



Community Perspectives Toward Food Allergies

Albandari Bin Ammar¹, Khalid ME Eltalib², Mohamed Ahmed Agab Ahmed Agab², Hussain Gadelkarim Ahmed^{3,4}

¹Department of Clinical Nutrition, College of applied Medical Sciences, University of Hail, Saudi Arabia.

²Department of Medicine, Faculty of Medicine, Kordofan University, El-Obeid, Sudan. Coronary Care Unit, El-Obeid Teaching Hospital, El-Obeid, Sudan.

³Prof Medical Research Consultancy Center, NK, El-Obeid, Sudan.

⁴Department of Histopathology and Cytology, FMLS, University of Khartoum, Sudan.

Abstract

Background: Food allergy is a widespread condition with multiple manifestations across the globe. The purpose of this study was to analyze the community's knowledge of techniques to improving food allergy awareness in Saudi Arabia. **Methodology:** This cross-sectional poll includes 15141 Saudi residents between December 2020 and January 2021. The data was gathered using convenience/snowball sampling via an online poll. The questionnaire was created using the verified design by Gupta et al. [12]. The survey was marketed on social media and by e-mail. **Results:** In this study, 15142 individuals had been surveyed. This population's average overall knowledge was 57.1%. Approximately 12% of participants claimed food allergies and had previously been diagnosed with an IgE test, with 11.7% males and 12% females. Contacting a person with FA calmed about 11% of people, including 8.4% of men and 11.6% of women. **Conclusion:** The Saudi population has a low level of overall understanding about FA allergy. FA proportions are higher among those aged 36 to 45. The knowledge level of FA does not appear to be affected by gender, financial situation, or education level. In this study, FA prevalence rates were lower in nations with lower rates.

Keywords: food allergy, Saudi Arabia, IgE, Allergic reactions.

Correspondence to: Dr. Khalid ME, Email: Eisa.khalid1@gmail.com

Cite this article: Ammar AB, Eltalib KME, Agab MAAA, Ahmed HG. Medical Research Updates 2023;1(1): 10-20. DOI: <https://doi.org/10.70084/pmrcc.mruj1.12>

Introduction

Food Allergy (FA) is a serious global health issue that is becoming more prevalent in the urbanized community. FA has an impact on the quality of life of many allergy patients and their families due to increased costs [1,2]. FA prevalence rates are quickly increasing in several parts of the world, necessitating the need for improved prevention, diagnosis, and treatment measures. Significant progress has been made in understanding the causes and mechanisms underlying FA in recent years. This resulted in the implementation of several guidelines and the promotion of continuous upgrades [3]. Investigations understanding the risk factors that have contributed to the growth in FA consequences, as well as their core immunological mechanisms, may help to define ways for FA therapy and prevention [1]. The most common FA-associated foods include soybeans, milk, eggs, groundnuts, shellfishes, tree nuts, cereals, and fish (Big Eight) [4,5].

FA is defined as unfavorable immune responses to dietary proteins that result in conventional clinical

manifestations such as dermatologic, respiratory, gastrointestinal, cardiovascular, and/or neurologic symptoms. Immunoglobulin (Ig) E-mediated allergy disorder differs from non-IgE-mediated allergy disorder in that the pathophysiology originates from immune system activation, activating a T helper 2 response, which leads to IgE binding to Fc receptors on effector cells such as mast cells and basophils. In contrast to non-IgE-mediated FA, this activation commences the release of histamine and other comparable inflammatory mediators, and symptoms begin immediately [6].

Ig E-mediated allergy symptoms can range from moderate to severe, and life-threatening anaphylaxis can occur. Skin prick testing, allergen-specific serum IgE, and/or oral meal challenges are currently recommended for diagnosis. Management entails allergen avoidance and appropriate medication for allergic reactions when accidental ingestions occur. Recently, immunotherapy, biological treatments, and new vaccinations have been introduced [7-9].



However, there is a scarcity of data on FA from Saudi Arabia. The few relevant studies refer to food consumed outside the home, such as fast food or dining out [10,11]. As a result, the current study sought to assess the community's understanding of measures to increase understanding of food allergies in Saudi Arabia.

Materials and Methods

This cross-sectional poll includes 15141 Saudi residents between December 2020 and January 2021. The data was gathered using convenience/snowball sampling via an online poll. The questioner was created using the verified design by Gupta et al. [13]. The survey was marketed on social media and by e-mail.

Ethical Considerations

The participants in this study gave their consent voluntarily, since they would not be forced or encouraged to take part. The survey results were not coupled with any personal data, and the study participants remained anonymous. On the participant information sheet, which was the first page of the online survey, participants were asked to confirm that they were willing to participate in this study.

Consent was secured by including a mandatory response question that required their agreement in order to participate. Only those who actively clicked to consent may view the subsequent sections of the survey.

Statistical Analysis

The Statistical Package for the Social Sciences (SPSS) version 23 was used for the statistical analyses. Descriptive data reported as frequencies and percentages were included in the statistical analysis.

RESULTS

The awareness level of food allergies was tested in this study for 15142 participants, 3350 (22%) males and 11792 (78%) females, aged 18 to 80 years, with a mean age of 28.5 years. The majority of participants were between the ages of 21 and 35, and the vast majority were Saudi (96%). The majority of contributors had a Bachelor degree BSc level of education, followed by high school and diploma, accounting for 62%, 23%, and 9%, respectively. As shown in Table 1, Figure 1, the majority of participants have a monthly income of 3000 SAR (52%), followed by 3000 to 6000 SAR (15%).

