

## Prevalence of lactose intolerance among natives and expats in Kuwait

Ahmad Alfadhli<sup>1</sup>, Mohamed Alborai<sup>2</sup>, Altaf Al-Qadeeri<sup>3</sup>, Mohamed Elfar<sup>1</sup>, Abhijit Dangi<sup>1</sup>, Mostafa Afifi<sup>4</sup>, Mohamed Nour<sup>5</sup>, Reem Ezzat<sup>6</sup>, Motaz Saad<sup>7</sup>

### Affiliations:

- 1- Haya Al-Habeeb gastroenterology center, Mubarak Al-Kabeer hospital, Kuwait.
- 2- Department of Internal Medicine, Al-Azhar University, Cairo, Egypt.
- 3- Department of Medicine, Mubarak Al-Kabeer hospital, Kuwait.
- 4- Department of Gastroenterology, Lancashire Teaching Hospitals NHS Trust, Chorley, UK
- 5- Faculty of Public Health & Health Informatics, Umm Al Qura University, Makkah, Saudi Arabia.
- 6- Internal Medicine Department, Faculty of Medicine, Assiut University, Assiut 71515, Egypt.
- 7- International Medical Center, Cairo, Egypt

### Correspondence

Reem Ezzat Mahdy  
Internal Medicine Department,  
Faculty of Medicine,  
Assiut University,  
Assiut 71515, Egypt  
Email: [reemezzat1@gmail.com](mailto:reemezzat1@gmail.com).

### Abstract

Prevalence of lactose intolerance is not clear due to diversity and methodological limitations in the published literature [1]. Studies from the Middle East region, especially Kuwait, are limited. Lactase activity assay in small bowel biopsy is considered the gold standard for diagnosing lactose malabsorption. However, it is not commonly used as it is invasive with availability of non-invasive tests [2].

### Aims & Methods:

We aimed at comparing the prevalence of lactose intolerance among Kuwaitis and non-Kuwaiti expats resident in Kuwait. One hundred and seventeen consecutive patients were recruited from our outpatient clinics (52 Kuwaitis and 65 non-Kuwaitis). Patients were enrolled if they have symptoms of lactose intolerance (diarrhea, abdominal pain, bloating after milk products ingestion). Patients were subjected to upper gastrointestinal endoscopy and two post bulbar duodenal biopsies were tested using the Quick Lactase Test assays (Biohit Oyj, Helsinki, Finland) [5].

### Results:

Our study included 117 patients (44.4% Kuwaitis and 55.6% non-Kuwaiti) with mean age ( $\pm$ SD) 42.1 ( $\pm$ 13.5) years including 70 females (59.8%). diarrhea was present in (14.5 %), abdominal pain in (65.8 %), abdominal bloating in (53.8 %) and flatulence in (36.8 %) of the studied groups. There were no significant differences between Kuwaitis and non-Kuwaitis in regard to symptoms of lactose intolerance or demographic data. Lactose intolerance was positive in 96 patients (82.1%), of which severe lactose intolerance was reported in 65 cases (67.7 %) while mild lactose intolerance was reported in 31 cases (32.3%). All patients express symptoms of lactose intolerance; however only flatulence was significantly increased in patients having severe lactose intolerance.

### Conclusion:

Lactose intolerance is highly prevalent among Kuwaitis and non-Kuwaiti patients having symptoms suggestive of lactose intolerance. Flatulence was the most significant symptoms associated with lactose intolerance in Kuwait.

### Keywords:

Lactose intolerance; Seroprevalence; Diarrhoea, Abdominal pain; Flatulence

## INTRODUCTION

Lactose is a disaccharide that accounts for most of the dairy products. Its digestion and absorption depends on the presence of lactase in the small intestinal brush border. Once lactose is ingested, lactose is hydrolyzed by the small intestinal lactase to monosaccharides (glucose and galactose) on the microvillus membrane of intestinal adsorptive cell. (1) Undigested lactose undergoes bacterial fermentation in the colon which results in the production of carbon dioxide, hydrogen, methane, and short chain fatty acids: propionic, butyric acids causing the symptoms of lactose intolerance, such as abdominal pain, bloating, cramps, flatulence, watery diarrhea, nausea and vomiting (2,3).

