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Determination of Lactose Intolerance and Effect of Supplementing Lactose Hydrolyzed Milk among Elderly Population of Urban Vadodara

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Abstract

Lactose intolerance is the inability to digest lactose which may lead to gastrointestinal symptoms. These symptoms hinder nutrient absorption and cause discomfort. The objective of the study was to determine lactose intolerance and determine the effect of lactose hydrolyzed milk supplementation to lactose intolerants among geriatric population. A semi-structured questionnaire was developed to assess gastrointestinal symptoms post-consumption of various foods. Hydrogen breath analyser test (HBT) was conducted to determine lactose intolerance and further divided into mild, moderate, and severe categories of lactose intolerance. Lactose intolerants are supplemented with lactose hydrolyzed milk (LHM) for 6 weeks. The highest gastrointestinal symptoms were observed in 37.4% of the subjects' post-milk and milk products consumption whereas cereal products exhibited the least (2.73%). HBT revealed that 55.5% of the subjects were lactose intolerant. A significant improvement ($P < 0.05$) in energy, protein, calcium, and fat intakes was observed post-supplementation by 3%, 3.30%, 43.62%, and 4.19%, respectively. There was an increase in normal category body weight by 6.7% post-LHM supplementation. No significant changes ($P < 0.05$) were observed in quality of life before and after intervention. Conclusion: Lactose-intolerance was 55.5% among the studied geriatric population. All the elderlies (100%) were able to tolerate LHM without experiencing any gastrointestinal disturbances for 45 days.

Keywords: Lactose intolerance, Hydrogen breath analyser test, Lactose hydrolyzed milk

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Introduction

Milk and milk products are nutritious and an excellent source of calcium and protein, with a range of essential micronutrients (especially calcium, magnesium, potassium, zinc, and phosphorus) in an easily absorbed form.[1-5] Lactose is a disaccharide present in milk and milk products. It consists of monosaccharide glucose and galactose. Hydrolysis of lactose is carried out by enzyme-Lactase–phlorizin hydrolase (commonly known as lactase. Lactose intolerance is an inability to digest lactose due to less or no lactose produced by the brush border of the small intestine.[6] Lactose intolerance is characterized by gastrointestinal symptoms such as vomiting, diarrhea, stomach pain, nausea, and headache. Such individuals are unable to drink milk and have other milk products diary milk and milk products.[7,8]

Lactose intolerance is of four types – primary lactose intolerance, secondary lactose intolerance, developmental lactose intolerance, and congenital lactose intolerance.[9] There are various methods for detecting lactose intolerance, namely, lactose tolerance test, breath analyser test, intestinal biopsy, and genetic analysis.[10,11] The objective of the study was to assess the presence of lactose intolerance among elderlies and the effect of lactose hydrolyzed milk (LHM) supplementation on their dietary intake, anthropometry, and quality of life.

Methodology

Using cross-sectional study design and purposive sampling technique, 219 elderlies (60 and above year) were enrolled and screened for the presence of gastrointestinal symptoms using semi-structured questionnaire. Hydrogen breath test (HBT) was conducted to determine the lactose intolerant elderlies ($n = 54$) and classified them into mild, moderate, and severe categories followed by supplementing them with 250 ml Lactose hydrolyzed milk (LHM) [procured from Amul® dairy] daily for a period of 6 weeks. Nutrient intake (24 h dietary recall), anthropometry (standard methods), and quality of life (semi-structured questionnaire) were determined before and after the intervention period. Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) software (version 25).

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Results and Discussion

Gastrointestinal Symptoms Post-consumption of Various Foods

Food intolerances are opposing reaction to foods, the immune system does as not play a role in this.[12] Symptoms of intolerance toward carbohydrates are caused mainly due to deficiency of enzymes or transporters or overloading of a transport system located on the brush border of the epithelium lining present in the small intestine. Fermentable oligosaccharides, disaccharides,

monosaccharides, and polyols (FODMAPs) are some of the short-chain carbohydrates that are poorly absorbed at the intestinal level.[13] Prevalence of food intolerance among FGID (functional gastrointestinal disorders) was 60% intolerance toward fructose whereas 51% intolerance was detected toward lactose and 33% subjects showed intolerance for both. Any undigested fructose will lead to gastrointestinal discomfort and show symptoms similar to lactose.[14] In this, gastrointestinal symptoms were observed in 28% of the subjects' post-milk and milk products consumption followed by vegetables (13%), pulses (7%), fermented foods (10%), fruits (9%), and cereal products (3%). Among milk and milk products, 65% of elderlies suffered from gastrointestinal symptoms due to milk followed by cheese (7%) [Table 1].

