

# A Cross-Section Survey Assessment Study on the Prevalence of Knowledge and Awareness toward the Attitude on the Severity of Food Allergy among the Saudi Population of Jeddah Region

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## Abstract

**Introduction:** Food Allergy (FA) is an adverse immune reaction triggered by a specific food antigen. It can be immunoglobulin (Ig) E-mediated or non-IgE-mediated, or mixed. FA is a common life-threatening condition that can affect families' well-being. We conducted our study based on a study done in the Al-Taif city, Saudi Arabia. This study aimed to measure and raise awareness regarding the causes, severity, and symptoms of FA in Jeddah, Saudi Arabia. **Materials and Methods:** A cross-sectional study was conducted on 2060 participants. Data were collected through a self-reported modified questionnaire, randomized, online-based questionnaire, and direct interview with the campaign's participants, which were performed from October 2019 to November 2019. The designed questionnaire encompassed demographic information such as age, gender, and educational level and ten comprehensive questions regarding FA. **Results and Discussion:** Most subjects had a FA (65.6%). The FA was mostly to eggs (46.3%), then seafood (30.4%), dairy foods (21.2%), and nuts (20.3%). Moreover, most allergy symptoms were moderate (52.6%), while severe was (13.1%). Most allergy symptoms were itching (57.7%) followed by dyspnea (36.2%) body swelling (26.5%). Regarding the awareness score range from 0 to 6, with 0 being the lowest score, and 6 being the highest score, the participants who had terrible scores were significantly higher than those with adequate scores. Subjects with food allergies had a more adequate awareness score than those without food allergies (47.7% vs. 13.1%). **Conclusion:** A health education program about food allergies should be designed and conducted to educate our population about food allergies, treatment options, severity, and possible causes. It is also recommended to have a national day in Saudi Arabia to educate the population about food allergies, especially mothers and children.

**Key words:** Allergens, anaphylactic shock, eggs, food allergy, food and drug administration, IBM SPSS Statistics for Windows, immunoglobulin E, peanuts, shellfish

## INTRODUCTION

Food allergy (FA) is defined as an adverse immune reaction triggered by a specific food antigen, and it can be immunoglobulin (Ig) E-mediated or non-IgE-mediated or mixed.<sup>[1]</sup> FA is a growing public health problem that affects millions of people and their quality of life.<sup>[2]</sup> While there is a lack of detailed epidemiological data, over 220

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**Received:** 26-02-2022

**Revised:** 26-04-2022

**Accepted:** 06-05-2022

million people worldwide are estimated to suffer from FA.<sup>[1]</sup> In addition to that, the prevalence of FA has increased in Western countries in the last two decades.<sup>[3]</sup> However, only a few studies on food allergies were performed on the Saudi population. More than 170 identifiable foods are branded to cause allergy, with only a handful of these foods causing most reactions, and common food allergens differ depending on geographic regions, age, local diet, and many other circumstances.<sup>[3]</sup> The Food and Drug Administration (FDA) classifies milk, egg, peanuts, soybeans, wheat, tree nuts, fish, and crustacean shellfish, as the eight most prevalent food allergens.<sup>[4]</sup> The most common foods that trigger allergic reactions include cow's milk, egg, peanut, soy, tree nuts, and wheat in children. While on the other hand, fish and shellfish and peanut and tree nuts are considered the culprit in adults.<sup>[5]</sup> Sometimes FA can be a life-threatening problem.<sup>[6]</sup>

According to how severe the condition is, symptoms may range from tingling or numbness around the mouth up to anaphylactic shock.<sup>[7]</sup> Primarily, FA diagnosis is based on clinical history, though confirmed by testing, such as skin prick testing, oral food challenges, and specific IgE.<sup>[8]</sup> As far as management goes, FA chiefly entails firm avoidance of the triggering food allergen and the commencement of treatment in case of an accidental consumption.<sup>[9,10]</sup> A previous study in the United Kingdom, was conducted in 2014, shows that the highest prevalence of food allergens in young children is caused by cow's milk (2.5%), egg (1.3%), and an adult is caused by shellfish (2%) and peanut (0.6%).<sup>[7]</sup> Another study performed in US 2015–2016 has established the prevalence rate of FA among adults (10.8%), include (51.1%) had suffered at least one severe allergic reaction from food, and the history of severe reaction was observed most commonly between participants with consuming peanut (67.8%).<sup>[5]</sup> Furthermore, a Saudi study that ran from 2015 to 2017 investigated different triggers of anaphylaxis with cases admitted to the emergency department revealed that food (39.1%) is the top trigger compared to other measured parameters.<sup>[11]</sup> Another recent 2019 Saudi study in Taif city was done with a sample of 400 Mothers concluded that around (48%) of children had a history of symptoms suggesting FA. Furthermore, the study showed that only 24% of the mothers had good knowledge about FA, while 58% had poor knowledge. For the reason that, there is a paucity of data in Saudi Arabia about allergic responses to foods and its awareness along with the lack of interventions, thus promoting to increase the knowledge and awareness of FA nationwide and in the society which is essential.<sup>[11,12]</sup> Therefore, this study aims to raise awareness regarding the causes and symptoms of FA in Jeddah.

