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Hidden Burden of Lactose Intolerance in Urban Gujarat: A Cross-Sectional Community Survey

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ABSTRACT

Background: Lactose intolerance (LI) is a widespread but underdiagnosed condition in India, particularly in regions with high dairy consumption such as Gujarat. Limited community-level data are available regarding its prevalence, symptom characteristics, and awareness in healthy adults. **Methods:** A cross-sectional observational study was conducted over three months among healthy adults aged 18 years and above in Vadodara, Gujarat. An electronic questionnaire assessed demographics, dairy consumption habits, gastrointestinal symptoms after dairy intake, awareness, family history, and use of lactose-free or plant-based milk alternatives. Responses from 1,091 eligible participants were analyzed using descriptive statistics and chi-square tests. **Results:** Regular dairy consumption was reported by 83.1% of participants, with daily intake predominant (56.0%). Discomfort after dairy was reported by 22.1%, most commonly as bloating (10.0%), gas (7.6%), stomach pain (6.8%), nausea (5.2%), and diarrhoea (4.9%). The majority (65.5%) experienced no symptoms. Onset of symptoms was most frequently within several hours after dairy intake. Awareness of LI was reported by 64.5% of respondents; however, only 8.6% documented a family history, and 15.5% believed LI is inherited. Plant-based alternatives were considered by just 18.1%. All frequency parameters and symptom associations were statistically significant ($p < 0.001$). **Conclusion:** Lactose intolerance symptoms affect a substantial minority of adults in Vadodara despite high levels of regular dairy consumption. Awareness is moderate but gaps exist in knowledge about genetic inheritance and family recognition. Few individuals adopt lactose-free or plant-based alternatives. Improved public health education, diagnostic access, and dietary options are warranted to address the under recognized burden of LI in western India.

Key Words: Lactose intolerance symptoms, Community, Survey, Gujarat.

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Introduction

Lactose intolerance is a common gastrointestinal condition resulting from deficient lactase enzyme activity. Despite its variable prevalence globally, India shows marked regional variation, with Gujarat noted for intense dairy consumption. Limited data exist on its prevalence among healthy adults in urban Gujarat. Understanding community-level burden is essential for nutrition planning and public health interventions. This study therefore aimed to assess the prevalence of lactose intolerance symptoms, awareness, diagnosis, and management strategies among adults in Vadodara, Gujarat, using an electronic questionnaire.

Methods

A cross-sectional observational study was conducted over 3 months among healthy adults aged 18 years and above residing in Vadodara, Gujarat. Data were collected from 1,091 eligible participants through an electronic questionnaire distributed online. Participants self-reported demographic information, dairy consumption habits, gastrointestinal symptoms following dairy intake, awareness, family history, and use of lactose-free or plant-based alternatives. The survey was designed to differentiate probable lactose intolerance symptoms from other causes of gastrointestinal discomfort.

Individuals with chronic gastrointestinal disease, pregnant or lactating women, those below 18 years, and unwilling participants were excluded. No laboratory diagnostic tests such as hydrogen breath or lactose tolerance tests were performed due to the non-invasive, population-level nature of the survey.

Ethical approval was obtained from the Institutional Ethics Committee of Sumandeep Vidyapeeth. Informed electronic consent was obtained from all participants. Data were exported from the Google Forms questionnaire to Microsoft Excel for cleaning and statistical analysis. Descriptive statistics and chi-square tests were performed to assess relationships between categorical variables. Confidentiality of participants was maintained by excluding personal identifiers.

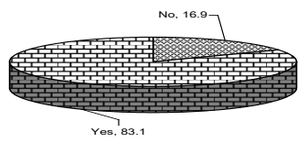
Results

Among the 1,091 surveyed adults in Vadodara, Gujarat, 907 participants (83.1%) reported regular dairy consumption, while 184 (16.9%) indicated that they do not consume dairy products regularly. This result demonstrates that dairy is a dietary staple for the overwhelming majority of individuals in this population. This result is strongly statistically significant ($p<0.001$) and not due to random variation.