Table 1. Distribution of study population by demographical data

Category	Variable	Males (n=3350)	Females (n=11792)	Total (n=15142)
Nationality	<i>Saudi</i>	3166	11095	14261
	<i>Non-Saudi</i>	184	697	881
Age	<i>20-18 years</i>	483	2493	2976
	<i>21-25 years</i>	872	4270	5142
	<i>26-35 years</i>	1010	2682	3692
	<i>36-45 years</i>	523	1598	2121
	<i>46+ years</i>	462	749	1211
Education	<i>Illiterate</i>	35	62	97
	<i>High school</i>	741	2732	3473
	<i>Diploma</i>	515	883	1398
	<i>BSc</i>	1777	7578	9355
	<i>MSc</i>	223	400	623
	<i>PhD</i>	59	137	196
Income in Saudi Riyals (SAR)	<i>< 3,000 SAR</i>	1119	6736	7855
	<i>3000-6000</i>	443	1785	2228
	<i>6000-8000</i>	278	689	967
	<i>8000-10000</i>	336	821	1157
	<i>10000-15000</i>	487	1026	1513
	<i>15000-20000</i>	322	369	691
	<i>20000-25000</i>	162	128	290



More than 25000	203	238	441
-----------------	-----	-----	-----

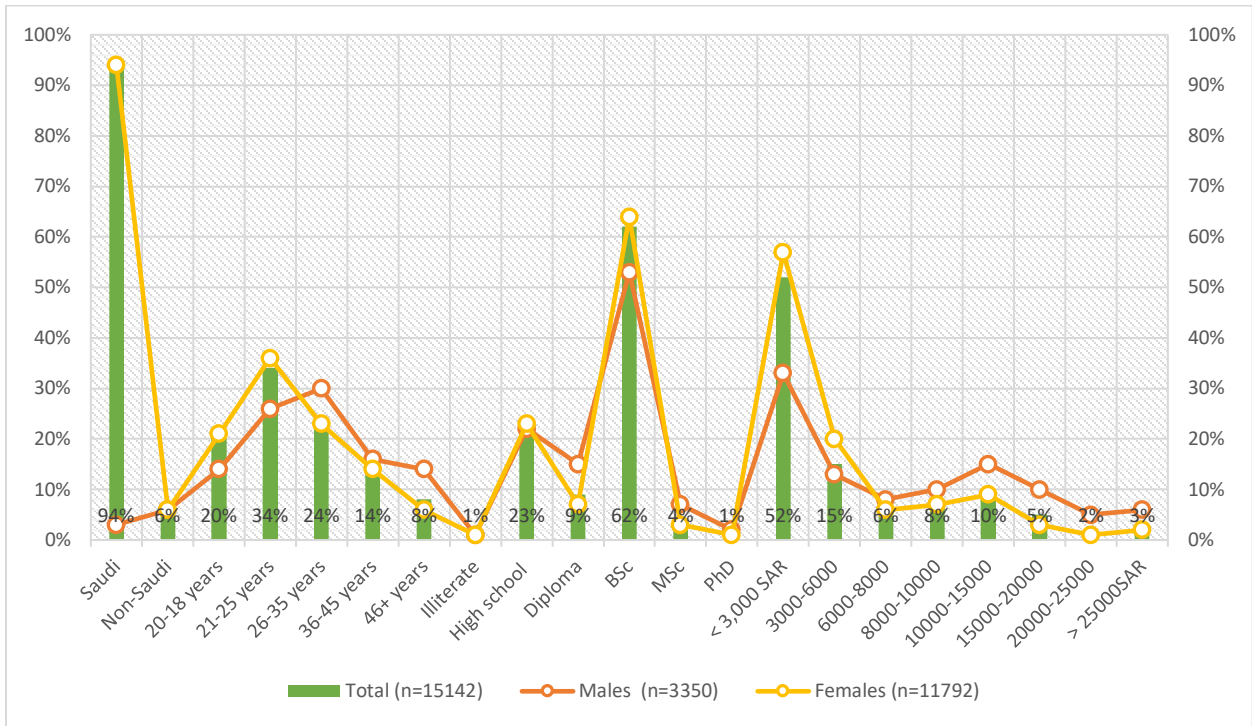


Figure 1. proportions of the study population by demographical data

Around 1796/15142 (12%) participants claimed to have food allergies and had previously been identified with an IgE test, including 391/3350 (11.7%) males and 1405/11792 (12%) females.

Furthermore, as indicated in Figure 2, around 1445/13246 (11%) calmed contacting a person with FA, including 247/2928 (8.4%) males and 1198/10318 (11.6%) females.



Figure 2. Description of the study population prevalence rates of FA

This population's average overall knowledge was 57.1%.

Table 2 and Figure 2 show the gender distribution of the study population as well as various FA



knowledge-related categories. When asked if "FA is an allergic reaction that happens when the body considers a food to be harmful," 7004/13270 (52.8%) said "True," including 1550/2929 (53%) males and 5454/10341 (52.7%) females.

In response to the question "Is a family history of FA considered a risk factor for having FA?" 8466/13270 (63.8%) said "True," including 1772/2929 (60%) males and 6694/10341 (64.7%) females.

4710/13270 (35.5%) responded "True" to the question "Asthma is an important risk factor for severe anaphylaxis," with 1033/2929 (35.3%) males and 3677/10341 (35.6%) females.