## MATERIALS AND METHODS

A cross-sectional study was constructed at Ibn Sina National College for Medical Studies. A campaign was held during a weekend at the Mall of Arabia, recruiting the public across the city of Jeddah. Mall of Arabia was selected for logistic

reasons as it is the second biggest mall in Jeddah city with 109 million visitors annually. The survey was a randomized, online-based questionnaire, and a direct interview with the campaign's participants from October 2019 to November 2019. Both English/Arabic versions of the questionnaire were developed. Consent approvals were given from the ethical committee at Ibn Sina National College of Medical Sciences in 2019. The number of participants who could fully complete the survey questions was 2060 participants. The designed questionnaire encompassed demographic information such as age, gender, educational level, and ten comprehensive questions regarding FA.

Furthermore, additional questions were written depending on relatedness to breastfeeding *x*. Based on reviews of existing literature, essential content areas of FA were reputable. Six content areas are recognized: Definition, symptoms, severity, causes, awareness of vulnerability and predominance, and treatment. These areas designed the outline, from which questions were inspired. A standardized set of open-ended, multiple-choice, and yes/no questions were included examples of the questions, as shown in Table 1. Participants were asked to choose what food they were allergic to. The eight most common food allergens documented by the FDA were included in the analysis are milk, egg, wheat, soy, peanut, tree nuts, fish, and crustacean shellfish.

## Statistical analysis

As appropriate, the values were presented as number (%) or mean  $\pm$  standard deviation (minimum-maximum). IBM

**Table 1: Demographic characteristics of participants**

Characteristics	Value (%)	Significance
Age groups ( <i>n</i> =2061)		
≤20 years	284 (13.7)	0.0001
20–39 years	1178 (57.2)	
40–59 years	548 (26.6)	
≥60 years	49 (2.4)	
Gender ( <i>n</i> =2059)		
Male	877 (42.6)	0.0001
Female	1182 (57.4)	
Marital status ( <i>n</i> =2014)		
Single	991 (49.2)	0.476
Married	1023 (50.8)	
Education levels ( <i>n</i> =2014)		
Elementary	71 (3.5)	0.0001
Intermediate	140 (7.0)	
Secondary	497 (24.7)	
Academic education	1306 (63.8)	

Data were expressed as number (percentage). Significance between groups was made using Person Chi-square test

SPSS Statistics for Windows, version 23 was utilized for analysis (IBM SPSS, IBM Corp., Armonk, N.Y., USA). The right answer to the awareness question was given 1, while the wrong answer was given 0.

Then, the marks of the six questions were summated to each participant. The awareness score ranges from 0 to 6, with a score  $\leq 3$  was considered a bad score, while  $> 3$  was considered an adequate score. Statistical comparisons were made by Pearson Chi-square test for categorized data and parametric data by Kruskal–Walli’s test for comparison of more than two groups and Mann–Whitney U-test for comparison of two groups. The data were significant if  $P < 0.05$ .