Table- 1: Frequency of Dairy Consumption

Frequency	No.	%
Never	81	7.4
Rarely	82	7.5
Few times a week	317	29.1
Daily	611	56.0

Figure-1: Regular Dairy Consumption (N=1091)

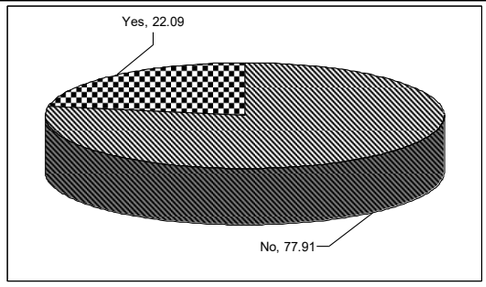


Daily dairy consumption was reported by the majority of participants (611, 56.0%), followed by a few times a week 317 (29.1%), rarely 82 (7.5%), and never 81 (7.4%). Chi-square analysis showed a highly significant deviation from uniform distribution ($\chi^2=694.87$, $p<0.0001$), indicating that daily intake predominates in this population.

Table- 2: Symptoms experienced after dairy consumption

Symptoms	No.	%
Bloating	130	10.0
Diarrhoea	64	4.9
Stomach Pain	88	6.8
Gas	98	7.6
Nausea	68	5.2
Not applicable	850	65.5

Figure-2: Discomfort after consuming dairy (N=1091).



Most participants (65.5%) did not report any symptoms after consuming dairy. Among those who experienced discomfort, bloating was the most frequent symptom (10.0%), followed by gas (7.6%), stomach pain (6.8%), nausea (5.2%), and

diarrhoea (4.9%). Chi-square analysis demonstrated a highly significant deviation from uniform distribution ($p<0.001$), indicating that these differences are unlikely to have occurred by chance and reflect a genuine pattern of symptom occurrence in this population (Table-2).

Most participants did not report discomfort after consuming dairy, whereas approximately one-fifth experienced symptoms. Chi-square analysis showed a highly significant deviation from equal distribution ($p<0.001$), indicating that while lactose intolerance affects a notable minority, the majority of the population tolerates dairy without apparent problems (Fig.-2).

Table- 3: Onset of Symptoms After Dairy (N=1091)

Onset Category	No.	%
Within 30 min	56	5.1
Within few hours (64)	64	5.9
Within few hours (121)	121	11.1
No symptoms	850	77.9

The majority of participants 850 (77.9%) reported no symptoms after dairy consumption. Among those who experienced discomfort, onset was most commonly within several hours 121 (11.1%), followed by within a few hours 64 (5.9%) and within 30 minutes 56 (5.1%). Chi-square analysis demonstrated a highly significant deviation from uniform distribution ($p <0.001$), confirming that the observed pattern of symptom onset reflects a true distribution in the study population (Table-3).

Awareness of lactose intolerance was reported by 704 participants (64.5%), while 387 (35.5%) indicated no awareness. Chi-square analysis demonstrated a highly significant deviation from equal distribution ($p<0.001$), indicating that awareness was substantially higher than expected by chance and reflects moderate to high general awareness in the population (Table-4).

Table-4: Awareness of Lactose Intolerance (N=1091)

Awareness	No.	%
Yes	704	64.5
No	387	35.5

Only a small proportion of participants 94 (8.6%) reported a family history of lactose intolerance, while 487 (44.6%) reported no such history and 510 (46.7%) were unsure. Chi-square analysis demonstrated a highly significant deviation from equal distribution ($\chi^2 = 300.67$, $p<0.001$), suggesting that lactose intolerance is infrequently recognized or reported within families in this population (Table-5).

Table-5: Family Members with of Lactose Intolerance (N=1091)

Family member lactose intolerance	No.	%
Yes	94	8.6
No	487	44.6
Not Sure	510	46.7

Over half of the participants 618 (56.6%) were unsure whether lactose intolerance is inherited, while 304 (27.9%) responded “No” and only 169 (15.5%) reported “Yes.” Chi-square analysis revealed a highly significant deviation from equal distribution ($\chi^2=291.86$, $p<0.001$), indicating considerable uncertainty and limited knowledge in the population regarding the genetic inheritance of lactose intolerance (Table-6).

Table-6: Belief Lactose Intolerance is inherited (N=1091)

Belief Inheritance	No.	%
Yes	169	15.5
No	304	27.9
Not Sure	618	56.6

Only a small proportion of participants 198 (18.1%) reported considering plant-based milk alternatives, whereas the vast majority 893 (81.9%) had not. Chi-square analysis showed a highly significant deviation from equal distribution ($\chi^2=442.74$, $p<0.001$), indicating that consideration of plant-based milk is uncommon and not randomly distributed in this population (Table-7).

Table-7: Considered Plant- Based Milk Alternatives (N=1091)

	No.	%
Yes	198	18.1
No	893	81.9

Discussion

This cross-sectional study among 1,091 healthy adults in Vadodara provides important insights into the prevalence, awareness, and management of lactose intolerance (LI) in a dairy-consuming community of western India.

