Introduction

Lactose intolerance is a disorder featured by experiencing digestive symptoms including bloating, diarrhoea, and gas after consuming lactose-rich foods. This condition is often characterized by abdominal pain, bloating, and flatulence. The primary cause of lactose intolerance is the deficiency of the enzyme lactase, which is necessary for the breakdown of lactose, a sugar found in dairy products.

Awareness of Lactose Intolerance Disorder in Saudi Arabia Population

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Abstract

Background: Lactose intolerance is defined as “Lactose malabsorption with gastrointestinal symptoms.” Also, lactose malabsorption can be defined as “Not all ingested lactose was absorbed and that some has reached the large intestine.” The common symptoms associated with the maldigestion of lactose are bloating, diarrhoea, nausea, and abdominal pain.

Aim: The current study aims to assess knowledge of people awareness of the lactose intolerance disorder and its relation to nutrition and dietary habits in Saudi Arabia.

Methods: A descriptive cross-sectional approach was used targeting all accessible population in Saudi Arabia aging 18 years or more and accept to participate in the study. Data were collected from participants using an online pre-structured questionnaire. The researchers constructed the survey tool after intensive literature review and expert’s consultation. The questionnaire covered the following data: participants’ socio-demographic data like age, gender, and monthly income. Second section covered participants’ dairy products intake with associated symptoms. Third part covered personal and family history of glucose intolerance disorder among the study participants. Awareness was assessed using multiple reponse and mutually exclusive questions.

Results: A total of 1189 participants fulfilling the inclusion criteria completed the study questionnaire. Participants ages ranged from 18 to 58 years old with mean age of 25.1 ± 12.9 years. Exact of 692 (58.2%) participants were females. Exact of 104 (8.7%) of the study participants reported that they had lactose intolerance disorder which started at the age of 11 to 20 years among 41 (39.4%) and at the age of 21 to 30 years among 36 (34.6%). About 77% of the study participants know that lactose indolence disorder symptoms appear after eating dairy or its derivatives. A total of 45.8% reported that leaky gut syndrome (diarrhoea and bloating) is caused by symptoms that occur with lactose intolerance and 39.4% know lactose intolerance is an uncurable disease.

Conclusion: In conclusion, this study revealed that nearly one out of each three persons on Saudi Arabia is knowledgeable regarding lactose intolerance disorder and its related factors and relieving factors. Dairy products use in daily basis was reported among two thirds of the study population with abdominal distention and abdominal pain was the main accompanying symptoms.

Keywords: Awareness, knowledge, lactose intolerance, lactose malabsorption, population, Saudi Arabia

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Lactose intolerance is variable in its magnitude globally. In Africa and Asia, most people have lactose malabsorption. In northern Europe, many people had a gene that help them to digest lactose after infancy, with less frequent lactose malabsorption syndrome. In the United States, nearly one third of the population have lactose malabsorption.

Small intestine biopsy is the cornerstone procedure to diagnose lactose intolerance as it directly measures lactase activity. In spite of its invasive procedure making, it is scarcely accepted by patients except to be with gastrointestinal endoscopy for other reasons. A lactose tolerance test can be used and mostly includes having a lactose load after an overnight fast and then measuring blood glucose concentration or breath hydrogen expiration. A baseline measurement of blood glucose or breath gases is taken before ingestion of the lactose, and then the measurements are repeated at 30 min intervals up to 2 to 3 h, respectively. An increase in blood glucose indicates lactose digestion. At the field of primary care, lactose intolerance mostly affects every time persons eat. So, persons need to be advised for the foods they eat every day. Although, many people can tolerate a certain amount of lactose and do not need to completely avoid it. This role can be managed by primary health care staff who provide the first line of care for general population.

Many people suffer from an intolerance of a disaccharide present in milk called lactose, this study aims to understand the awareness of Lactose Intolerance (LI) among common Saudi people and if they can detect their symptoms associated with LI. There is no such study available in literature, hence these results could provide a baseline data for further research in this area.

