3%) presented with urticaria, 17 (39.5%) atopic dermatitis, 10 (26.3%) anaphylaxis. WBC was $10,039 \pm 4,735$ cells/ μ L, eosinophil $1,143 \pm 2,213$ cells/ μ L, IgE 694 ± 921 IU/mL, cow's milk-specific-IgE 23.5 ± 35.6 KU/L. Only 7 children (18.4%) tested positive to camel milk and 24 (63.2%) to goat milk. 6 (15.8%) were positive to camel, goat, and cow milks. Patients with negative SPT tolerated well camel and goat milks. **Conclusions.** In CMA, SPT indicates low cross-reactivity between camel milk and cow milk, and camel milk is a safer alternative than goat milk.

1. Introduction

In infants and young children, CMA is the most common food allergic disease [1]. Total elimination of cow milk protein from child diet and providing a suitable, nutritional, substitute supply for feeding are the only current strategies [2, 3]. Extensively hydrolyzed and soy-based formulas are the most commonly used substitutes of cow milk protein in children with CMA [4, 5]. Although their nutritional value is high, their high cost and poor palatability by some children limit the use of extensively hydrolyzed formulas. For these reasons, there has been continuous search for other nonbovine, mammalian milks as a replacement of cow milk. These trials included milk of sheep, goat, ass or donkey, mare, and buffalo [6–9]. Unfortunately, it has been demonstrated, by several studies, that children with CMA develop allergy to the milk proteins of these mammalian milks due to some similarity between the proteins of these mammalian milks and that of the cow milk [10].

Goat milk has been tried but it seems it is not an appropriate alternative supply for children with IgE-mediated CMA as has been demonstrated by skin testing, CAP test, and challenge tests [6].

In this study, part of a prospective cohort study on camel milk, we wished to (a) find out the cross-reactivity between camel milk, goat milk, and cow milk in children with CMA, and (b) determine whether camel milk could be regarded as a safer alternative to goat milk in feeding these children.

- Abstract
- Full-Text PDF
- Full-Text HTML
- Full-Text ePUB
- Full-Text XML
- Linked References
- Citations to this Article
- How to Cite this Article

2. Subjects and Methods

2.1. Subjects

This prospective cohort study was conducted between April 2007 and April 2010 on 38 children less than 14 years, who were referred to the Pediatric Allergy-Immunology Clinics at Hamad Medical Corporation with symptoms related to CMA. The inclusion criteria required (i) history highly suggestive of CMA, (ii) elevated cow milk protein-specific IgE ≥ 0.35 IU [3], and (iii) positive skin prick test to cow milk protein. However the gold standard for diagnosing CMA is a “double blind placebo controlled food challenge” (DBPCFC) [11, 12]. Exclusion criteria included severe skin disease that precludes skin testing; persistent daily need for oral antihistamines, immunosuppressive drugs; severe cardiovascular, renal, debilitating disease (e.g., terminal malignancy), marasmic kwashiorkor, or respiratory disease, or current use β -blockers. Data was collected using a structured interview and a standardized questionnaire. The questionnaire also included family history of allergies in parents, siblings, and grandparents.

The study was approved by the Hamad General Hospital, Hamad Medical Corporation. All human studies have been approved by the Research Ethics Committee and have been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki. All children were included in this study after informed consent from parents. We evaluated camel milk allergy by using skin prick test with camel milk.

2.2. Skin Prick Tests (SPT) and Reagents

Milks of goat and camel were collected from local farms. They were sterilized at 100 to 120°C for ten to 20 minute [13, 14]. After cooling down, they were stored and placed at 4°C and used within 3 days. Skin prick tests were performed following the *Updated Practice Parameter of Allergy Diagnostic Testing* [15]. Tests were performed on the volar surface of the forearm with undiluted goat and camel milk allergen using a sterile lancet (Stallergen, Paris, France). A 50% glycerin/saline solution and HCL histamine solution at 10 mg/mL were used as negative and positive controls, respectively. SPT were read after 15–20 minutes, and test was considered positive if the mean diameter of the tested allergen should be at least 3 mm and greater than the histamine control. All patients had SPT with homogenized cow milk.

2.3. Laboratory Workup

All patients had blood tests for CBC, total serum IgE, and cow milk-specific IgE measured by RIDA AllergyScreen Panel 3 test kit (R-Biopharm AG, Darmstadt, Germany).

3. Statistical Analysis

The data was analyzed using the Statistical Packages for Social Sciences (SPSS), Window version number 17. With frequency distributions, one- and two-way tabulations were obtained. Chi-square analysis was performed to test for differences in proportions of categorical variables between two or more groups. In 2×2 tables, the Fisher's exact test (two-tailed) replaced the chi-square test if the assumptions underlying chi-square violated, namely, in case of small sample size and where the expected frequency is less than 5 in any of the cells. The level $P < .05$ was considered as the cut-off value for significance.

4. Results

Table 1 shows the demographic characteristics of 38 children with confirmed cow milk allergy who were skin tested against camel milk and goat milk. Their median age was 21.5 months, range 4–126 months. Males outnumber female by a ratio of 1.92 : 1. 61% (23 of 38 children) of them had been breastfed for more than 12 months. Family history of allergy was positive in 26 children (68.4%).

Variable	Count	Percentage
Gender		
Male	23	60.53%
Female	15	39.47%
Age (months)		
Median	21.5	
Range	4-126	
Mean	38.7	101.79%
Std. Dev.	33.06	84.63%
Min.	4	10.26%
Max.	126	328.95%
Family history of allergy		
Positive	26	68.42%
Negative	12	31.58%

Table 1: Basic demographic characteristics of patients studied ($N = 38$).

The socioeconomic features of these patients are shown in Table 2. Most of them are members of educated, urban-living families of high income.

Variable	Count	Percentage
Education level of father		
Illiterate	0	0%
Primary	11	28.95%
Middle school	11	28.95%
High school	11	28.95%
University	6	15.79%
Postgraduate	1	2.63%
Total	39	100%
Residence		
Urban	38	100%
Rural	0	0%
Total	38	100%
Family income (Sudanese Pound)		
Low	1	2.63%
Medium	11	28.95%
High	26	68.42%
Total	38	100%

Table 2: Socioeconomic characteristics of 38 cow milk allergic children.

Table 3 shows the clinical presentation of their allergic disease and laboratory workup. The most common (29 children, 76.3%) allergic presentations were acute urticaria and anaphylactic reactions. Peripheral blood eosinophilia (absolute blood count ≥ 500 cells/ μ L) was noticed in 19 patients (50%) and an elevated total serum IgE in 33 patients (86.8%).

Abbreviations

CMA: Cow milk allergy
SPT: Skin prick test.

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