Lactose intolerance due to lactase deficiency could be congenital, primary or secondary (4). Congenital lactase deficiency is a rare autosomal recessive disorder characterized by the absence of lactase activity with symptoms resultant after birth. Primary lactase deficiency which is also called adult-type-hypolactasia (ATH); as 5%-10% of lactase activity decreases towards adulthood, ATH is genetically regulated reduction in lactase enzyme activity which appears in adulthood due to the absence of a lactase persistent allele (4,5). Secondary causes include; small intestinal bacterial overgrowth, which results in a symptoms of lactose intolerance by increasing the fermentation of dietary lactose in small intestine, or small bowel injury causing villi atrophy due to another pathology as gastroenteritis, inflammatory bowel disease (Crohn's disease), chemotherapy or various infection ( 6,7). The incidence and severity of symptoms is related to the amount of lactose being ingested and the diet in which lactose was taken with. Diet high in fat content and high osmolality slow gastric emptying therefore, reduces the severity of symptoms, in contrast, rapid lactose transit to the colon may cause much more severe symptoms (8). The diagnosis of lactose intolerance includes non-invasive and invasive tests. One of the non-invasive tests is lactose tolerance test that measures the glucose levels which result from degradation of lactose in several blood samples monitored at 0, 60 minutes and then 120 minutes after lactose intake, a less than 20 mg/dL (1.1 mmol/L) increase in blood glucose level with the presence of symptoms is considered diagnostic ( 9). On the other hand, lactose breath test (LBT) is another non-invasive test that measure the hydrogen in the expired air, in three hours' duration with at least 30 minutes samples interval, The test is considered positive if the hydrogen value in the expired air increases of 20 parts per million (ppm) above the baseline (10). Lactase activity assay in small bowel biopsy is considered the gold standard for diagnosing lactose malabsorption (11), however is not commonly used as it is invasive and needs small

bowel sampling by endoscopy. Availability of non-invasive tests makes it less popular although it can help in differentiating primary from secondary causes of lactose intolerance. Other less commonly used tests include genetic assays for primary lactose intolerance; this test is limited by the high cost and lack of applicability for all patients. Although the global prevalence of lactose intolerance is high globally; data from the Middle East are scarce. In this study; we aimed at comparing the prevalence of lactose intolerance among Kuwaitis and non-Kuwaiti expats resident in Kuwait.

## Patients and methods:

### Patients:

This is a cross sectional study that included 117 patients who complained of symptoms related to lactose ingestion. The patients were divided into 52 Kuwaitis and 65 non-Kuwaitis patients.

All patients fulfilled a questionnaire including symptoms of bloating, abdominal pains, diarrhea and flatulence that are related to lactose ingestion.

Upper endoscopy was done for all the patients using ..... system under conscious sedation with propofol. 2 bulb duodenal biopsies were taken from the examined patients.

### Quick lactose test assay:

The duodenum biopsies were deposited on the plate provided by the kit. Two drops of the substrate solution (lactose with acetate buffer and thimerosal as preservative) were added and left for 15 minutes. Subsequently, one drop of chromogen solution and two drops of reaction solution (enzyme solution and thimerosal as preservative) were added. After 5 minutes a color change was observed, and compared to the reference given by the manufacturer. If the color changed (lactose hydrolysis happened), it was concluded as "normolactasia." If color change was weak or absent, it was concluded as "hypolactasia" ("mild" or "severe" respectively)

Exclusion criteria: subjects with previous GI surgeries, conditions that affect gut transit or chronic GI diseases were excluded.

Written consents were taken from the patients according to Heliniski declaration before enrollment in the study.

### Statistical analysis:

We used the SPSS version.... for the data enrolled. Descriptive statistics: Means, standard deviations, medians, ranges and percentages were calculated. Test of significances: chi-square test was used to compare the difference in distribution of frequencies among different groups. P value was considered of statistical significance of  $\leq 0.05$ .