**Methodology**

A descriptive cross-sectional approach was used targeting all accessible population in Saudi Arabia aging 18 years or more and accept to participate in the study. A total of 1570 individuals received the study survey. Exact of 1198 participants fulfilled the inclusion criteria and completed the study questionnaire. Participants’ ages ranged from 18 to 58 years with mean age of 25.1 ± 12.9 years. Exact of 928 (58.2%) were females. As for educational level, 885 (74.4%) were university graduated and 245 (20.6%) had secondary level of education. Income was just sufficient among 830 (69.8%) participants and more than sufficient among 247 (20.8%). Exact of 544 (45.8%) told that they know about lactose intolerance disorder [Table 1].

Table 2 Lactose intolerance frequency and related practice among study participants, Saudi Arabia. Exact of 104 (8.7%) of the study participants reported that they had lactose intolerance disorder which started at the age of 11 to 20 years among 41 (39.4%) and at the age of 21 to 30 years among 36 (34.6%), while 18 (17.3%) had the disease during the first 10 years of their life.
Table 1: Socio-demographic data of study population, Saudi Arabia

| Socio-demographic data          | No  | %    |
|---------------------------------|-----|------|
| **Age in years**                |     |      |
| <25 years                       | 628 | 52.8%|
| 25-45 years                     | 419 | 35.2%|
| >45 years                       | 142 | 11.9%|
| **Gender**                      |     |      |
| Male                            | 497 | 41.8%|
| Female                          | 692 | 58.2%|
| **Educational level**           |     |      |
| Below secondary                 | 59  | 5.0% |
| Secondary                       | 245 | 20.6%|
| University/above                | 885 | 74.4%|
| **Income**                      |     |      |
| Less than sufficient            | 112 | 9.4% |
| Just sufficient                 | 830 | 69.8%|
| More than sufficient            | 247 | 20.8%|
| **Know about lactose intolerance disorder** | Yes | 544  | 45.8%|
| No                              | 645 | 54.2%|

Table 2: Lactose intolerance frequency and related practice among study participants, Saudi Arabia

| Lactose intolerance data                          | No  | %    |
|--------------------------------------------------|-----|------|
| **Do you consume dairy or its derivatives on a daily basis?** |     |      |
| Yes                                              | 811 | 68.2%|
| No                                               | 378 | 31.8%|
| **If you consume dairy and dairy products, have you noticed any of the following symptoms** |     |      |
| Abdominal distention and gases                   | 434 | 36.5%|
| Abdominal pain                                   | 271 | 22.8%|
| Diarrhoea                                        | 144 | 12.1%|
| Nausea                                           | 108 | 9.1% |
| Vomiting                                         | 43  | 3.6% |
| No symptoms                                      | 639 | 53.7%|
| **Do you have lactose intolerance disorder?**    |     |      |
| Yes                                              | 104 | 8.7% |
| No                                               | 423 | 35.6%|
| Do not know                                      | 662 | 55.7%|
| **If yes, age at diagnosis (years) (n=104)**     |     |      |
| 0-10                                             | 18  | 17.3%|
| 11-20                                            | 41  | 39.4%|
| 21-30                                            | 36  | 34.6%|
| 31-40                                            | 9   | 8.7% |
| **Do you know anyone who has lactose intolerance?** |     |      |
| Yes                                              | 352 | 29.6%|
| No                                               | 837 | 70.4%|
| **Degree of relation with that person (n=352)**  |     |      |
| First degree                                     | 128 | 36.5%|
| Second degree                                    | 41  | 11.7%|
| Third degree                                     | 38  | 10.8%|
| Not relative                                     | 184 | 52.4%|

Also, 352 (29.6%) participants reported that they know someone who had the disorder who were first degree relative among 128 (36.5%) and second degree relative among 41 (11.7%), while 38 had third degree relative with the disorder (10.8%). As for participants’ dairy products intake, 811 (68.2%) reported that they consume dairy or its derivatives on a daily basis. Exact of 36.5% of them complained of Abdominal distention and gases, 22.8% complained of abdominal pain only, 12.1% had diarrheal attacks, and 12.7% had nausea and vomiting, while 53.7% had no symptoms.