In response to the question "whether FA is an infectious condition," 10430/13270 (78.6%) said "False," including 2111/2929 (72%) males and 8319/10341 (80%) females.

The question reads: "Hives (red bumps or blotches on the skin that can be itchy) are a common symptom of an FA reaction" 10440/13270 (78.7%) said "True," with 2117/2929 (72.2%) males and 8323/10341 (80.5%) females responding.

When asked if "people with food allergies can have an allergic reaction after touching a food," 5034/13270 (38%) said "True," with 1026/2929 (35%) males and 4008/10341 (38.8%) females responding.

In response to the question "Is FA more common in children than in adults?" 6822/13270 (51.4%) said "True," including 1297/2929 (44.3%) males and 5525/10341 (53.4%) females.

When asked if a person could die as a result of an FA reaction, 7693/13270 (58%) said "True," including 1401/2929 (47.8%) males and 6292/10341 (60.8%) females.

Table 2. Distribution of the study population by sex and some FA knowledge-related domains.

Category	Variable	Males n=2929	Females n=10341	Total n=13270
<i>FA is an allergic reaction that happens when the body considers a food to be harmful.</i>				
	True	1550	5454	7004
	False	815	3164	3979
	Don't know	564	1723	2287
<i>A family history of FA is considered a risk factor for having FA.</i>				
	True	1772	6694	8466
	False	419	1259	1678
	Don't know	738	2388	3126
<i>Asthma is a significant risk factor for severe anaphylaxis.</i>				
	True	1033	3677	4710
	False	764	2419	3183
	Don't know	1132	4245	5377
FA is an infectious condition				
	True	297	688	985
	False	2111	8319	10430
	Don't know	521	1334	1855
<i>Hives (red bumps or blotches on the skin that can be itchy) are a common symptom of a FA reaction.</i>				
	True	2117	8323	10440
	False	218	529	747
	Don't know	594	1489	2083
<i>People with food allergies can have an allergic reaction after touching a food.</i>				
	True	1026	4008	5034
	False	1046	3610	4656
	Don't know	857	2723	3580
<i>FA is more common in children than in adults</i>				
	True	1297	5525	6822
	False	587	1403	1990
	Don't know	1045	3413	4458
<i>A person can die from having a FA reaction</i>				
	True	1401	6292	7693
	False	644	1492	2136
	Don't know	884	2557	3441

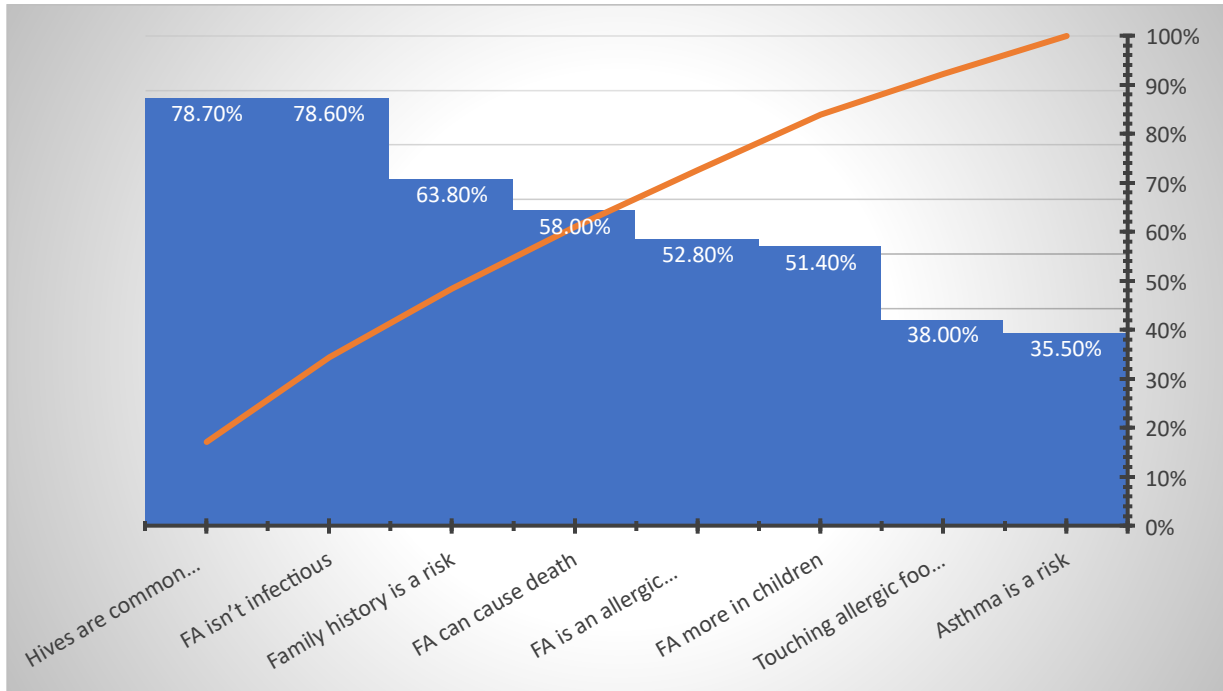


Figure 3. Study population by proportions of knowledge levels

Table 3 and Figure 3 show the gender distribution of the study participants as well as their awareness of frequent allergy foods. "Lactose intolerance (difficulty digesting dairy products) is the same as having a milk allergy," 6275/13270 (47.3%), followed by "Foods eaten by a mother can cause an

FA by passing to her child through her breast milk," 5875/13270 (44.3%), "Acidic foods (like lemons, oranges, and tomatoes) are not commonly causing FA," 4649/13270 (35%), and "A person with a milk allergy can still drink low-fat milk without having an allergic reaction" 1269/13270(9.6%).