## RESULTS AND DISCUSSION

The demographic characteristics of the participants are shown in Table 1. Most of the participants were in the age group 20–39 years (57.2%), then 40–59 years (26.6%),  $\leq 20$  years (13.7%) and least  $\geq 60$  years (2.4%) with significant difference between groups ( $P < 0.0001$ ). The number of females was significantly higher than males (57.4% vs. 42.6%,  $P < 0.0001$ ). There was an insignificant difference regarding marital status between participants ( $P = 0.476$ ). The education levels were mostly academic education (63.8%) followed by secondary (24.7%), intermediate (7.0%), and finally elementary (3.5%) with significant difference between them ( $P < 0.0001$ ). Most of the subjects had a FA (65.6%). The FA was mostly to eggs (46.3%) then see foods (30.4%), dairy foods (21.2%), nuts (20.3%), pollens (19.2%), gluten (13.8%), and fruits (13.4%) with significant difference between peoples who had FA to these types of food and those had not ( $P = 0.006$ ;  $P < 0.0001$ ,  $P < 0.0001$ ,  $P < 0.0001$ ,  $P < 0.0001$ , and  $P < 0.0001$ , respectively). Most allergy symptoms were moderate (52.6%) then mild (34.3%), and finally severe (13.1%), with significant differences between them ( $P < 0.0001$ ). Most allergy symptoms were itching (57.7%) followed by dyspnea (36.2%), body swelling (26.5%), tearing (13.8%), tachycardia (12.1%), and finally, abdominal pain (11.4%), with a significant difference between peoples who had these symptoms of FA to these to those, had not ( $P < 0.0001$  for all) [Table 2]. A questionnaire regarding awareness of subjects about FA is represented in [Table 3]. Most participants were not aware of can severely cases of allergy lead to death (39.2%), the relation between ageing and allergy severity (19.8%), breastfeeding protects the child from having FA in future (25.0%), with a significant difference between subject had and had not awareness of these questions ( $P < 0.0001$  for all). However, most participants were aware of background about allergy symptoms (61.9%), the best treatment to allergy (80.6%), and their thinking that there is a substitute for allergens (76.4%), with significant difference between subjects who had and had not awareness of these questions ( $P < 0.0001$  for all).

The awareness score ranges from 0 to 6, with 0 being the lowest score and 6 is the highest score. Most of participants

**Table 2: Prevalence of food allergy**

Characteristics	Value (%)	Significance
Do you suffer from allergy? ( $n=2061$ )		0.0001
No	710 (34.4)	
Yes	1351 (65.6)	
Type of allergy ( $n=1351$ )		
Eggs	625 (46.3)	0.006
See foods	411 (30.4)	0.0001
Dairy products	287 (21.2)	0.0001
Nuts	274 (20.3)	0.0001
Pollens	259 (19.2)	0.0001
Gluten	187 (13.8)	0.0001
Fruits	181 (13.4)	0.0001
Severity of Symptoms ( $n=1351$ )		
Mild	464 (34.3)	0.0001
Moderate	710 (52.6)	
Severe	177 (13.1)	
Most common symptoms ( $n=1351$ )		
Itching	779 (57.7)	0.0001
Dyspnea	489 (36.2)	0.0001
Body swelling	358 (26.5)	0.0001
Tearing	187 (13.8)	0.0001
Tachycardia	163 (12.1)	0.0001
Abdominal pain	154 (11.4)	0.0001

Data were expressed as number (percentage). Significance between groups was made using Person Chi-square test

get score “3” (30.3%), then score “4” (25.3%), score “2” (23.5%), score “5” (9.8%), score “0” (0.9%), and finally score “6” (0.7%), with significance difference between them ( $P < 0.0001$ ). The participants who had bad scores were significantly higher than those with adequate scores (64.2% vs. 35.8%,  $P < 0.0001$ ) [Table 4]. Food allergies were significantly higher in females versus males (60.3% vs. 52.0%,  $P < 0.0001$ ). Meanwhile, there were insignificant differences between subjects with and without FA regarding age group ( $P = 0.325$ ), marital status ( $P = 0.319$ ), and education status ( $P = 0.500$ ) [Table 5]. Adequate awareness was significantly higher in females versus males (63.8% vs. 36.2%,  $P < 0.0001$ ). Meanwhile, there were insignificant differences between subjects with and without adequate awareness regarding age group ( $P = 0.793$ ), marital status ( $P = 0.282$ ), and education status ( $P = 0.129$ ) [Table 6].

The severity of symptoms mainly was mild in age group  $\leq 20$  years (38.3%), moderate in the age group 40–59 years (56.2%), and severe in age group  $\geq 60$  years (29.6%), with significant difference between groups ( $P = 0.001$ ) [Table 7]. The total awareness score was significantly higher in females versus males ( $P < 0.0001$ ) and subjects with academic education versus other education levels ( $P = 0.003$ ). However, there was an insignificant difference in total awareness score

between subjects with different age groups ( $P = 0.837$ ) and marital status ( $P = 0.525$ ) [Table 8].

