

Exploring the Saudi population's knowledge of and attitude to food allergies: cross-sectional study

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Objectives: Food allergies are a serious health condition involving an abnormal immune response to specific food allergens, leading to adverse reactions upon exposure. This study aimed to assess the level of knowledge and awareness of food allergies among the Saudi population by exploring various related topics.

Design: Data were collected via a bilingual (Arabic and English) online survey. The study enrolled 11 790 healthy adult participants; individuals who did not provide consent, those with allergies, and caregivers for allergy sufferers were excluded. The questionnaire, adapted from a previously validated survey, gathered demographic information and assessed knowledge of and attitudes towards food allergies. Statistical analysis was performed using IBM SPSS Statistics, and ethical guidelines were adhered to.

Results: All 11 790 participants completed the survey. The majority of respondents were female (77.8%) and of Saudi nationality (94.2%). Geographically, the highest participation rate was from the Western region (32.9%), while the lowest was from the Southern region (8.5%). Over half of the participants held a bachelor's degree (62.8%). Knowledge levels varied across different domains, with the highest scores observed in areas related to symptoms/severity and definition/diagnosis.

Conclusions: Enhancing public knowledge of food allergies is crucial, particularly concerning treatment options, management strategies, differentiating allergies from intolerances, and identifying risk factors. Therefore, implementing targeted educational programmes holds significant potential for improving overall public understanding and management of food allergies.



Introduction

Food allergies are an increasingly important global public health concern, affecting millions of individuals from various cultural and ethnic groups. They are characterised by harmful reactions caused by an immune response to specific foods. Clinical manifestations may vary from mild symptoms to severe, life-threatening conditions such as anaphylaxis. Recent evidence suggests that the prevalence of food allergies has been increasing worldwide, with current estimates indicating that up to 10% of the population may be affected, reflecting a notable rise compared with earlier decades.¹

In Saudi Arabia, the increasing prevalence of food allergies reflects patterns observed worldwide.² This growing trend places added pressure on healthcare systems and exposes affected individuals to a continual risk of allergic reactions.³ People with food allergies often face significant challenges, particularly the possibility of accidental exposure in settings such as schools and restaurants, where severe reactions are more likely to occur. Addressing these risks effectively requires improved awareness, adequate knowledge and strong support at the community level.⁴

The general public has a crucial role in fostering a safe and supportive environment for individuals living with food allergies.⁴ Increasing awareness can significantly improve their safety and quality of life, particularly by enhancing recognition of symptoms and understanding the seriousness of allergic reactions.⁵ Public settings such as schools and restaurants are especially important, as improved awareness and preparedness in these environments

can be lifesaving. Furthermore, because food allergies may arise at any age,⁶ it is essential to promote broad-based education on identifying symptoms, recognising potential triggers and responding appropriately to allergic reactions.⁷

Food allergies are also associated with negative social perceptions that may adversely influence the well-being and mental health of affected individuals and their families. Addressing these challenges requires fostering a more informed and supportive societal environment.⁸ In addition, access to appropriate healthcare services and treatment options is essential for effective management of the condition. Therefore, assessing community attitudes toward food allergies, perceptions of related risks and preferred ways to support affected individuals is highly valuable.⁹ Such insights are critical for designing and implementing targeted educational interventions and public health strategies that address the specific needs of this population. This study ultimately explores the perceptions and knowledge of food allergies among the general public in Saudi Arabia. The findings will offer valuable insights that can help tailor public health programmes. Such initiatives are crucial for improving community support, enhancing patient care and ultimately creating a safer environment for individuals with food allergies.

Methodology

Study design and sampling

This cross-sectional study investigated the knowledge and attitudes towards food allergies among Saudi adults. Participants

were recruited using a non-probability convenience sampling approach through an online questionnaire available in both Arabic and English. The survey specifically targeted healthy adult individuals living in Saudi Arabia who had not been diagnosed with food allergies.

Data collection was conducted over an eight-week period beginning in December 2020. The survey link was distributed electronically across different regions of Saudi Arabia through several social media platforms, including WhatsApp, X (formerly Twitter), and Instagram. In addition, targeted email invitations were shared with online community groups and networks related to public health and food allergy awareness to improve outreach and participation among the general population. Participation was voluntary, and electronic informed consent was obtained from all participants before completing the questionnaire.