Table 3. Distribution of the study population by sex and knowledge related to common allergic food.

Category	Variable	Males n=2929	Females n=10341	Total n=13270
<i>Lactose intolerance (trouble digesting dairy products) is the same as having a milk allergy.</i>				
	True	1185	5090	6275
	False	533	1843	2376
	Don't know	1211	3408	4619
<i>Acidic foods (like lemons, oranges, and tomatoes) commonly cause FA.</i>				
	True	577	2640	3217
	False	1137	3512	4649
	Don't know	1215	4189	5404
<i>A person with a milk allergy can still drink low-fat milk without having an allergic reaction.</i>				
	True	358	911	1269
	False	1340	5582	6922
	Don't know	1231	3848	5079
<i>Foods eaten by a mother can cause a FA by passing to her child through her breast milk.</i>				
	True	994	4881	5875
	False	671	1776	2447
	Don't know	1264	3684	4948

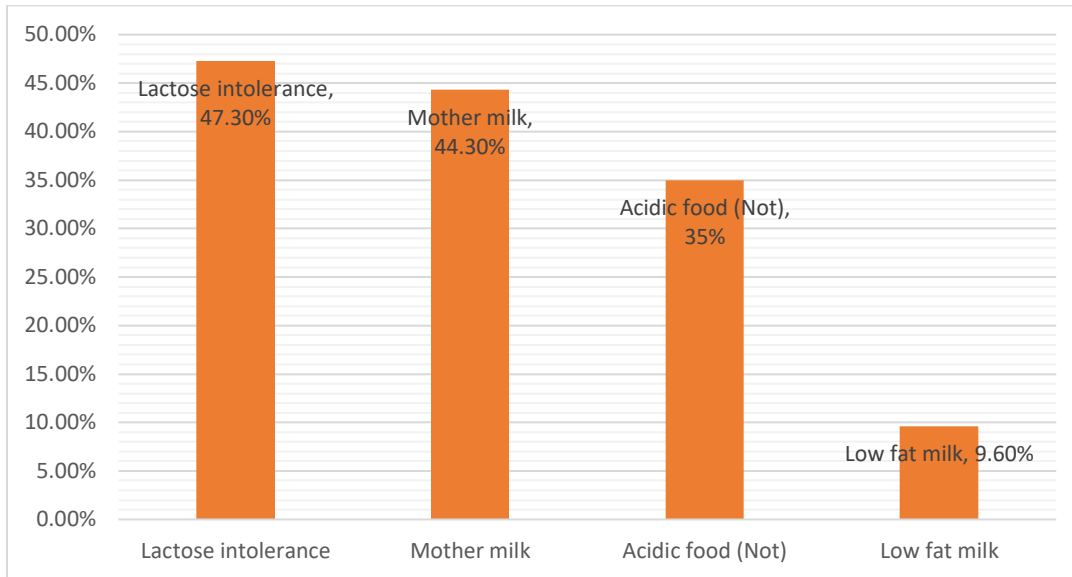


Figure 3. Proportions of knowledge levels by some allergies

Table 4 summarizes the study subjects by sex and some concepts about preventive measures. On querying the participants "whether *Food allergies can go away as a person gets older*," 3193(24%) answered "YES," of whom 691(23.6%) were males and 2502(24.2%) were females.

In the query "*The only way to prevent an allergic reaction is to stay away from food that causes an*

allergic reaction," 10407(78.4%) answered "YES," of whom 2170 (74%) were males and 8237 (79.6%) were females.

In the query "*There is a cure for food allergies*," 2895 (21.8%) answered "NO," of whom 603 (20.6%) were males, and 2292 (22%) were females.

Table 4. Study subjects by sex and some judgments about preventive measures.

Category	Variable	Males n=2929	Females n=10341	Total n=13270
<i>Food allergies can go away as a person gets older</i>				
	Yes	691	2502	3193
	No	891	3085	3976
	Don't Know	1347	4754	6101
<i>The only way to prevent an allergic reaction is to stay away from food that causes an allergic reaction</i>				
	Yes	2170	8237	10407
	No	312	871	1183
	Don't Know	447	1233	1680
<i>There is a cure for food allergies</i>				
	Yes	1171	3662	4833
	No	603	2292	2895
	Don't Know	1155	4387	5542

On asking the participants about the quick symptoms of FA reactions, about 3590/13270(27%) answered, "Immediately his tongue swells, and he will have trouble breathing," comprising 615(21%) males and 2975(28.8%) females. About 7924 (60%) participants indicated

that "*After 15 minutes, he gets hives on his face and chest*," including 1753(60%) males and 6171(60%) females. When asking the contributors, "*Where is the best place to use an EpiPen (injectable epinephrine)?*" 1480/13270(11%) answered "Buttock," as indicated in Table 5

Table 5. Descriptions of the study subjects by symptoms and management.