Table 3 Public awareness regarding lactose intolerance disorder in Saudi Arabia. Exact of 77.1% of the study participants know that lactose intolerance disorder symptoms appear after eating dairy or its derivatives. As for methods to relieve symptoms in a person with lactose intolerance, 75.3% reported for avoiding dairy and its derivatives and use lactose-free alternatives. Only 24.8% of the participants know that lactose intolerance disorder may start after Gastrointestinal (GIT) disorders/infections. Exact of 70.4% of the population know that people with lactose intolerance need to take nutritional supplements, 79% know that people with lactose intolerance need to consume alternatives to lactose-containing products, and 53.6% reported that lactose-free dairy products lack the nutritional value found in dairy and dairy products. A total of 45.8% reported that leaky gut syndrome (diarrhoea and bloating) is caused by symptoms that occur with lactose intolerance and 39.4% know lactose intolerance is incurable disease. Also, 89.1% of the study population know that the severity of lactose intolerance differs from person to person and 46.9% know that milk allergy and lactose intolerance are not the same. Exact of 76.7% of the participants reported that it is possible to get lactose intolerance if your parents are not affected, and 68.6% know it is possible for a person to suddenly had lactose intolerant. As for disease complications, 38.2% reported for Ca and vitamin D deficiency, 33.1% reported for osteoporosis, and 38.7% know about GIT complications. As for testing for lactose intolerance disorder, stool acidity assessment was known for 25.5% of the participants. Considering the highly risk groups, Asians were known for 58.3% of the study participants followed by Africans (25.1%).

Figure 1 Overall awareness level of the general population regarding lactose intolerance disorder in Saudi Arabia. Exact of 452 (38%) participants had good awareness level regarding the disorder while 737 (62%) had poor awareness.

Figure 2 Source of information regarding lactose intolerance disorder among population, Saudi Arabia. The most reported source of information was internet (28.8%), followed by relatives and friends (17.6%), physicians (12.4%), books (9.3%), academic study (6.1%), and newspapers (3.2%). Exact of 48.1% had no specific source for the disease.

Table 4 Distribution of public awareness regarding lactose intolerance by their bio-demographic data. Exact of 44.6% of participants aged less than 25 years had good awareness level compared with 24.6% of old age group with recorded statistical significance (P =0.001). Also, 42.6% of females had good knowledge level versus 31.6% of males (P =0.001). Good knowledge was significantly higher among university
graduated participants (39.2%) than among those who had below secondary education (23.7%; \( P = .048 \)). Also, 51.8% who heard about the disorder had good awareness compared with 26.4% of those who did not (\( P = .001 \)). Exact of 54.8% of participants had lactose intolerance disorder and had good awareness about the disease compared with 30.1% of those who do not know (\( P = .001 \)). Also, 53.7% of participants who know others with the disease had good awareness regarding the disease compared with 31.4% of those who did not (\( P = .001 \)). The highest awareness level was detected among participants who had their information from physicians (65.3%) compared with 60.3% who reported academic study and 51.4% of those who reported for books but 27.6% of those who had no source showed good awareness (\( P = .001 \)).

