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Prevalence of Lactose Intolerance in Primary School Children in Qena Governorate, Egypt

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Abstract

Most people are born with the ability to digest lactose. Approximately 75% of the general population loses this ability, to some extent, going into adulthood (adult hypolactasia), while others retain such ability. The aim of the present study was to determine the prevalence of lactose intolerance, and its correlation with gastrointestinal symptoms, in primary school children aged 6-12 years in Qena Governorate, Egypt. A cross-sectional study was carried out on 300 school children with clinical suspicion of lactose intolerance. Biological and clinical data were obtained from children's parents or guardians. The history of diarrheal attacks especially following ingestion of milk or dairy products, as well as the incidence of diabetes in the children or family history of such diseases was also obtained. The children were instructed to maintain a low fiber diet without lactose for 48 hours prior to the day of examination. After 12 hours of fasting lactose tolerance test was carried out. The data obtained revealed that 74% of the participants in the study were intolerant to lactose. However, only 56.8% of lactose-intolerant children had positive clinical history of abdominal pain, abdominal distension or diarrheal attacks following ingestion of milk or dairy products. The prevalence of lactose intolerance in the studied cohort increased with age. Such genetically determined intolerance was 58% at 6-7 years of age and increased to 90% by the age of 11-12.

Keywords: Lactose Intolerance, Adult Hypolactasia, Qena Governorate, Cross-Sectional Study, Egypt

1. Introduction

Lactose is a disaccharide that is abundant in mammalian milk. It is hydrolyzed into glucose and galactose by the enzyme lactase, which is located in the brush border (microvilli) of the small intestine. In most infants, intestinal lactase activity is maximal during the perinatal period. However, after 2-12 years of age two distinct groups emerge: those with low lactase activity (hypolactasia) or a "lactase non-persistence" group, and a "lactase persistence" group of individuals who retain their neonatal level of lactase activity into adulthood (Mattar *et al*., 2012; Genauer *et al*., 2010; NDDIC, 2009).

Lactose intolerance is generally a lifelong inherited condition, but can be a temporary result of infection or some other insult to the jejuna mucosa. Lactose malabsorption occurs in three main types: primary, secondary and congenital. The most common form is primary adult hypolactasia. Secondary or acquired hypolactasia, can result from any gastrointestinal illness that damages the brush border or significantly increases transit time in the jejunum (Swagerty *et al.,* 2002). Lifelong complete absence of lactase [congenital hypolactasia] is rare. Recognition of these conditions is important, as its gastrointestinal symptoms are easily managed by simple dietary adjustments (Swagerty *et al*., 2002; Matter *et al*., 2012). Searching available literature did not reveal any previous studies regarding the prevalence of lactose intolerance in Upper Egypt. The Ethics Committee of Assiut University; approved the protocol of the present study and all experimental procedures were in accordance with the Helsinki Declaration of 1975, as revised in 1983. The present cross-sectional study was undertaken to determine the prevalence of lactose intolerance among primary school children in Qena governorate and the extent of cooperation of the community in such work. It was felt that determining the extent of this problem is important, as part of an overall study to categorize the different types of diarrheal diseases, which constitute serious morbid conditions in young school children in the less privileged communities.

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2. Subjects and Methods

A cohort of 300 children aged 6-12 years, including 153 males and 147 females in different primary schools in Qena governorate was recruited to participate in the study. Exclusion criteria included children with known chronic illnesses or family history of such diseases like diabetes, children with overnight fasting blood glucose level >126 mg/dl, those with any intestinal or allergic disorders or those with history of recent gastroenteritis to avoid causes of secondary hypolactasia.

The aim of the study was explained to the parents or guardians and written consents were obtained. Biological and clinical data were obtained through a written protocol including name, gender, age, weight, history of diarrheal attacks, especially following ingestion of milk or dairy products as well as chronic diseases or family history of such diseases, including diabetes mellitus.

Diagnosis of lactose intolerance depended mainly on family history and blood glucose level following ingestion of standard doses of lactose (Swagerty *et al*., 2002; Law *et al*., 2010). For performing the lactose tolerance test, the parents were instructed to maintain the children on a low fiber diet without lactose for 48 hours prior to examination. After 12 hours fasting, a baseline concentration of blood glucose was measured using portable glucometer (Medi Smart of Switzerland-Brilliant). Subjects then ingested an oral load of lactose of 2 g/kg body weight, with a maximum of 50 g, as 20% aqueous solution. Blood glucose level was measured again after 2 hours. The test was considered positive when intestinal symptoms occurred and the increase in blood glucose level was less than 20 mg/dl above the fasting level (Joneja, 2003; Law *et al*., 2010).

2.1. Statistical Analysis

The data were subjected to statistical analysis and tabulation using SPSS program Version 10. Means and standard deviations were used to describe numeric variables. The variables of categorical types were given as a number and percentages. Comparisons of continuous variables were performed using the Student-t test for independent samples.

Differences were considered significant when $p<0.05$. Comparisons for categorical variables were carried out using the $\chi 2$ test value calculated using the Epi Info 2000 Program. Results were presented to fulfil the objectives of the study.

3. Results

There was equal sex distribution in the studied cohort, where 51% were males and 49% were females. The measured body weights of the children were used to calculate the oral lactose load. Biological and clinical history data are presented in Table 1. The overall results showed that 222 children were lactose intolerant, representing 74% of the studied group. There were no statistically significant differences between the lactose tolerant and intolerant children with regard to age and gender. However, a positive correlation could be detected between lactose intolerance and history of gastrointestinal symptoms of abdominal pain and distension or diarrhea following ingestion of dairy products. The concentrations of fasting blood glucose and the two hours postprandial glucose level in the different age groups are presented in Table 2. It was found that the prevalence of lactose intolerance steadily increased with age from 58% in children aged 6-7 years up to 90% in the 11-12 year group (Figure 1).