Category	Variable	Males	Females	Total
<i>A boy with a milk allergy accidentally drank some milk which of the following could be a symptom of FA reaction</i>				



<i>After 2 days, he gets hyperactive and cranky and has headaches</i>	385	794	1179
<i>After 15 minutes, he gets hives on his face and chest</i>	1753	6171	7924
<i>Immediately his tongue swells, and he will have trouble breathing</i>	615	2975	3590
<i>He has a stuffy nose that won't go away for weeks</i>	176	401	577
Total	2929	10341	13270
<i>Where is the best place to use an EpiPen (injectable epinephrine)?</i>			
Upper arm	646	2220	2866
Buttock	434	1046	1480
Outer thigh	526	1817	2343
I don't know	1323	5258	6581
Total	2929	10341	13270

As indicated in Table 6, Figure 4, FA was increasingly diagnosed in age groups (36-45 &

46+) followed by 26-35 years, and (18-20& 21-25), representing 14%, 13%, and 11%, respectively.

Table 6. Distribution of FA by age.

Variable	18-20 years	21-25	26-35	36-45	46+	Total
<i>Do you suffer from FA, and have you been diagnosed with an IgE test?</i>						
Yes	333	559	472	266	166	1796
No	2643	4583	3220	1855	1045	13346
Total	2976	5142	3692	2121	1211	15142
<i>Do you take care of people with food allergies?</i>						
Yes	225	401	388	303	128	1445
No	2386	4147	2813	1542	913	11801
Total	2611	4548	3201	1845	1041	13246

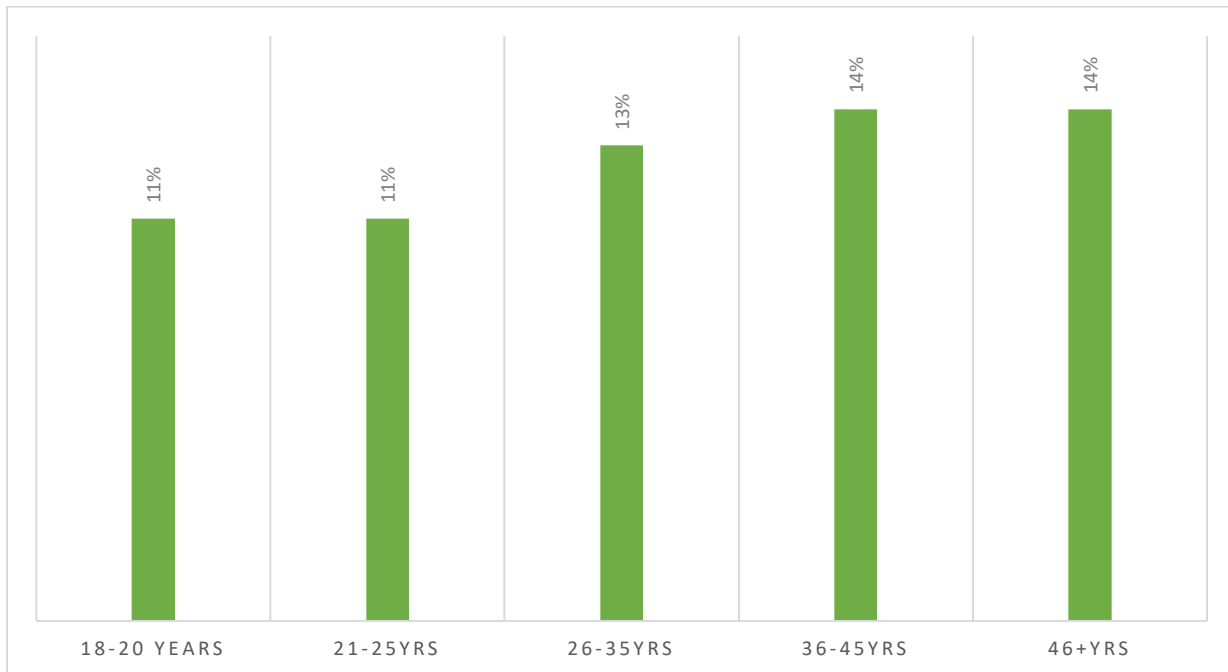


Figure 4. Proportions of FA by age

Table 7. Distribution of FA by monthly income.

Variable	<3000SAR	3000-6000	6000-8000	8000-10000	10000-15000	15000-20000	20000-25000	>25000
<i>Do you suffer from FA, and have you been diagnosed with an IgE test?</i>								



Yes	884	279	124	153	164	93	41	58
No	6971	1949	843	1004	1349	598	249	383
Total	7855	2228	967	1157	1513	691	290	441
<i>Do you take care of people with food allergies?</i>								
Yes	676	244	94	106	179	66	25	55
No	6239	1698	744	887	1161	528	222	322
Total	6915	1942	838	993	1340	594	247	377