A total of 15 142 individuals accessed the survey link. After applying the eligibility criteria, individuals who did not provide consent ($n = 1$), participants diagnosed with food allergies ($n = 1\,796$), caregivers of individuals with food allergies ($n = 1\,442$) and incomplete responses ($n = 114$) were excluded. Furthermore, participants with prior professional or personal knowledge regarding food allergies, including those familiar with symptoms, management or treatment or those who had consulted healthcare professionals about food allergies, were excluded to minimise potential information bias.

Following these exclusions, a final sample of 11 790 complete responses from healthy adult participants was included in the analysis (Figure 1). Although probability sampling was not used, efforts were made to increase sample diversity through broad geographic distribution across Saudi Arabia. The response rate could not be accurately determined due to the nature of online survey dissemination. However, the large sample size and wide regional representation strengthen the generalizability of the study findings.

Sample size calculation

The sample size was calculated using a standard formula for cross-sectional studies to estimate population proportions. A 95% confidence level ($Z = 1.96$), a margin of error of 5% ($d = 0.05$), and an assumed population proportion of 50% ($p = 0.5$) were used due to the absence of prior prevalence data. Based on these parameters, the minimum required sample size was estimated to be 385 participants. Considering the large population size of Saudi Arabia (approximately 34 million), the finite population correction was not applied, as its effect is negligible in large populations.

Although the minimum required sample size was 385, a substantially larger sample ($n = 11\,790$) was ultimately obtained, which enhances the statistical power and generalizability of the study findings.

Survey development

The instrument used in this study was adapted from a validated survey developed by Gupta et al.¹² in 2009. Researchers from Taibah University and the National Nutrition Committee at the Saudi Food and Drug Authority modified the survey. Additionally, this survey has been utilised in various recent studies on the Saudi population.¹¹ To ensure clarity and comprehensibility, the translated instrument was pilot-tested with 25 laypersons

and 12 nutrition professionals. Modifications were made based on their feedback.

The survey was made available in both Arabic and English to increase accessibility for the Saudi population. It consisted of 22 items divided into three main sections. The first section collected demographic information, including age, region of residence, gender, educational level and economic status. The second section focused on knowledge, featuring questions designed to assess participants' understanding of food allergies, including definitions, diagnosis, symptoms and severity, triggers and environmental risks, perceptions of susceptibility and prevalence, treatment, healthcare utilisation, the most common food allergies in children and adults, and the proper use of an EpiPen.

The third section assessed perceptions and attitudes towards food allergies, covering the importance and seriousness of the issue, perceptions of quality of life, management policies, and treatment and healthcare utilisation, all presented on a Likert scale. The demographic characteristics of participants, including age and gender, were carefully evaluated. Furthermore, socioeconomic status, race, ethnicity, and other relevant variables were assessed as additional significant factors. Examining these various demographic dimensions allowed for a detailed understanding of the research sample.

Statistical analysis

The online survey consisted of three sections: Section 1 captured demographic characteristics; Section 2 assessed participants' knowledge of food allergies; and Section 3 evaluated perceptions and attitudes towards food allergies. Participant characteristics were summarised using frequencies and percentages (n [%]) for categorical variables.

The knowledge score was calculated by assigning one point for each correct response and summing the total score for each participant. As the knowledge scores were not normally distributed, non-parametric statistical methods were applied. Accordingly, knowledge scores were summarised using the median and interquartile range (IQR). The Kruskal–Wallis H test was used to compare knowledge scores across independent groups.

A p -value of < 0.05 was considered statistically significant, and all p -values were reported consistently in lowercase italic format throughout the manuscript. Data analysis was performed using IBM SPSS Statistics (version 29.0.2.2; IBM Corp, Armonk, NY, USA).

Results

Participants characteristics

A total of 15 142 individuals accessed the survey link. However, we ultimately included 11 790 complete responses in the analysis after excluding those who did not consent to participate, individuals with allergies, caregivers of individuals with allergies and cases with missing data (see Figure 1).