### Results:

117 patients with symptoms suggesting lactose intolerance were included in this study, divided into 52 kuwaitis and 65 non-kuwaitis. The mean age was 42.1+/- 13.5, with 47 males and 70 females. 17 patients complained of diarrhea, 77 experienced abdominal pain, 63 had abdominal bloating and flatulence was recorded in 43 patients. 96 patients were positive for Quick lactose test assay with 65 mild and 31 with severe activity(table1)

**Table (1)** Demography, clinical features and results of the studied sample.

Variables		No.= 117 (%)
Nationality	Kuwaitis	52 (44.4)
	Non-Kuwaitis	65 (55.6)
Age Mean + SD Min - Max	42.1 + 13.5 16 - 76	
Gender	Male	47 (40.2)
	Female	70 (59.8)
Diarrhea	No	100 (85.5)
	Yes	17 (14.5)
Abdominal pain	No	40 (34.2)
	Yes	77 (65.8)
Abdominal bloating	No	54 (46.2)
	Yes	63 (53.8)
Flatulence	No	74 (63.2)
	Yes	43 (36.8)
Results	Positive	96 (82.1)
	Negative	21 (17.9)
Positive degree	Mild	65/96 (67.7)
	Severe	31/96 (32.3)

Although abdominal pain was the most recoded symptom by the patients to be mentioned in 67 of positive patients, yet the p value showed no statistical significance when calculated in presented symptoms in both positive and negative cases. The same was for the nationality and gender that didn't show statistical significance. 53 complained of abdominal bloating, 38 with flatulence and 18 patients out of the positive 96 ones recorded diarrhea. The same symptoms were present in negative patients with diarrhea mentioned in 1 patients, abdominal pain and bloating in 10 patients each and flatulence in 5 patients of the studied negative group. (Table 2)

**Table (2)** Relation between results and demographic & clinical features of the studied sample.

Variables		Results		P-value 1
		Positive (No.=96) No. (%)	Negative (No.=21) No. (%)	
Nationality	Kuwaitis	40 (41.7)	12 (57.1)	0.230
	Non-Kuwaitis	56 (58.3)	9 (42.9)	
Age (Mean + SD)		41.6 + 13.8	44.4 + 11.9	0.401 2
Gender	Male	39 (40.6)	8 (38.1)	1.000
	Female	57 (59.4)	13 (61.9)	
Diarrhea	No	80 (83.3)	20 (95.2)	0.302
	Yes	16 (16.7)	1 (4.8)	
Abdominal pain	No	29 (30.2)	11 (52.4)	0.074
	Yes	67 (69.8)	10 (47.6)	
Abdominal bloating	No	43 (44.8)	11 (52.4)	0.631
	Yes	53 (55.2)	10 (47.6)	
Flatulence	No	58 (60.4)	16 (76.2)	0.217
	Yes	38 (39.6)	5 (23.8)	

1 Fisher's Exact test.

2 Independent Samples t-test.

Diarrhea was recorded in 8 cases of both arms of mild and severe. Abdominal pain was reported in 44 of mild cases and 23 of severe cases. Flatulence was said to happen in 21 of mild cases and 17 of severe ones. Abdominal bloating was mentioned in 36 and 17 of mild and severe cases respectively. When we examined the symptoms, the nationality and gender according to the severity of the disease, only flatulence showed significant p value of 0.04. The other examined terms were of no statistical significant value.

**Table (3)** Relation between severity of disease and demographic & clinical features of the studied sample

Variables		Severity of disease		P-value 1
		Mild (No.=65) No. (%)	Severe (No.=31) No. (%)	
Nationality	Kuwaitis	31 (47.7)	9 (29.9)	0.121
	Non-Kuwaitis	34 (52.3)	22 (71.0)	
Age (Mean + SD)		42.6 + 14.6	39.5 + 12.0	0.309 2
Gender	Male	24 (36.9)	15 (48.4)	0.374
	Female	41 (63.1)	16 (51.6)	
Diarrhea	No	57 (87.7)	23 (74.2)	0.142
	Yes	8 (12.3)	8 (25.8)	
Abdominal pain	No	21 (32.3)	8 (25.8)	0.637
	Yes	44 (67.7)	23 (74.2)	
Abdominal bloating	No	29 (44.6)	14 (45.2)	1.000
	Yes	36 (55.4)	17 (54.8)	
Flatulence	No	44 (67.7)	14 (45.2)	0.045
	Yes	21 (32.3)	17 (54.8)	

1 Fisher's Exact test.

2 Independent Samples t-test.

The relation between results and nationality and gender didn't show significant p value where it was 1 in Kuwaitis and 0.7 in non-Kuwaitis. (table 4)

**Table (4)** Relation between results and nationality & gender of the studied sample.

		Results		P-value 1
		Positive (No.=96) No. (%)	Negative (No.=21) No. (%)	
Kuwaitis	Male	12 (23.1)	3 (5.8)	1.000
	Female	28 (53.8)	9 (17.3)	
Non-Kuwaitis	Male	27 (41.5)	5 (7.7)	0.733
	Female	29 (44.6)	4 (6.2)	