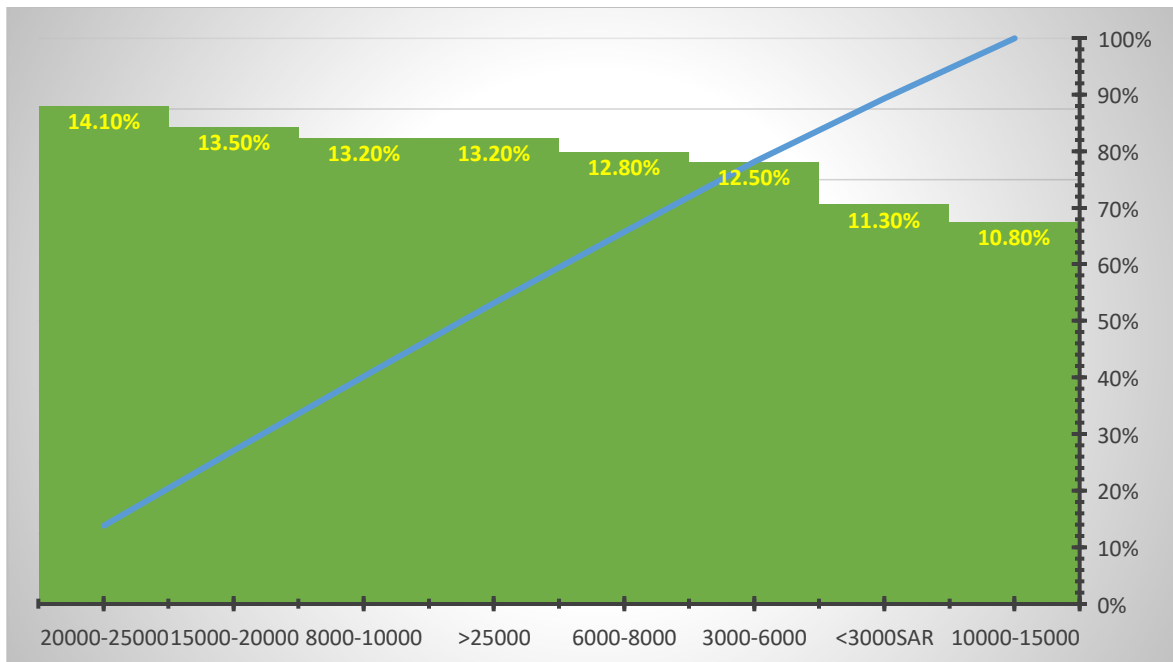


Figure 5. Proportions of FA by monthly income.

Regarding the proportions of FA and monthly income, the most affected people were those with 20000 to 25000 SAR, followed by 15000-20000, and 8000 to 10000, representing 14.1%, 13.5%, and 13.2%, in this order, as indicated in Table 7, Figure 5.

Table 8, Figure 6, describe the proportions of overall knowledge levels of FA by the level of education. High ratios of knowledge levels were For FA, more in children increased percentage seen within illiterate (61%), followed by MSc (57%) and Ph.D. (55%).

Table 8. Level of knowledge of FA by education

Variable	illiterate	High school	Diploma	BSc	MSc	PhD	Total
<i>FA is an allergic reaction that happens when the body considers a food to be harmful</i>							
Yes	51	1638	643	4266	302	104	7004
False	14	755	282	2689	184	55	3979
Don't know	15	589	268	1317	76	22	2287
Total	80	2982	1193	8272	562	181	13270
<i>A family history of FA is considered a risk factor for having FA.</i>							
Yes	53	1733	669	5474	412	125	8466
False	17	400	176	1002	62	21	1678

observed: For "FA is an allergic reaction," seen illiterate followed by Ph.D., and high school, representing 64%, 57%, and 55%, correspondingly. For family history, high knowledge levels were revealed in MSc (73%), followed by Ph.D. (69%) and illiterate & BSc (66%). For hives, mostly MSc 985%) followed by BSc (81%) and high school (74%).



Don't know	10	849	348	1796	88	35	3126
Total	80	2982	1193	8272	562	181	13270
<i>Asthma is a significant risk factor for severe anaphylaxis</i>							
Yes	45	976	426	2967	224	72	4710
False	16	743	314	1937	129	44	3183
Don't know	19	1263	453	3368	209	65	5377
Total	80	2982	1193	8272	562	181	13270
<i>FA is an infectious condition</i>							
Yes	32	284	124	501	28	16	985
False	30	2223	860	6687	483	147	10430
Don't know	18	475	209	1084	51	18	1855
Total	80	2982	1193	8272	562	181	13270
<i>Hives (red bumps or blotches on the skin that can be itchy) are a common symptom of a FA reaction</i>							
Yes	49	2210	871	6689	476	145	10440
False	11	191	76	431	28	10	747
Don't know	20	581	246	1152	58	26	2083
Total	80	2982	1193	8272	562	181	13270
<i>FA is more common in children than in adults</i>							
Yes	49	1479	592	4282	320	100	6822
False	14	459	207	1204	78	28	1990
Don't know	17	1044	394	2786	164	53	4458
Total	80	2982	1193	8272	562	181	13270