In terms of the basic characteristics of the participants, the majority were aged between 18 and 29 years (65.4%). Most respondents were female (77.8%), and nearly all participants were Saudi (94.2%). Regarding education levels, more than half of the participants held a bachelor's degree (62.8%). Additionally, the majority of participants were not healthcare practitioners (81.1%) (Table 1).

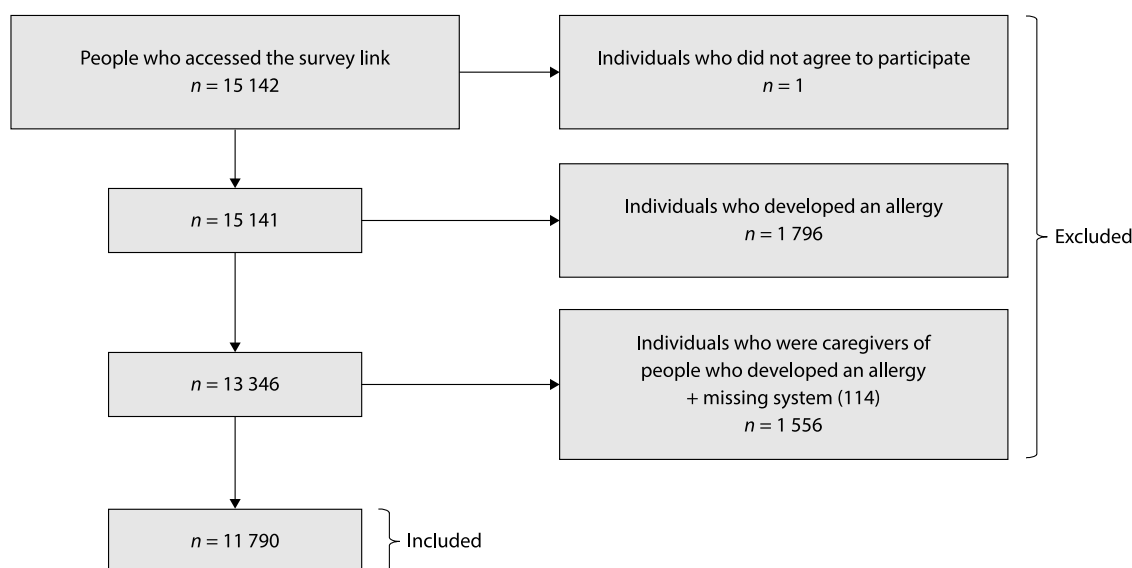


Figure 1: Participants included in data analysis.

Knowledge of food allergies

The average scores for correct responses across different areas and their corresponding items are presented in Table 2. Approximately 43.9% of participants correctly answered questions related to the definition and diagnosis of food allergies, with a small percentage (5.9%) mistakenly believing that food allergies are infectious. Surprisingly, only 15.5% of individuals could differentiate between food allergies and food intolerances, indicating a significant lack of understanding. In the symptoms and severity domain, the average score for correct answers was 51.1%. Only one-third of participants recognised that asthma is a risk factor for severe anaphylaxis (30.7%), although slightly more than half (51.2%) understood that severe allergic reactions can be fatal. Additionally, 69.4% of participants correctly identified hives as a common symptom of a food allergy reaction, and 53.2% recognised that hives appearing on the face and chest within 15 minutes of consuming milk are a typical sign.

The third domain, focusing on triggers and environmental risks, demonstrated a relatively low level of knowledge, with an average correct response rate of 37%. Approximately 32.5% of participants correctly recognised that contact with food can trigger an allergic reaction. To improve clarity, the item related to milk allergy was rephrased to emphasise that individuals with milk allergy must avoid all forms of milk due to allergenic proteins, rather than implying any relationship with fat content; accordingly, 46.4% of participants answered this item correctly. In addition, 39.3% were aware that allergenic proteins can be transmitted through breast milk. However, 21.2% of participants incorrectly believed that acidic foods such as lemons, oranges and tomatoes are common causes of food allergies.