**Table 3: Awareness about food allergy**

Questions	Value (%)	Significance
Q1. Can severe cases allergy lead to death?		
Yes (correct answer)	808 (39.2)	0.0001
No	543 (26.3)	
Do not know	710 (34.4)	
Q2. Do you have a background about allergy symptoms?		
Yes (correct answer)	1276 (61.9)	0.0001
No	785 (38.1)	
Q3. Do you think there is a relation between aging and the severity of allergy?		
Yes (correct answer)	408 (19.8)	0.0001
No	687 (33.3)	
May be	966 (46.9)	
Q4. Which way is the best in treating allergy?(n=2031)		
Avoid the allergen (correct answer)	1636 (80.6)	0.0001
Oral	191 (9.4)	
Injection	204 (10.0)	
Q5. Can breast feeding protect the child from having food allergy in the future?		
Yes	1545 (75.0)	0.0001
No (correct answer)	516 (25.0)	
Q6. Do you think there is a substitute for allergens?		
Yes (correct answer)	1574 (76.4)	0.0001
No	487 (23.6)	

Data were expressed as number (percentage). Significance between groups was made using Person Chi-square test

**Table 4: Awareness score**

Score	Value (%)	Significance
Total awareness score	3.02±1.19 (0.00–6.00)	
Awareness score		
0 out of 6	19 (0.9)	0.0001
1 out of 6	196 (9.5)	
2 out of 6	484 (23.5)	
3 out of 6	625 (30.3)	
4 out of 6	521 (25.3)	
5 out of 6	201 (9.8)	
6 out of 6	15 (0.7)	
Score status		
Inadequate score ( $\leq 3$ )	1324 (64.2)	0.0001
Adequate score ( $>3$ )	737 (35.8)	

Data were expressed as mean±standard deviation (minimum – maximum) or number (percentage) as appropriate. Significance between groups was made using Person Chi-square test

**Table 5: Cross tabulation between food allergy and demographic characteristics of participants**

Characteristics	Food allergy (%)		Significance
	Yes (n=1351)	No (n=710)	
Age groups (n=2061)			
≤20 years	183 (13.5)	101 (14.3)	0.325
20–39 years	771 (57.1)	407 (57.5)	
40–59 years	370 (27.4)	178 (25.1)	
≥60 years	27 (2.0)	22 (3.1)	
Gender (n=2059)			
Male	537 (39.7)	340 (48.0)	0.0001
Female	814 (60.3)	368 (52.0)	
Marital status (n=2014)			
Single	657 (49.6)	334 (48.4)	0.319
Married	667 (50.4)	356 (51.6)	
Education levels (n=2014)			
Elementary	46 (3.5)	25 (3.6)	0.500
Intermediate	84 (6.3)	56 (8.1)	
Secondary	335 (25.1)	165 (23.9)	
Academic education	862 (65.1)	444 (64.3)	

Data were expressed as number (percentage). Significance between groups was made using Person Chi-square test

**Table 6: Cross tabulation between awareness score and demographic characteristics of participants**

Characteristics	Awareness score		Significance
	Inadequate (n=1324)	Adequate (n=737)	
Age groups (n=2061)			
≤20 years	177 (13.4)	107 (14.5)	0.793
20–39 years	766 (57.6)	412 (55.9)	
40–59 years	349 (26.4)	199 (27.0)	
≥60 years	30 (2.3)	19 (2.6)	
Gender (n=2059)			
Male	610 (46.1)	267 (36.2)	0.0001
Female	712 (53.9)	470 (63.8)	
Marital status (n=2014)			
Single	632 (48.7)	359 (50.1)	0.282
Married	666 (51.3)	357 (49.9)	
Education levels (n=2014)			
Elementary	44 (3.4)	27 (3.8)	0.129
Intermediate	99 (7.6)	41 (5.7)	
Secondary	334 (25.7)	163 (22.8)	
Academic education	821 (63.3)	485 (67.7)	

Data were expressed as number (percentage). Significance between groups was made using Person Chi-square test