1 Fisher's Exact test.

The severity of the disease was mild in 31 Kuwaitis and 34 non-Kuwaitis which presents near numerical values with no nationality predominance. (table 5)

**Table (5)** Distribution of positive results regarding nationality and severity of disease among the studied sample.

		Positive results (No.=96) No. (%)
Kuwaitis	Mild	31 (77.5)
	Severe	9 (22.5)
Non-Kuwaitis	Mild	34 (60.7)
	Severe	22 (39.3)

The symptoms examined were of no statistical significance when examined in relation to the nationality despite the numerical difference in some symptoms as abdominal pain which was recorded in 45 non-kuwaitis patients but only in 32 of Kuwaitis ones. This was the same for abdominal bloating which was perceived in 37 of non-Kuwaitis and in 27 of Kuwaitis. Flatulence had a p value of 0.05 in this relation being found in 29 of no Kuwaitis and 14 of Kuwaitis studied patients. (table 6)

**Table (6)** Relation between nationality & clinical features of the studied sample.

Variables		Nationality		P-value 1
		Kuwaitis (No.=52) No. (%)	Non-Kuwaitis (No.=65) No. (%)	
Diarrhea	No	45 (86.5)	55 (84.6)	0.799
	Yes	7 (13.5)	10 (15.4)	
Abdominal pain	No	20 (38.5)	20 (30.8)	0.435
	Yes	32 (61.5)	45 (69.2)	
Abdominal bloating	No	26 (50.0)	28 (43.1)	0.463
	Yes	26 (50.0)	37 (56.9)	
Flatulence	No	38 (73.1)	36 (55.4)	0.056
	Yes	14 (26.9)	29 (44.6)	

1 Fisher's Exact test.

## Discussion:

Three terms are involved and misinterpreted in the lactose metabolism pathogenesis. Lactase deficiency (LD) is the first term which means the failure to express lactase at the brush border of the small intestine. The second term is lactose malabsorption (LM) which indicates the inability to digest/absorb lactose. The third one is lactose intolerance (LI) which denotes relation between symptoms as bloating, diarrhea and abdominal pains after lactose ingestion. (12) Prevalence of lactose intolerance was studied in the work in Kuwaitis and non-Kuwaitis patients included. Patients presented by symptoms suggesting lactose intolerance were included in the study. 56% of the proven patients for lactose intolerance were non-Kuwaitis. This was of no statistical significance between the 2 groups even when the severity of the condition or the gender was added. This was consistent with the study carried out

by Asmawi M and his colleagues where they postulated that no statistical differences are found between races (13). There was numerical gender difference as it was detected mainly in females but neither gender nor age showed statistical difference in studied groups. This was not the same finding as the study carried out by Louay Labban and Rawaa Al Tajjar (14) where the age from 19-40 had the highest prevalence but still with no statistical difference but the gender showed statistical significance where it was more prevalent in males.

Of the studied symptoms, abdominal pain was recorded in 77 patients to be followed by abdominal bloating, flatulence and diarrhea in frequency of recording. This was not in concordance with the study done by Louay Labban and Rawaa Al Tajjar where diarrhea was the main prevailing symptom to be recorded in 54% of patients (14). This was the same case for other published studies (15-18).

When we studied the relation between the symptoms of the patients and the nationality, no statistical significance was recorded. When we studied the symptoms in relation to the severity of the condition, only flatulence showed statistical significance with p value 0.04.

Kuokkanen et al reached a postulation that Quick Lactase Test has a good distinguishing accuracy between normolactasia and severe hypolactasia. (19). In another study carried out by Rojo et al, they found a high diagnostic concordance between the genetic test and the breath test with lactose, and lower concordance with LQT. However, in none of the patients with normolactasia by LQT, the breath test was abnormal. This means that if you do Quick lactose test, you don't have to confirm it by the breath test. (20) So, we used this test in our study to categorize our patients into mild and severe hypolactasia. Most of the patients were of mild stage according to the biopsy result were 65 out of the diagnosed 96 were in this stage.

## Conclusion

Lactose intolerance is highly prevalent among Kuwaitis and non-Kuwaiti patients having symptoms suggestive of lactose intolerance. Flatulence was the most significant symptoms associated with lactose intolerance in Kuwait.

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