In the domain assessing perceptions of susceptibility and prevalence, 41.2% of responses were correct. Only about 21% of participants were aware that food allergies may resolve with age, while 45.9% correctly identified that food allergies are more common in children. Furthermore, 56.7% acknowledged that a family history of allergies is an important risk factor. In the domain related to treatment and healthcare utilisation, the average score for correct answers was 34.3%.

Only a small percentage (18.6%) understood that food allergies can be cured. However, the majority (69.1%) recognised that avoiding allergenic foods is essential for preventing allergic reactions, and only 15.2% knew the correct location for administering an EpiPen (injectable epinephrine). Participants performed relatively well in identifying the three most common food allergies in children, with 60.6% identifying eggs, 46.4% for milk and 39.6% for peanuts. For adults, the percentages were 26.4% for wheat (gluten), 33.1% for fish and 33.5% for shellfish (shrimp, lobster, crab).

Influence of demographic factors on the knowledge of food allergy

Statistically significant differences were observed among four different age groups. Participants aged 18–20 years had a higher median score compared with other age categories ($H = 61.158$, $p < 0.001$). Additionally, a significant difference in median scores was found between females and males, with females achieving higher median scores than males ($H = 128.692$, $p < 0.001$) (Table 3). Saudi respondents also demonstrated significantly higher median scores ($H = 11.479$, $p < 0.001$). When examining various regions, a statistically significant difference was noted across five regions, with the highest median score found in the western region ($H = 115.051$, $p < 0.001$). Educational levels showed a significant impact on knowledge scores, as participants with bachelor's degrees had the highest scores ($H = 255.065$, $p < 0.001$). In terms of the employment sector, participants in the non-working sector achieved significantly higher median scores compared with others ($H = 18.808$, $p < 0.001$). Regarding monthly income, a statistically significant difference was found; participants earning less than SAR 3 000 had a higher median score ($H = 71.757$, $p < 0.001$). Finally, there was a significant difference between healthcare practitioners and non-healthcare practitioners, with non-healthcare practitioners scoring significantly higher ($H = 206.135$, $p < 0.001$).

Food allergies: attitudes and beliefs

Table 4 presents the various domains and their associated items. In the importance and seriousness domain, an equal number of participants (33.6%) selected both the agree and

Table 1: Basic characteristics of participants

Characteristics	n (%)
Age group	
18–29	8 731 (65.4)
30–44	3 356 (25.1)
45–59	1 140 (8.5)
60+	51 (0.9)
Gender	
Male	2 959 (22.2)
Female	10 387 (77.8)
Nationality	
Saudi	12 577 (94.2)
Non-Saudi	769 (5.8)
Region	
Central region	1 956 (14.7)
Eastern region	2 117 (15.9)
Western region	4 395 (32.9)
Northern region	3 750 (28.1)
Southern region	1 128 (8.5)
Educational level	
Not educated	51 (0.4)
Less than high school	3 016 (22.6)
Diploma	1 211 (9.1)
Bachelor	8 376 (62.8)
Master	522 (3.9)
PhD	170 (1.3)
Employment sector	
Governmental	4 115 (30.8)
Private	1 559 (11.7)
Not working	5 978 (44.8)
Looking for a job	1 694 (12.7)
Monthly income*	
Less than 3 000	6 971 (52.2)
3 000–6 000	1 949 (14.6)
6 000–8 000	843 (6.3)
8 000–10 000	1 004 (7.5)
10 000–15 000	1 349 (10.1)
15 000–20 000	598 (4.5)
20,000–25 000	249 (1.9)
More than 25 000	383 (2.9)
Healthcare practitioner	
Yes	2 523 (18.9)
No	10 823 (81.1)

*The currency is Saudi Riyal (SAR).

disagree options, indicating awareness of food allergy symptoms. A significant portion of respondents (37%) acknowledged that food allergies are a serious matter that should be considered.