**Table 7: Cross tabulation between Severity of allergy and age of participants with food allergy (n=1351)**

Characteristics	Severity of symptoms (%)			Significance
	Mild (n=464)	Moderate (n=710)	Severe (n=177)	
≤ 20 years (n=183)	70 (38.3)	94 (51.4)	19 (10.4)	0.001
20–39 years (n=771)	288 (37.1)	397 (51.5)	88 (11.4)	
40–59 years (n=370)	100 (27.0)	208 (56.2)	62 (16.8)	
≥ 60 years (n=27)	8 (29.6)	11 (40.7)	8 (29.6)	

Data were expressed as number (percentage). Significance between groups was made using Person Chi-square test

A comparison of awareness among participants with and without food allergies is shown in [Table 8]. The subjects with FA had been significant awareness than subjects without FA the following aspects severe cases allergy leads to death ( $P < 0.0001$ ), having back group about allergy ( $P < 0.0001$ ), the relation between ageing and severity of allergy ( $P = 0.007$ ) and there is a substitute for allergens ( $P = 0.004$ ). However, there was an insignificant difference regarding awareness among participants with and without FA in the best treatment of allergy ( $P = 0.506$ ), and breastfeeding protects the child from having FA in the future ( $P = 0.078$ ). The total awareness score was significantly higher in subjects with food allergies than those without food allergies ( $P < 0.0001$ ). Subjects with food allergies had more adequate awareness scores than those without food allergies (47.7% vs. 13.1%,  $P < 0.0001$ ) [Table 9].

FA is an adverse immune reaction triggered by a specific food antigen. The symptoms may range from mild up to life-threatening. Our study goal was to assess the knowledge and perception of FA among the Jeddah city population. Going through this study, we had found that most participants do not have awareness in turn of severe cases of FA lead to death (39.2%) to awareness score which done according to the correct answer, where the participants who had bad score (64.2%) were significantly higher than those with adequate score (35.8%). While in consist of demographic characteristics of the participants, there were insignificant differences regarding the age group, marital status, and education status, eliciting the gender ( $P = 0.0001$ ), in which female (60.3%) were significantly higher than male (52%) [Table 5]. Furthermore, a present Saudi study founded on the scoring system also shows that (58%) mothers had poor knowledge, while (24%) had good knowledge (Taif). However, concerning the mother's knowledge pertinence with demographic data, their result was slightly different, as there was a significant difference regarding mother's age ( $P < 0.05$ ), but likewise, they found little relation to mother's educational level ( $P \geq 0.05$ ) (Taif). Hence, we epitomize that FA awareness is still a necessity for reinforcements. Despite the increased case of FA that has been noticed in the US in the last decade, while in consist of demographic characteristics of the participants, there were insignificant differences regarding the age group, marital status, and education status, eliciting the gender ( $P = 0.0001$ ), in which female (60.3%) were significantly higher than male (52%) Table 5.

**Table 8: Comparison of total awareness score in different category of demographic data**

Characteristics	Total awareness score	Significance
Age groups (n=2061)		
≤20 years	3.03±1.24	0.837
20–39 years	3.01±1.19	
40–59 years	3.031±1.18	
≥60 years	3.14±0.98	
Gender (n=2059)		
Male	2.84±1.20	0.0001
Female	3.15±1.16	
Marital status (n=2014)		
Single	3.02±1.21	0.525
Married	3.00±1.17	
Education levels (n=2014)		
Elementary	3.03±1.34	0.003
Intermediate	2.80±1.16	
Secondary	2.89±1.18	
Academic education	3.08±1.17	

Data were expressed as mean±standard deviation. Significance between groups was made using Kruskal–Wallis test for comparison of more than two groups and Mann–Whitney U-test for comparison of two groups

Furthermore, a present Saudi study founded on the scoring system also shows that 58% of mothers had poor knowledge, while 24% had good knowledge (Taif). However, concerning the mother's knowledge pertinence with demographic data, their results were slightly different, as there was a significant difference regarding mothers age ( $P < 0.05$ ), but likewise, they found little relation to mother's educational level ( $P \geq 0.05$ ) (Taif). In the presented study, it was found that 65.6% of the sample subjects have a FA. They reported eggs, shellfish, dairy products, nuts, wheat, and fruits allergies. Among the reported allergens, people were primarily allergic to eggs (46.3%). This finding matched a cross-sectional observational study performed between March 2016 and December 2017 about the clinical and laboratory characteristics of patients with FA, in which egg allergy (32.2 %) was the highest.<sup>[13]</sup> Furthermore, various other studies demonstrated conflicting results regarding the most common food allergen. A study