### Table 3: Public awareness regarding lactose intolerance disorder in Saudi Arabia

| Awareness items                                                                 | No  | %    |
|---------------------------------------------------------------------------------|-----|------|
| In your opinion, when do symptoms usually occur?                               |     |      |
| After eating dairy or its derivatives.                                          | 917 | 77.1%|
| At daytime                                                                      | 127 | 10.7%|
| At night                                                                        | 272 | 22.9%|
| How to relieve symptoms in a person with lactose intolerance?                  |     |      |
| Avoid dairy and its derivatives and use lactose-free alternatives               | 895 | 75.3%|
| Physician consultation                                                           | 354 | 29.8%|
| Using analgesics                                                                | 150 | 12.6%|
| What are the causes of lactose intolerance disorder?                            |     |      |
| After GIT disorders/infections                                                  | 295 | 24.8%|
| After GIT surgery                                                                | 52  | 4.4% |
| After using some drugs                                                           | 51  | 4.3% |
| People with lactose intolerance need to take nutritional supplements            |     |      |
| Yes                                                                             | 837 | 70.4%|
| No                                                                              | 352 | 29.6%|
| People with lactose intolerance need to consume alternatives to lactose-containing products? |     |      |
| Yes                                                                             | 939 | 79.0%|
| No                                                                              | 250 | 21.0%|
| Can lactose-free dairy products lack the nutritional value found in dairy and dairy products? |     |      |
| Yes                                                                             | 637 | 53.6%|
| No                                                                              | 552 | 46.4%|
| Did you know that leaky gut syndrome (diarrhoea and bloating) is caused by symptoms that occur with lactose intolerance? |     |      |
| Yes                                                                             | 544 | 45.8%|
| No                                                                              | 645 | 54.2%|
| Do you think lactose intolerance is curable?                                    |     |      |
| Yes                                                                             | 720 | 60.6%|
| No                                                                              | 469 | 39.4%|
| Does the severity of lactose intolerance differ from person to person?          |     |      |
| Yes                                                                             | 1059| 89.1%|
| No                                                                              | 130 | 10.9%|
| Do you think milk allergy and lactose intolerance are the same?                 |     |      |
| Yes                                                                             | 631 | 53.1%|
| No                                                                              | 558 | 46.9%|
| Is it possible to get lactose intolerance if your parents are not affected?     |     |      |
| Yes                                                                             | 912 | 76.7%|
| No                                                                              | 277 | 23.3%|
| Is it possible for a person to suddenly had lactose intolerant?                 |     |      |
| Yes                                                                             | 816 | 68.6%|
| No                                                                              | 373 | 31.4%|
| Complications of lactose intolerance disorder?                                  |     |      |
| Ca & vitamin D deficiency                                                       | 454 | 38.2%|
| Osteoporosis                                                                    | 393 | 33.1%|
| GIT complications                                                               | 460 | 38.7%|
| Reduced weight                                                                  | 225 | 18.9%|
| Neurological disorders                                                          | 231 | 19.4%|
| Dont know                                                                       | 416 | 35.0%|
| How can lactose intolerance be tested?                                          |     |      |
| Stool acidity assessment                                                        | 303 | 25.5%|
| Blood glucose level assessment                                                  | 257 | 21.6%|
| Breath hydrogenation test                                                       | 141 | 11.9%|
| Dont know                                                                       | 641 | 53.9%|
| The most susceptible ethnic group?                                              |     |      |
| Asians                                                                          | 693 | 58.3%|
| Africans                                                                        | 299 | 25.1%|
| Europeans                                                                       | 404 | 34.0%|
| Latinos                                                                        | 212 | 17.8%|

### Discussion

Lactose intolerance is a GIT disorder detected among more than 65% of the human population. An intolerance to lactose is featured by the incapability to digest the lactose sugar in milk and dairy products causing a state of stomach pains or discomfort.\(^{[15-17]}\) As for public issue, lactose intolerance disorder usually affected by lifestyles with increased rates associated with higher liberties and lower sunlight exposure and, thus, lower vitamin D.\(^{[18,19]}\) Intestinal flora is quite different from person to person, so it is difficult to identify a single, generalizable intestinal flora composition, and to define a specific healthy one. Nevertheless, it is a feature that the best intestinal flora
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shows a high degree of stable species variety.[20] So, it is vital to improve public awareness of lactose intolerance. With the main knowledge about symptoms and use of lactose free diet, LI can be significantly decreased. This study was conducted to assess public awareness regarding lactose intolerance and to study condition after consuming dairy products and if people can relate the mentioned symptoms to the consumption of milk products. Awareness of LI and the available alternatives to milk can help people to reduce their associated symptoms.

This study’s results revealed that more than one third (38%) of the study participants had good knowledge regarding lactose intolerance.

Table 4: Distribution of public awareness regarding lactose intolerance by their bio-demographic data

| Factors                          | Awareness level | P       |
|---------------------------------|-----------------|---------|
|                                 | Poor (0-10)     | Good (11-18) | 0.001* |
| Age in years                    |                 |          |
| <25 years                       | 348             | 280     | 55.4% | 44.6% |
| 25-45 years                     | 282             | 137     | 67.3% | 32.7% |
| >45 years                       | 107             | 35      | 75.4% | 24.6% |
| Gender                          |                 | 0.001* |
| Male                            | 340             | 157     | 68.4% | 31.6% |
| Female                          | 397             | 295     | 57.4% | 42.6% |
| Educational level               |                 | 0.048* |
| Below secondary                 | 45              | 14      | 76.3% | 23.7% |
| Secondary                       | 154             | 91      | 62.9% | 37.1% |
| University/above                | 538             | 347     | 60.8% | 39.2% |
| Know about lactose intolerance disorder |           | 0.001* |
| Yes                             | 262             | 282     | 48.2% | 51.8% |
| No                              | 475             | 170     | 73.6% | 26.4% |
| Do you have lactose intolerance disorder? |       | 0.001* |
| Yes                             | 47              | 57      | 45.2% | 54.8% |
| No                              | 227             | 196     | 53.7% | 46.3% |
| Do not know                     | 463             | 199     | 69.9% | 30.1% |
| Do you know anyone who has lactose intolerance? |       | 0.001* |
| Yes                             | 163             | 189     | 46.3% | 53.7% |
| No                              | 574             | 263     | 68.6% | 31.4% |
| Source of information           |                 | 0.001* |
| None                            | 414             | 158     | 72.4% | 27.6% |
| Internet                        | 170             | 172     | 49.7% | 50.3% |
| Physicians                      | 51              | 96      | 34.7% | 65.3% |
| Academic study                  | 29              | 44      | 39.7% | 60.3% |
| Books                           | 54              | 57      | 48.6% | 51.4% |
| Relatives/friends               | 113             | 96      | 54.1% | 45.9% |
| Newspapers                      | 26              | 12      | 68.4% | 31.6% |