In the quality-of-life domain, the majority of participants (38.9%) agreed that individuals with food allergies face challenges when dining out at restaurants. Regarding policy issues, nearly half of the participants (44.9%) expressed support for increased government funding for food allergy research. Furthermore, the highest percentage of respondents (51.2%) strongly agreed that schools should implement plans to ensure the safety of students with food allergies. More than two-thirds of participants either strongly agreed (31.7%) or agreed (30.5%) that schools

Table 2: Knowledge section

Item	n (%)		
	True	False	I don't know
Definition and diagnosis	43.9*		
Food allergy is an allergic reaction that happens when the body considers a food to be harmful (T)	6 164 (52.3)	3 609 (30.6)	2 018 (17.1)
Food allergy is an infectious condition (F)	791 (6.7)	9 357 (79.4)	1 643 (13.9)
Lactose intolerance (trouble digesting dairy products) is the same as having a milk allergy (F)	5 616 (47.6)	2 063 (17.5)	4 112 (34.9)
Symptoms and severity	51.1 *		
Asthma is an important risk factor for severe anaphylaxis (T)	4 102 (34.8)	4 102 (34.8)	4 102 (34.8)
A person can die from having a food allergy reaction (T)	6 837 (58.0)	6 837 (58.0)	6 837 (58.0)
Hives (red bumps or blotches on the skin that can be itchy) are a common symptom of a food allergy reaction (T)	9 266 (78.6)	9 266 (78.6)	9 266 (78.6)
A boy with a milk allergy accidentally drank some milk; which of the following could be sign of food allergy reaction			
After 15 minutes he gets hives on his face and chest	7 104 (53.2)	4 687 (46.8)	-
Triggers and environmental risk	37.0 *		
People with food allergies can have an allergic reaction after touching a food (T)	4 343 (36.8)	4 343 (36.8)	4 343 (36.8)
A person with a milk allergy can still drink low-fat milk without having an allergic reaction (F)	1 067 (9.0)	1 067 (9.0)	1 067 (9.0)
Foods eaten by a mother can cause a food allergy by passing to her child through her breast milk (T)	5 250 (44.5)	5 250 (44.5)	5 250 (44.5)
Acidic foods (like lemons, oranges and tomatoes) commonly cause food allergy (F)	2 832 (24.0)	2 832 (24.0)	2 832 (24.0)
Perceptions of susceptibility and prevalence	41.2*		
Family history of food allergy is considered a risk factor for having food allergy (T)	7 567 (64.2)	7 567 (64.2)	7 567 (64.2)
Food allergies can go away as a person gets older (T)	2 804 (23.8)	2 804 (23.8)	2 804 (23.8)

(Continued)

Table 2: Continued.

Item	n (%)		
	True	False	I don't know
Food allergy is more common in children than adults (T)	6 120 (51.9)	6 120 (51.9)	6 120 (51.9)
Treatment and use of health care	34.3 *		
There is a cure for food allergies (F)	4 329 (36.7)	4 329 (36.7)	4 329 (36.7)
The only way to prevent allergic reaction is to stay away from food that causes allergic reaction (T)	9 216 (78.2)	9 216 (78.2)	9 216 (78.2)
The best place to use an EpiPen (injectable epinephrine)			
Outer thigh	2 029 (15.2)	9 762 (84.8)	-
The three most common food allergies in children			
Egg	8 084 (60.6)	5 262 (39.4)	-
Milk	6 193 (46.4)	7 153 (53.6)	-
Peanut	5 279 (39.6)	8 067 (60.4)	-
The three most common food allergies in adults			
Wheat (Gluten)	3 524 (26.4)	9 822 (73.6)	-
Fish	4 416 (33.1)	8 930 (66.9)	-
Shellfish (shrimp, lobster, crab)	4 468 (33.5)	8 878 (66.5)	-

* Average score of the correct answers for each domain.
The influence of demographic factors on the knowledge of food allergy.

should provide designated tables for children with food allergies to eat their meals safely.

In the final domain, which focuses on treatment and healthcare utilisation, 45.3% of participants agreed that it is essential for children with severe food allergies to carry an EpiPen.

Additionally, as shown in Table 5, the majority of respondents (48.3%) considered improving food allergy treatments to be the most important strategy for assisting individuals with food allergies. Consequently, a significant proportion of participants (53.0%) indicated that they preferred using the internet and/or email as their primary sources of information regarding food allergies. When it came to learning how to protect their children with food allergies, participants favoured receiving lectures from healthcare providers, with 30.4% selecting this as their preferred educational method.