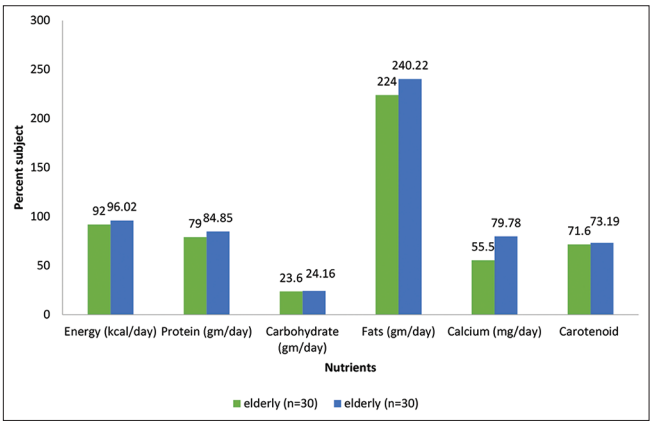

Figure 1: Impact of lactose hydrolyzed milk supplementation on dietary intake

Table 1: Gastrointestinal symptoms experienced by elderlies after milk and milk products consumption (*n*=82)

Milk and milk products	*n (%)*
Milk	53 (64.6)
Lassi	2 (2.43)
Kadhi	4 (4.87)
Milk powder	0 (0)
Chaach	3 (3.65)
Milk sweets	2 (2.43)
Milk chocolates	0 (0)
Ice cream	1 (1.21)
Cheese	7 (8.53)
Fruit custard	6 (7.31)
Yogurt	4 (4.87)
Condensed milk	0 (0)

Detection of Lactose Intolerance

HBT is the most used method because it is non-invasive, inexpensive, and highly sensitive and specific, as well as easy to perform.[6,15] The principles of breath test are based on the concept that part of the gas produced by colonic bacteria fermentation diffuses into the blood, is rapidly excreted by breath, and can be consequently measured and quantified by dedicated instruments.[16-19] Solomons *et al*. 1980 mentioned in their study that 50 g of lactose was used for the breath test but that lead to diarrhea and flatulence among patients during the test. Therefore, another study was conducted by[20] in which the amount of lactose used was modified for conducting lactose hydrogen breath test. Patients positive with 50 g lactose were repeated with 25 and 12.5 g lactose in 1-week interval. About 91.4% patients were detected of LI with 25 g lactose and 42.8% with 12.5 g lactose. Symptoms of diarrhea (63%) and flatulence (97%) decreased to 22.8 and 34.2%, respectively with 25 g lactose. Therefore, 25 g of oral lactose dose was used for detecting the occurrence of lactose intolerance in our study. Post-conducting HBT, it was revealed that 55.5% of the subjects were lactose intolerant and divided into three categories – mild, moderate, and severe [Table 2].

Impact after Lactose Hydrolyzed Milk Supplementation

Milk is beneficial for overall nutritional intake among elderly. Wall *et al*. 2014 concluded that proteins such as whey protein that are rapidly digested and absorbed lead to greater muscle protein synthesis than proteins that are more slowly digested such as casein and those in soya. Thereby emphasizing the importance of dairy protein for elderly. In this study, mean energy intake at baseline was 1788.85 ± 272.40 whereas post-intervention, it was 1847.93 ± 273.3 with a % diff of 3.30. Calcium intake at baseline was 333.35 ± 118.05 whereas post-supplementation, it was 478.77 ± 117.19 [Table 3]. Significant improvement ($P < 0.05$) in energy, protein, calcium, and fat intakes was observed post-supplementation by 3%, 3.30%, 43.62%, and 4.19%, respectively [Figure 1].

Post-LHM supplementation, there was an increase in normal category body weight by 6.7%. Obesity and overweight remained the same whereas post-LHM supplementation underweight

Table 2: Presence of lactose intolerance and its severity among subjects

Presence of lactose intolerance (n=54)		*Categories of lactose intolerant subject (n=30)*	
Lactose intolerant	30 (55.5%)	Mild malabsorption (>20 ppm)	26 (86.6%)
Non-lactose intolerant	24 (44.4%)	Moderate malabsorption (>60 ppm)	4 (3.3%)
		Severe malabsorption (>80 ppm)	0 (0%)

Table 3: Effect of lactose hydrolyzed milk supplementation on dietary intake (n=30)

Nutrients	*Pre-supplementation*	*Post-supplementation*	*Paired t test*	*% Difference*
Energy	1788.85±272.40	1847.93±273.3	83.7***	3.30
Protein	45.06±6.19	48.01±5.16	5.3***	6.54
Carbohydrate	225.69±75.84	235.16±77.99	2.21*	4.19
Fat	48.35±8.41	51.90±8.22	42.63***	7.34
Calcium	333.35±118.05	478.77±117.19	244.25***	43.62
Carotenoid	3437.8±584.78	3583.08±584.62	1025.19***	4.22

***Significant at 0.001, **Significant at 0.01, NS: Non-significant

Table 4: Effect of lactose hydrolyzed milk supplementation on anthropometry (BM)

Categories	*Pre-supplementation %*	*Post-supplementation %*
Underweight	14	7
Normal	33	40
Overweight	33	33
Obese	20	20

decreased by 6% [Table 4].

The health-related quality of life (HRQOL) is a patient-focused concept, referring to an impairment of functional status (physical or mental) and the sense of well-being. The health-related quality of life was significantly impaired in subjects with GERD, un investigated dyspepsia and IBS in this community.[21] In this study however, no significant changes ($P < 0.05$) were observed in quality of life post-intervention.

Conclusion

A study conducted in Indonesia revealed the prevalence of lactose intolerance among elderlies amounted to 66% (57–75%), 54% (37–70%), and 73% (61–84%) in the total population, dairy and non-dairy users, respectively.[22] In the present study, 37.4% of subjects suffered from gastrointestinal symptoms post-milk and milk products intake. The presence of lactose intolerance among elderly is 13.7% of the total population studied. In this study, lactose intolerance was determined using hydrogen breath analyser test. For further research, methane and hydrogen breath analyser can also be used along with genetic analysis and intestinal biopsy.

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