P: Pearson χ² test, Exact probability test. *P<0.05 (significant)

Figure 1: Overall awareness level of the general population regarding lactose intolerance disorder in Saudi Arabia

Figure 2: Source of information regarding lactose intolerance disorder among population, Saudi Arabia
quarters (77.1%) of the study participants know that lactose intolerance disorder symptoms appear after eating dairy or its derivatives. Also, half of the participants (53.6%) correctly know that lactose-free dairy products lack the nutritional value found in dairy and dairy products. Less than half of the study respondents (45.8%) reported that leaky gut syndrome (diarrhoea and bloating) is caused by symptoms that occur with lactose intolerance, and more than one third (39.4%) correctly reported lactose intolerance is incurable disease. Also, vast majority of the study group (89.1%) correctly know that the severity of lactose intolerance differs from person to person, and 46.9% know that milk allergy and lactose intolerance are not the same. Considering method to relieve symptoms in a person with lactose intolerance, about three quarters correctly reported for avoiding dairy and its derivatives and use lactose-free alternatives. About risk factors more than three quarters (76.7%) of the participants know that it is possible to get lactose intolerance if your parents are not affected, and two thirds (68.6%) agreed that it is possible for a person to suddenly had lactose intolerant. Only one quarter (24.8%) of the participants know that lactose intolerance disorder may start after GIT disorders/infections. On the other hand, less than the quarters of the study population know that people with lactose intolerance need to take nutritional supplements, and more than three quarters (79%) know that people with lactose intolerance need to consume alternatives to lactose-containing products. Considering complications, 38.2% reported for Ca and vitamin D deficiency, 33.1% reported for osteoporosis, and 38.7% know about GIT complications. As for testing for lactose intolerance disorder, stool acidity assessment was known for 25.5% of the participants. With regard to the highly risk groups, Asians were known for 58.3% of the study participants followed by Africans (25.1%). Public awareness was significantly higher among young aged participants who mostly had higher level of education, and among females, persons with personal or family history of lactose intolerance disorder. Also, higher awareness was reported among participants who had their information from physician who were not the most reported source as internet was the main source of public information while nearly half of them had no specific source of information. Similar level of awareness was detected among Indian population by Diandra et al.[21] who found that 71.5% of the respondents knew about lactose intolerance. Also, 78.7% of the respondents did not experience the associated symptoms; 21.3% of those who observed symptoms observed bloating apart from other listed symptoms. Also, 59.7% of the respondents used alternative for dairy products to reduce symptoms. Lactose intolerance awareness among study patients was not high with frequent intake of dairy products among the study respondents with reported GIT symptoms.

Conclusions and Recommendations

In conclusion, this study revealed that nearly one out of each three persons on Saudi Arabia is knowledgeable regarding lactose intolerance disorder and its related factors and relieving factors. Dairy products use in daily basis was reported among two thirds of the study population with abdominal distention and abdominal pain was the main accompanying symptoms. Public awareness regarding lactose intolerance and the availability of alternative lactose free diet should be improved to reduce the disease frequency and improving public quality of life. This can be achieved through health education campaigns, posters, mass media, and social media. Physicians especially those at primary health care centers should pay more effort to improve public awareness regarding GIT health and dietary life style.

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Conflicts of interest

There are no conflicts of interest.

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