Discussion

This study examined knowledge and attitudes toward food allergies among the general population in Saudi Arabia, focusing on five key aspects: definition and diagnosis, associated symptoms and severity, triggers and environmental risks, susceptibility and prevalence, and available healthcare treatment options. The results indicate a generally low level of awareness in these areas. The highest knowledge was found in the “symptoms and severity” category, with 51.12% of questions answered correctly, while the lowest was in “triggers and environmental risks”, where only 37.27% were answered

correctly. Significant gaps were identified in understanding the proper use of EpiPens, differentiating between allergies and intolerances, and acknowledging that food allergies are incurable and can arise from factors such as age and environmental exposure.

Regarding attitudes, more than half of the participants believed that the public is aware of food allergy symptoms, though opinions varied on how seriously allergies are taken. The study highlighted the substantial challenges faced by individuals with food allergies in dining environments, emphasising the need for enhanced governmental, educational and healthcare support. Preferred methods for gaining knowledge concerning food allergies included the Internet and educational seminars provided by healthcare professionals and schools. To improve awareness and practices related to food allergies, the Saudi Food and Drug Authority (SFDA) has implemented regulations mandating food establishments to display allergens on menus and pre-packaged food labels.¹⁰ However, more targeted programmes are recommended to raise awareness in these settings, empowering consumers to identify allergenic ingredients.

The study found that demographic variables such as gender, age, nationality, education level, employment status, monthly income and healthcare specialisation significantly affect food allergy awareness, underscoring the need for tailored educational interventions. However, certain variables showed no significant impact on knowledge, indicating areas for further research. While 51.12% of participants demonstrated a moderate level of awareness of symptoms and severity, a recent study by Takrouni et al.¹¹ reported a similar understanding in Jeddah. In contrast, Gupta et al.¹² found that approximately 64% of the US population could accurately identify allergy symptoms. The difference may stem from comprehensive allergy education programmes and extensive public health campaigns in the United States, which promote awareness of food allergies. Understanding the symptoms and severity of food allergies is crucial for empowering individuals to recognise allergic reactions in themselves or their children and respond quickly, potentially preventing fatalities. Recognising symptoms of anaphylaxis, such as respiratory distress, swelling or hives, is vital in emergencies. This knowledge is essential, as food allergies can develop at any stage of life, often without warning.^{1,13}

The limited understanding of triggers and environmental hazards associated with food allergies, evidenced by a 37.27% accuracy rate in our study, highlights a significant gap in public awareness in Saudi Arabia. These findings align with those of Al-Ahmad et al.,¹⁴ who noted similar deficiencies among Saudi participants. Takrouni et al.¹¹ also identified substantial gaps in the general public's knowledge of food allergies in Jeddah, underscoring the need for comprehensive educational campaigns nationwide. International studies have similarly addressed the prevalence and severity of childhood food allergies, emphasising misunderstandings about their triggers.^{15,16} These findings suggest that cultural and educational differences influence awareness levels, although the knowledge gap is smaller in regions with established food allergy education initiatives.

The study also identified significant gaps in knowledge regarding the use of EpiPens and the distinction between allergies and intolerances, reflecting a global challenge in effectively managing food allergies due to inadequate public education and