**Table 9:** Comparison of awareness among participants with and without food allergy

Questions	Food allergy (%)		Significance
	Yes (n=1351)	No (n=710)	
Q1. Can severe cases allergy lead to death?			
Incorrect answer	543 (40.2)	710 (100.0)	0.0001
Correct answer	808 (59.8)	-	
Q2. Do you have a background about allergy symptoms?			
Incorrect answer	411 (30.4)	374 (52.7)	0.0001
Correct answer	940 (69.6)	336 (47.3)	
Q3. Do you think there is a relation between aging and the severity of allergy?			
Incorrect answer	1062 (78.6)	591 (83.2)	0.007
Correct answer	289 (21.4)	119 (16.8)	
Q4. Which way is the best in treating allergy?(n=2031)			
Incorrect answer	279 (20.7)	146 (20.6)	0.506
Correct answer	1072 (79.3)	564 (79.4)	
Q5. Can breast feeding protect the child from having food allergy in the future?			
Incorrect answer	999 (73.9)	549 (76.9)	0.078
Correct answer	352 (26.1)	164 (23.1)	
Q6. Do you think there is a substitute for allergens?			
Incorrect answer	294 (21.8)	193 (27.2)	0.004
Correct answer	1057 (78.2)	517 (72.8)	
Total score	3.34±1.16	2.39±0.98	0.0001
Score status			
Inadequate score ( $\leq 3$ )	707 (52.3)	617 (66.9)	0.0001
Adequate score ( $>3$ )	644 (47.7)	93 (13.1)	

Data were expressed as number (percentage). Significance between groups was made using Person Chi-square test for categorized data and Mann-Whitney U-test for parametric data

about the prevalence and severity of food allergies among US adults presented that allergy to shellfish was the most prevalent.<sup>[14]</sup> Also, in another study about the prevalence, severity, and distribution of childhood FA in the United States, the highest FA documented among children was peanut allergy.<sup>[15]</sup> Moreover, a study performed on adult Portuguese about the prevalence and clinical features of adverse food reactions also showed contradictory findings to the present study by stating that shellfish and fish were the most common food allergen in their sample.<sup>[13,14,15]</sup>

Studies also revealed disparity concerning the severity of FA symptoms. In the present study, moderate symptoms mainly were prevalent (52.6%). In contrast, a study about the severity of FA in adults and another about severity of FA in children, both conducted in the United States, showed that participants of these studies experienced severe symptoms (51.1%) and (38.7%), respectively.<sup>[13,14]</sup>

In this study, people mainly reported cutaneous manifestations of FA (57.7%). Similarly, a Portuguese study about the clinical features of FA demonstrated matching results (Boyce *et al.*, 2011; and Sicherer and Sampson, 2018). Furthermore, another study about clinical characteristics of patients with

FA further supported this finding by reporting that (55.6%) had atopic dermatitis and (34.4%) had urticarial.<sup>[13]</sup>

## CONCLUSION

Egg allergy was the most common food allergen in our study. However, other allergens were reported in an average percentage and severity among allergic subjects who experienced cutaneous primarily symptoms. Thus, intensive awareness about food allergens, especially those reported with lower percentages, is needed among the Saudi population. The public's knowledge was weakest regarding severe FA cases that can lead to death. Compared to other studies done in the United Kingdom, the knowledge of FA severity leading to death appears to be stronger. Our findings suggest that Saudi Arabia's population awareness needs to be improved regarding the severity of FA. Weakness was also observed considering the relation between ageing and allergy severity. Moreover, weakness observed in breastfeeding protects the child from having a FA. While in another study, they found no statistically significant relationship between the history of breastfeeding and FA with good strong knowledge. However, the public's knowledge was most substantial regarding FA