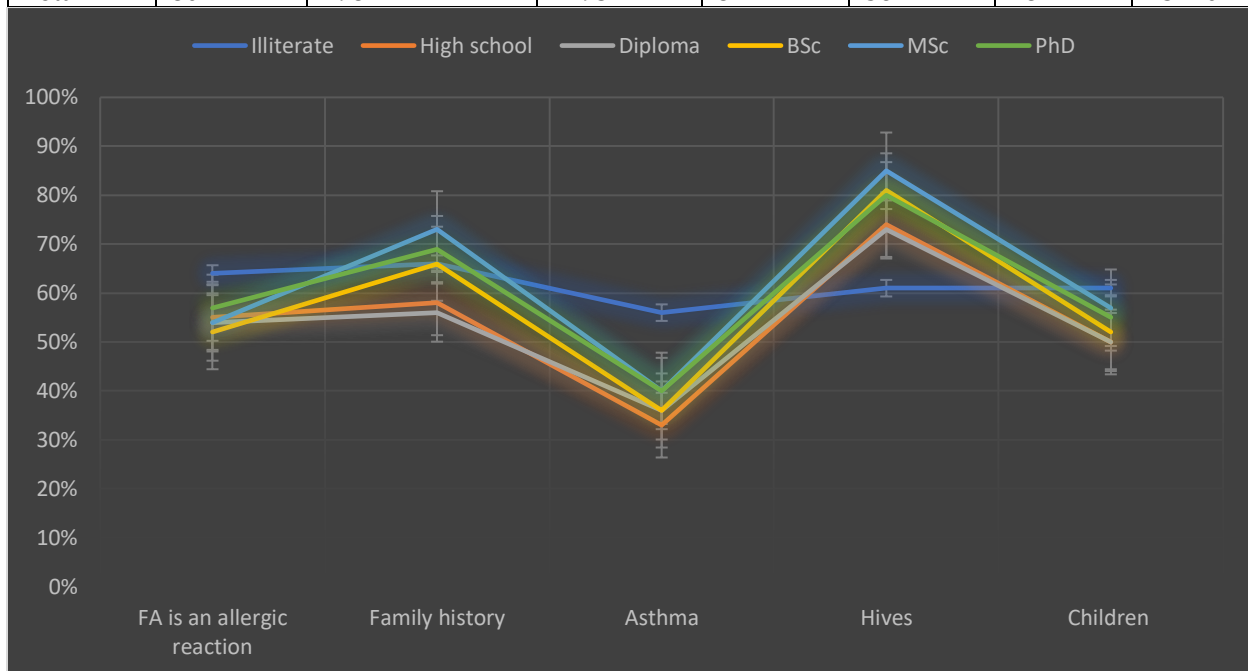


Figure 6. Proportions of overall knowledge levels of FA by the level of education.

Discussion

FA is a widespread disorder that has varying loads depending on geographical location. This variation



may be related to nutritional choices and level of awareness of prevalent allergy foods. Because there is a scarcity of literature in this field from Saudi Arabia, the purpose of this study was to assess the community's understanding of the techniques to raise awareness of food allergies in Saudi Arabia.

The current study's findings revealed that approximately 12% of the individuals had FA, with prevalence rates being roughly similar between males and females. To the best of our knowledge, no epidemiological studies have been conducted in Saudi Arabia to determine the actual prevalence of FA. FA is said to affect up to 10% of youngsters in wealthy countries [14]. However, the prevalence of FA allergy varies widely depending on a number of factors, including age and other demographic features. Some investigations found incidence rates ranging from 5.7% to 61.6% [15-17].

The overall level of knowledge metrics presented in this study (57.1%) was average. In this context, there were just two studies from Saudi Arabia available at the time. A study looked at the timing of introducing potentially allergenic foods into children's diets, as well as the level of maternal understanding and compliance with existing recommendations. Approximately 25% of the youngsters in the research were identified as high risk. Most moms overlook or disagree that the timing of the introduction of allergenic foods may help to prevent FA. Only 15.9% of mothers received adequate information from their health care providers [10]. Evaluated the allergen-labeling (AL) knowledge, practices, preferences, and perceptions regarding the latest Saudi Food and Drug Authority (SFDA) AL legislation among consumers with FA in Saudi Arabia. Only 28.1% declared knowledge about food allergen labeling and the related legislation in Saudi Arabia. Around 67% used to check labels in food packages. About 84% preferred food carrying safety statements. About 94% of participants supported SFDA legislation and like to eat in restaurants with available food allergen information [11].

The majority of participants (78.7%) were aware that "Hives (red bumps or blotches on the skin that can be itchy) are a common symptom of an FA reaction," and similar numbers were able to distinguish Food allergy reactions from infectious illnesses. Only 27% of the participants were able to identify the earliest signs of FA. However, people with FA have a wide range of symptoms that can

interact with other non-FA symptoms. However, irritation of the lips or tongue, as well as urticaria, are noteworthy characteristics [17]. Although the females' participants were much more than the males in the present study, no knowledge levels differences were noticed when calculating statistical metrics within each entire group.

Regarding age, most patients that experienced previous food allergic conditions were within the age range 36 – 45 years. This opposes the reports that FA is more common among the younger population and children [18]. This might be related to the increased number of participants in this study within the age group 36-45 years.

In the present study, monthly income didn't show any significant value with FA. Social and financial status and differences in prevalence rates of FA were previously reported [19]. In Saudi Arabia, though there is a wide range of monthly income, the life pattern and food intake are relatively similar.

In conclusion, The Saudi population has a low general level of awareness of FA allergies. There is an increase in FA proportions in the 36–45 age group. The degree of schooling, socioeconomic standing, or sex does not appear to have an impact on FA's knowledge. The study's FA prevalence percentages were found in comparatively poorer nations. All facets of the Saudi population, irrespective of age, socioeconomic standing, or educational attainment, are considered to benefit from health education regarding FA.

Acknowledgment

The authors would like to express their gratitude to all participants for their kind cooperation.

Authors Contribution

ABA: Conceptual, consultation, funding, and approval of the final version

KEME: Conceptual, data analysis, funding, and approval of the final version

MAA: conceptual, manuscript drafting, and approval of the final version

HGA: conceptual, administration, funding, and approval of the final version

Funding

Self-funded.

Data Availability

The data presented in this study are available on request to the corresponding author.