Table 3: Basic characteristics by overall knowledge score

Characteristic		<i>n</i>	Mean rank	df	<i>H</i>	<i>p</i> -value
Age	18–20	7 719	5 693.12	3	61.158	<0.001
	30–44	2 961	6 219.67			
	45–59	1 009	6 152.80			
	60+	46	6 330.35			
Gender	Male	2 604	5 231.85	1	128.692	<0.001
	Female	9 187	6 084.25			
Nationality	Saudi	11 119	5 870.02	1	11.479	<0.001
	Non-Saudi	672	6 325.89			
Region	Central region	1 715	6 025.13	4	115.051	<0.001
	Eastern region	1 895	6 004.89			
	Western region	3 882	6 249.61			
	Northern region	3 331	5 434.17			
	Southern region	968	5 625.19			
Educational level	Not educated	44	4 299.03	5	255.065	<0.001
	Less than high school	2 618	5 355.87			
	Diploma	1 049	5 219.48			
	Bachelor	7 450	6 066.81			
	Master	474	7 374.68			
	PhD	156	7 310.07			
Employment sector	Governmental	3 616	6 091.09	3	18.808	<0.001
	Private	1 393	5 808.98			
	Not working	5 290	5 783.31			
	Looking for a job	1 492	5 903.97			
Monthly income*	Less than 3 000	6 160	5 709.76	7	71.757	<0.001
	3 000–6 000	1 705	5 841.58			
	6 000–8 000	750	5 964.66			
	8 000–10 000	891	6 075.45			
	10 000–15 000	1 190	6 171.80			
	15 000–20 000	540	6 453.26			
	20 000–25 000	221	6 877.79			
	More than 25 000	334	6 442.63			
Healthcare practitioner	Yes	2 190	6 832.99	1	206.135	<0.001
	No	9 601	5 682.27			

*The currency is Saudi Riyal (SAR).

awareness campaign.¹⁶ It is concerning that individuals may either avoid foods they should not, or inadvertently consume allergenic foods due to confusion between allergies and intolerances, compromising their safety and quality of life. The lack of understanding regarding environmental triggers and appropriate emergency responses raises the risk of severe allergic reactions or anaphylaxis, which could be mitigated with improved awareness and preparedness.¹⁷ This gap may indicate insufficient healthcare resources dedicated to managing food allergies nationwide. It is crucial to remain vigilant regarding food allergies throughout life, as 38% of adult food allergies develop in adulthood.¹⁶ Knowing how to use an EpiPen and other treatment protocols is critical, as allergic reactions can occur anytime and anywhere.¹⁸ The public should understand the importance of avoiding allergens, quickly identifying reactions, and managing adverse responses.

Opinions concerning food allergies vary among people in Saudi Arabia. While 43.6% believe that the public often recognises the signs of food allergies, only 52.6% consider food allergies to be serious. Al-Ahmad et al.¹⁴ and Sicherer et al.¹ found that perceptions of seriousness and awareness are generally higher in

regional and international contexts, possibly due to differences in public health initiatives and the prevalence of food allergies among demographics. A significant majority of participants reported that individuals with food allergies face substantial challenges when dining out, with 68.6% indicating that it is difficult to eat safely at restaurants. Gupta et al.¹² identified similar challenges in the United States, and 68.6% of participants in this study agreed that dining safely in restaurants is particularly difficult for those with food allergies. These attitudes highlight the urgent need for stronger educational and governmental interventions in Saudi Arabia. Public awareness of food allergy risks is increasing, as shown by strong support for school safety measures (78.6%) and significant backing for increased government funding for food allergy research (70.4%). This aligns with global trends towards enhanced school safety practices.¹¹

There is a clear need for a more organised approach to managing food allergies in public spaces and educational institutions. A majority of participants support the creation of designated dining areas in schools (62.2%) and recognise the necessity of having EpiPens available (71.6%). While some

Table 4: Attitudes and beliefs (Likert scale)

Item	Strongly agree, n (%)	Agree, n (%)	Disagree, n (%)	Strongly disagree, n (%)
Importance and seriousness				
Most people know the symptoms of food allergy	1 328 (10)	4 481 (33.6)	4 479 (33.6)	684 (5.1)
Most people take food allergy seriously	2 079 (15.6)	4 942 (37)	3 473 (26)	478 (3.6)
Perceptions of quality of life				
It is difficult for people with food allergies to safely eat at restaurants	3 970 (29.7)	5 191 (38.9)	1 560 (11.7)	251 (1.9)
Policy issues				
More government money should go towards research on food allergy	3 402 (25.5)	5 992 (44.9)	1 364 (10.2)	214 (1.6)
Schools should have plans for keeping students with food allergies safe	6 836 (51.2)	3 662 (27.4)	358 (2.7)	116 (0.9)
Schools should have special tables where children with food allergies can eat their food safely	4 229 (31.7)	4 074 (30.5)	2 165 (16.2)	504 (3.8)
Treatment and use of health care				
Having an EpiPen (injectable epinephrine) is important for most children with severe food allergies	3 508 (26.3)	6 049 (45.3)	1 240 (9.3)	175 (1.3)

individuals are aware of food allergies, these findings underscore the urgent need for comprehensive educational programmes to raise awareness and encourage proactive responses to this health issue. Policymakers should develop extensive educational programmes accessible to the general public and specialised high-risk environments, such as schools and restaurants. By integrating online resources with face-to-face instruction, these initiatives can reach a broader audience and significantly improve understanding and management of food allergies.