The demographic profile of our study sample was predominantly young, with nearly two-thirds (61.9%) of participants aged 18–30 years. This age distribution likely reflects the greater accessibility and familiarity of younger adults with online survey tools, which may have contributed to their overrepresentation. Nevertheless, it provides valuable insights into dietary habits and symptom reporting among a younger demographic that consumes dairy regularly. The almost equal representation of males and females (50.0% each) strengthens the study by minimizing gender bias and allowing valid comparisons across sexes in terms of dietary practices and lactose intolerance prevalence. This study reveals that lactose intolerance symptoms are prevalent in the adult population of Vadodara, Gujarat, with 22.1% of respondents reporting discomfort following dairy consumption (Figure-2). This rate is consistent with previous epidemiological evidence from India showing regional variations in lactose intolerance prevalence, where Southern Indian populations exhibit higher rates compared to Northern populations[1].

Specifically, Tandon et al.[2] reported lactose malabsorption in 66.6% of South Indians and 27.4% in North Indians, aligning closely with the symptom prevalence observed here. Moreover, similar breath test-based studies in other Indian cohorts have identified comparable lactose intolerance prevalence, supporting the representative ness of these findings.

The symptom profile dominated by bloating, gas, abdominal pain, diarrhoea, and nausea (Table-2) matches classical presentations documented globally and in Indian clinical literature, reaffirming the validity of self-reported symptom data[3]. The onset of symptoms occurring within hours (Table-3) post-dairy consumption further corroborates typical lactose intolerance physiology. Awareness of lactose intolerance among respondents was relatively high at 64.5% (Table-4), suggesting progress in public recognition compared to older community surveys[4]. However, uncertainty about the hereditary nature of lactose intolerance remains prevalent, with over half of participants unsure whether it is inherited (Table-6). This finding reflects broader genetic complexity in the Indian subcontinent, where lactase persistence alleles show variable distribution and strong ancestral influences, particularly reflecting Indo-European pastoral origins versus Dravidian cultural adaptations. The limited family history recognition among participants further underscores these genetics education gaps[5].

The underutilization of plant-based milk alternatives considered by just 18.1% (Table-7) of respondents-reveals emerging opportunities for dietary management. While plant-based options have expanded in urban Indian markets due to increasing health and sustainability concerns, cultural attachment to traditional dairy and accessibility barriers may currently limit adoption [6,7].

The chi-square analyses demonstrating significant associations between dairy consumption frequency and symptom reporting, as well as between awareness and symptom prevalence, provide robust statistical validation of these relationships. Conversely, the absence of gender differences aligns with other population studies, suggesting symptom experience is uniformly distributed across sexes.

Collectively, these findings emphasize the need for enhanced healthcare strategies focused on increasing diagnostic accessibility including breath testing and genetic profiling, improving public education regarding lactose intolerance inheritance and manifestations, and promoting culturally acceptable dietary adaptations including lactose-free and plant-based dairy alternatives. Such measures may mitigate symptom burden, prevent unnecessary dietary restrictions, and optimize nutritional health in Indian communities[8,9]. The study has strengths, including a large community-based sample and robust statistical analyses. However, limitations include reliance on self-reported symptoms without confirmatory diagnostic tests such as hydrogen breath testing, which may underestimate or overestimate true prevalence. Additionally, younger adults were overrepresented, which may limit generalizability to older populations.

Overall, this study adds to limited evidence from western India, highlighting that while dairy intolerance symptoms exist in a minority of adults, awareness remains moderate and management is inadequate. Public health programs should prioritize education, accessible testing, and affordable dietary alternatives to reduce the hidden burden of LI.

Conclusion

This study demonstrates that, within a predominantly dairy-consuming urban Indian population, lactose intolerance symptoms affect a noteworthy minority of adults while the majority continues to tolerate dairy in their diets. Although general awareness of lactose intolerance is moderate to high, gaps remain in both diagnostic rates and adoption of structured management strategies, such as lactose-free products or plant-based milk alternatives. There is significant uncertainty about the genetic inheritance of lactose intolerance and limited family history recognition among respondents. The findings underscore the urgent need for improved public health initiatives, including accessible diagnostic tools, widespread education about lactose intolerance and its hereditary nature, and enhanced availability of culturally appropriate dietary alternatives. Such measures can reduce the hidden burden of lactose intolerance, bridge the gap between awareness and effective management, and ultimately improve nutritional well-being in Indian communities.

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