Disclosure of Interest

No interest to declare



References

- Peters RL, Krawiec M, Koplin JJ, Santos AF. Update on food allergy. *Pediatr Allergy Immunol.* 2021;32(4):647-657. doi: 10.1111/pai.13443.
- 2-Caimmi D, Caffarelli C, Licari A, Miraglia Del Giudice M, Calvani M, Marseglia GL, Marseglia A, Ricci G, Martelli A, Cravidi C, Caimmi S. Food allergy in primary care. *Acta Biomed.* 2021 Nov 29;92(S7):e2021521. doi: 10.23750/abm.v92iS7.12416.
- 3-Sampath V, Abrams EM, Adlou B, et al. Food allergy across the globe. *J Allergy Clin Immunol.* 2021 Dec;148(6):1347-1364. doi: 10.1016/j.jaci.2021.10.018.
- 4- Krisnawati DI, Alimansur M, Atmojo DS, Rahmawati EQ, Rahayu D, Susilowati E, Kuo T-R. Food Allergies: Immunosensors and Management. *Applied Sciences.* 2022; 12(5):2393. <https://doi.org/10.3390/app12052393>.
- 5- Iweala OI, Choudhary SK, Commins SP. Food Allergy. *Curr Gastroenterol Rep.* 2018;20(5):17. doi:10.1007/s11894-018-0624-y.
- 6- Anvari S, Miller J, Yeh CY, Davis CM. IgE-Mediated Food Allergy. *Clin Rev Allergy Immunol.* 2019 Oct;57(2):244-260. doi: 10.1007/s12016-018-8710-3.
- 7- Oriol RC, Wang J. Diagnosis and Management of Food Allergy. *Immunol Allergy Clin North Am.* 2021 Nov;41(4):571-585. doi: 10.1016/j.iac.2021.07.012.
- 8- Terlouw S, van Boven FE, Borsboom-van Zonneveld M, de Graaf-In 't Veld C, van Splunter ME, van Daele PLA, van Maaren MS, Schreurs MWJ, de Jong NW. Homemade Food Allergen Extracts for Use in Skin Prick Tests in the Diagnosis of IgE-Mediated Food Allergy: A Good Alternative in the Absence of Commercially Available Extracts? *Nutrients.* 2022 Jan 21;14(3):475. doi: 10.3390/nu14030475.
- 9- Brar KK. Food Allergy Evaluation for Dermatologic Disorders. *Immunol Allergy Clin North Am.* 2021 Aug;41(3):517-526. doi: 10.1016/j.iac.2021.04.010.
- 10-Almutairi AM, Aldayel AA, Aldayel AS, Alhussain HA, Alwehaibi SA, Almutairi TA. Maternal awareness to the timing of allergenic food introduction in Saudi infants: A cross-sectional study. *Int J Pediatr Adolesc Med.* 2021 Dec;8(4):239-245. doi: 10.1016/j.ijpam.2021.01.003.
- 11-Alghafari WT, Attar AA, Alghanmi AA, Alolayan DA, Alamri NA, Alqarni SA, Alshahafi AM, Arfaoui L. Responses of consumers with food allergy to the new allergen-labelling legislation in Saudi Arabia: a preliminary survey. *Public Health Nutr.* 2021 Dec;24(17):5941-5952. doi: 10.1017/S1368980021002500.
- 13-Gupta, R. S. *et al.* Development of the Chicago Food Allergy Research Surveys: assessing knowledge, attitudes, and beliefs of parents, physicians, and the general public. *BMC Health Serv. Res.* 2009; 9, 142.
- 14- Loh, Wenying, and Mimi L K Tang. "The Epidemiology of Food Allergy in the Global Context." *International journal of environmental research and public health* 2018; 15,9 2043. doi:10.3390/ijerph15092043
- 15-Grabenhenrich LB. Epidemiologische Daten zur Nahrungsmittelallergie in Europa [The epidemiology of food allergy in Europe]. *Bundesgesundheitsblatt Gesundheitsforschung Gesundheitsschutz.* 2016 Jun;59(6):745-54. German. doi: 10.1007/s00103-016-2358-z.
- 15-Zukiewicz-Sobczak, Wioletta Agnieszka et al. "Causes, symptoms and prevention of food allergy." *Postepy dermatologii i alergologii* vol. 30,2 (2013): 113-6. doi:10.5114/pdia.2013.34162.
- 16- Joao Pedro Lopes, Scott Sicherer. Food allergy: epidemiology, pathogenesis, diagnosis, prevention, and treatment. *Current Opinion in Immunology* 2020;66: 57-64.
- 17- Koga T, Tokuyama K, Ogawa S, Morita E, Ueda Y, Itazawa T, Kamijo A. Surveillance of pollen-food allergy syndrome in elementary and junior high school children in Saitama, Japan. *Asia Pac Allergy.* 2022 Jan 14;12(1):e3. doi: 10.5415/apallergy.2022.12.e3.
- 18-Turgay Yagmur I, Kulhas Celik I, Yilmaz Topal O, Civelek E, Toyran M, Karaatmaca B, Kocabas CN, Dibek Misirlioglu E. The Etiology, Clinical Features, and Severity of Anaphylaxis in Childhood by Age Groups. *Int Arch Allergy Immunol.* 2022 Jan 24:1-11. doi: 10.1159/000521063.
- 19- Hurst K, Gerdts J, Simons E, Abrams EM, Protudjer JLP. Social and financial impacts of food allergy on the economically disadvantaged and advantaged families: A qualitative interview study. *Ann Allergy Asthma Immunol.* 2021 Aug;127(2):243-248. doi: 10.1016/j.anai.2021.04.020.