Several studies have highlighted the complex relationship between demographic factors and food allergy awareness.^{11,19} Our findings are consistent with those of Takrouni et al.,¹¹ who examined the general population's understanding of food allergies in Saudi Arabia. Al-Ahmad et al.¹⁴ similarly noted that income and education level significantly influence

food allergy awareness. Global research has shown a similar trend; for instance, Gupta et al.¹² in the United States, Roberts et al.²⁰ in Europe, and Lee et al.¹⁹ in Korea have identified socio-economic status, education level and healthcare access as variables affecting food allergy awareness and management practices. These universal findings highlight the need for tailored educational programmes.¹² Generic public health initiatives often fail to achieve their goals without considering the unique socioeconomic and cultural circumstances of their target audiences.²¹ For instance, healthcare workers and college graduates may have specific needs that require modifications to existing interventions for effectiveness.²² Health communication strategies should be diverse and culturally sensitive to bridge knowledge gaps.²³ This may involve customising instructional materials for specific demographics and utilising multiple distribution channels, such as online resources for younger, tech-savvy populations and traditional media or in-person meetings for older or less technologically proficient audiences.²⁴ Furthermore, integrating education into schools and healthcare facilities can ensure a wide and impactful reach.³ A comprehensive and adaptable strategy is essential to enhance food allergy awareness and safety in Saudi Arabia. Educators and policymakers should respond to the population's demographic diversity by implementing varied educational practices that ensure all groups receive clear and relevant information.²⁰

Study limitations and strengths

Given the limitations of this study, it is important to interpret the findings cautiously. Establishing causal relationships between the research variables is not warranted, as is typical for cross-sectional studies. Additionally, because knowledge and attitudes regarding food allergies are still evolving in our region, conducting in-person interviews may yield more accurate data. While online self-administered surveys can introduce bias in data collection from the general population, they offer efficiency and require less preparation. Furthermore, to the authors' knowledge, this study is the first of its kind in Saudi Arabia, covering all regions of the country. A significant strength of this research is its ability to highlight varying levels of awareness across different regions and populations, underscoring the need for targeted educational programmes.

Table 5: Attitudes and beliefs (MCQs)

Item	n (%) (n = 11 790)
An important strategy to help people with food allergies	
Improve the treatments of food allergy	6 440 (48.3)
Find the causes of food allergy	5 515 (41.3)
Promote school education programmes for food allergy	4 557 (34.1)
Promote public awareness campaign for food allergy	4 493 (33.7)
The best way to learn about food allergies	
Television	2 164 (16.2)
Internet/Email	7 070 (53.0)
Handout/brochure	1 038 (7.8)
Other (specify)	700 (5.2)
The best way for schools to teach parents about how to protect children with food allergies	
Handouts/brochures in the mail	897 (6.7)
Presentation at parent teacher meetings	3 110 (23.3)
Parents of food-allergic children talking to other parents	2 783 (20.9)
Doctor or nurse talking about food allergy	4 056 (30.4)
Other (specify)	126 (0.9)

Conclusions

This study successfully identified critical knowledge gaps and attitudes regarding food allergies among the population of Saudi Arabia. While there is some awareness of allergy symptoms, significant deficiencies were found in understanding allergy triggers and emergency responses, including the proper use of EpiPens. This highlights the urgent need for enhanced educational initiatives tailored to the specific requirements of diverse demographic groups nationwide. The main conclusion emphasises the necessity for comprehensive educational programmes and robust public health policies to improve awareness and management of food allergies. Additionally, integrating these programmes into broader health strategies is essential for ensuring a coordinated and effective approach.

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