The results also indicated that only 56.8% of lactose intolerant children had positive clinical history of gastrointestinal symptoms, following ingestion of milk or other dairy products, while such symptoms were negative in the remaining 43.2%. The prevalence of the positive symptoms in the children in different age groups is presented in Table 1.

Table 1. Body weight ranges and history of symptoms in the studied children.

Age Group (years)	Male/Female Ratio	Body Weight Range (Kg)	Positive History of G.I Symptoms
6-7	27/23	20-25	54%
7-8	23/27	20-35	30%
8-9	26/24	20-35	48%
9-10	26/24	20-50	56%
10-11	27/23	20-50	62%
11-12	24/26	31-over 50	56%
Overall Results	153/147	_____	74%

Table 2. Concentrations of fasting blood glucose and two-hours postprandial in Lactose intolerant and Lactose tolerant children.

Age Group (years)	Lactose Intolerant Children		Lactose Tolerant Children	
	Fasting Blood Glucose mg/dl	Two-hours postprandial mg/dl	Fasting Blood Glucose mg/dl	Two-hours postprandial mg/dl
6-7	93.3 ± 7.77	91.3 ± 8.33	92.9 ± 9.28	139.3 ± 18.73*
7-8	93.0 ± 7.96	90.7 ± 8.17	90.6 ± 9.27	137.1 ± 13.79*
8-9	93.6 ± 8.39	94.8 ± 7.55	88.7 ± 10.54	130.0 ± 10.76*
9-10	94.1 ± 7.50	93.1 ± 7.75	93.0 ± 9.21	133.9 ± 6.25*
10-11	92.6 ± 7.28	92.0 ± 7.66	83.75 ± 6.84	126.5 ± 8.88*
11-12	92.8 ± 8.14	94.6 ± 7.60	82.40 ± 4.92	123.8 ± 10.91*

Data presented as Mean ± Standard Deviation (Mean ± SD)
*Significantly different from the fasting blood glucose level

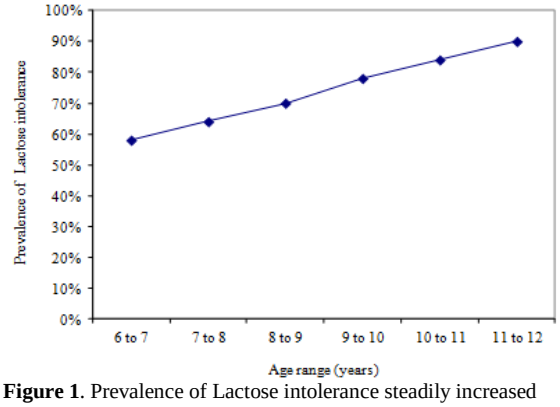

Figure 1. Prevalence of Lactose intolerance steadily increased with age

4. Discussion

Lactose intolerance, also called lactase deficiency or hypolactasia is the inability to digest lactose, a disaccharide found in milk and to a lesser extent in milk-derived dairy products. It is estimated that 75% of adults worldwide show some decrease in lactase activity during adulthood (Mattar *et al*., 2012, Morales *et al*., 2011, Swagerty *et al*., 2002). Such prevalence is very close to the overall result obtained in the present work, where 74% of the studied cohort was found to be lactose intolerant. The observation in the present study that the incidence of lactose intolerance increases with age is important since many published reports treated the studied population as a single unit and paid incomplete attention to age specific considerations (Tursi, 2004).

Lactose intolerance is a slowly progressive decline in available activity of the enzyme lactase. Such activity can be influenced by intestinal transit time and/or the additional foods concomitantly consumed with lactose (Morales *et al*., 2011; Hollox, 2005). In this respect, it should be recognized that lactose malabsorption is neither a homogeneous event nor an all-or-none phenomenon having its origins in a single etiology (Swallow, 2003). The appearance of GI symptoms depends on the amount of ingested milk and the degree of lactase deficiency. In case of partial lactase deficiency the GI symptoms appear only on ingestion of large amounts of milk or milk products (Heyman, 2006), this can be explained on the basis that the prevalence of GI symptoms depends on the amount of ingested milk and the degree of lactase deficiency, as they may have partial lactase deficiency so GI symptoms appear only on ingestion of large amounts of milk or dairy products statuses (Semenza *et al*., 2000; Troelsen, 2005; Heyman, 2006). Children should be investigated for other causes for the appearance of the GI symptoms, like for example milk allergy (Shaw & Davies, 1999; Labayen *et al*., 2001). The lack of correlation with gender probably indicates that if the clinical condition is genetically determined, it is not linked to the sex chromosomes. A genotyping study should be carried out to determine the variant that confers lactose tolerance in the studied population, which was beyond the scope of the present work.

5. Conclusion

The Prevalence of lactose intolerance in primary school children in Qena governorate is progressively increased with age. Not all lactose intolerant children have positive clinical history of abdominal pain and\ or abdominal distension and or diarrheal attacks following ingestion of milk or milk products as this related to many factors mainly, the amount of lactose ingested and the degree of activity of lactase enzyme. Symptoms usually disappear when you remove milk products or other lactose containing products from the diet.

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