symptoms (61.9%). Strength was also observed considering best treatment to allergy is avoiding the causative allergen (80.6%). Prior study has established that awareness is strong regarding FA treatment and symptoms. Accordingly, our findings suggest that targeted educational interventions could meaningfully improve the public's knowledge of FA in particular areas of knowledge. However, the participants who had inadequate knowledge were significantly higher than those with adequate knowledge (64.2% vs. 35.8%,  $P < 0.0001$ ) [Table 4]. While in consist of demographic characteristics of the participants, there were insignificant differences regarding the age group, marital status, and education status, eliciting the gender ( $P = 0.0001$ ), in which female (60.3%) were significantly higher than male (52%) Table 5. This study shows that the most severe of symptoms were mild in participants  $\leq 20$  years (38.3%), moderate in participants from 40 to 59 years (56.2%), and severe in participants  $\geq 60$  years (29.6%) and compared to a study was conducted in US, the results revealed that most adults expressed severe FA reactions [Table 7]. The results showed that participants with FA have more awareness than those who do not regard if severe allergy cases can cause death, the background of FA, the relation between ageing and severity of the allergy, and if there is a substitute for allergens. However, there was minimal awareness between participants with/without FA regarding best treatment and whether breastfeeding can protect the child from having FA. Furthermore, this study has shown that the adequate awareness score was higher in participants with food allergies (47.7% vs. 13.1%) [Table 9].

## ACKNOWLEDGMENT

We thank the participants who were all contributed samples to the study. We would like to Acknowledge IbnSina National College, Jeddah, K.S.A., Administration for their constant support and encouragement.

## AUTHORS' CONTRIBUTIONS

All authors contributed equally to this manuscript work and production.

## REFERENCES

- De Martinis M, Sirufo MM, Suppa M, Ginaldi L. 1+3-new perspectives in food allergy. *Int J Mol Sci* 2020;21:1-21.
- Cosme-Blanco W, Arroyo-Flores E, Ale H. 2-food allergies. *Pediatr Rev* 2020;41:403-13.
- Sicherer SH, Sampson HA. Food Allergy: A review and update on epidemiology, pathogenesis, diagnosis, prevention, and management. *J Allergy Clin Immunol* 2018;141:41-58.
- Waserman S, Bégin P, Watson W. IgE-mediated food allergy. *Allergy Asthma Clin Immunol* 2018;14:1-11.
- Gupta RS, Warren CM, Smith BM, Jiang J, Blumenstock JA, Davis MM, *et al.* 7-prevalence and severity of food allergies among US adults. *JAMA Netw Open* 2019;2:e185630.
- Gomaa N, Abdullah T, Alharthi W, Altowairqi A, Binbaz S, Alamri N. 5-knowledge and awareness about food allergy among mothers with allergic children in Taif city, Saudi Arabia. *Int J Med Dev Ctries* 2020;4:49-53.
- Turnbull JL, Adams HN, Gorard DA. Review article: The diagnosis and management of food allergy and food intolerances. *Aliment Pharmacol Ther* 2015;41:3-25.
- Alkanhal R, Alhoshan I, Aldakhil S, Alromaih N, Alharthy N, Salam M, *et al.* 6-Prevalence triggers and clinical severity associated with anaphylaxis at a tertiary care facility in Saudi Arabia A cross-sectional study. *Medicine (Baltimore)* 2018;97:e11582.
- Gupta RS, Kim JS, Springston EE, Smith B, Pongracic JA, Wang X, *et al.* Food allergy knowledge, attitudes, and beliefs in the United States. *Ann Allergy, Asthma Immunol* 2009;103:43-50.
- Iweala OI, Choudhary SK, Commins SP. Food allergy. *Curr Gastroenterol Rep* 2018;20:17.
- Vierk KA, Koehler KM, Fein SB, Street DA. Prevalence of self-reported food allergy in American adults and use of food labels. *J Allergy Clin Immunol* 2007;119:1504-10.
- Gupta RS, Kim JS, Barnathan JA, Amsden LB, Tummala LS, Holl JL. Food allergy knowledge, attitudes and beliefs: Focus groups of parents, physicians and the general public. *BMC Pediatr* 2008;8:36.
- Boyce JA, Assa'ad A, Burks AW, Jones SM, Sampson HA, Wood RA, *et al.* Guidelines for the diagnosis and management of food allergy in the United States: Summary of the NIAID-sponsored expert panel report. *J Am Acad Dermatol* 2011;64:175-92.
- Sicherer SH, Sampson HA. Food allergy. *J Allergy Clin Immunol* 2010;125:S116-25.
- El-Rab MO. Foods and food allergy: The prevalence of IgE antibodies specific for food allergens in Saudi patients. *Saudi J Gastroenterol* 1998;4:25.

**Source of Support:** Nil. **Conflicts of Interest:** None declared.