

Online Appendix 1. Study questionnaire and variables

The Chicago Food Allergy Research Survey for the General Public (CFARS-GP) was used to assess teachers' knowledge, attitudes, and beliefs of food allergy (FA).¹ Minor modifications were made to the CFARS-GP to make it applicable to our setting (i.e., Kuwait) and our target study population (i.e., kindergarten teachers). The CFARS-GP contains 35 items, of which 19 items assessed FA knowledge (16 true/false and 3 multiple choice questions) and 16 items evaluate FA attitudes and beliefs (13 Likert scale and 3 multiple choice questions). The instrument covered the following domains: (1) definition and diagnosis, (2) symptoms and severity, (3) triggers and environmental risk, (4) perceptions of susceptibility and prevalence, (5) stigma and acceptability, (6) perceptions of quality of life, (7) treatment and use of health care, and (8) policy issues.¹ An overall FA knowledge score was calculated for each participant by summing the percentage of knowledge items that each respondent answered correctly.

Moreover, the study questionnaire gathered information on socio-demographic data. In addition, it collected data on whether teachers were aware of any school emergency action plans in the event of an allergic reaction, if teachers have received information about FA and anaphylaxis, if teachers received training in FA, and asked teachers to identify the most common symptoms of FA. The study questionnaire also asked for their knowledge of the best medication that relieves a severe FA reaction and food-induced anaphylaxis. A variable resembling the number of acquaintances with FA a participant knows (ranging from 0 to ≥ 3) was developed by counting if the participant's parents, siblings, spouse, children, and/or someone else they know has FA.

The CFARS-GP was translated to the Arabic language by two of the study investigators who are Arabic native speakers and proficient in the English language. The Arabic-translated version of the CFARS-GP was checked by the other investigators to ensure resemblance to the original survey. Subsequently, pilot testing of the Arabic version of the CFARS-GP was conducted. The respondents in the pilot testing were asked to explain their understanding of the questions to confirm content validity. The comprehensibility and coherence were also reviewed, and the required modifications were done before finalizing the questionnaire. Only the Arabic translated version of the CFARS-GP was used, as it is the population's preferred language. The study questionnaire was converted into a web-based survey. A direct link (QR code) to the study questionnaire was given to each school's principal or vice principal, and she was asked to distribute it among all the teachers who self-completed the study questionnaire.

Online supplemental references

1. Gupta RS, Kim JS, Springston EE, 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.

Online Appendix 2. Description of changes made to the Chicago Food Allergy Research Survey for the General Public (CFARS-GP) Questionnaire.

Following is a description of the changes we made to the CFARS-GP questionnaire (our study questionnaire is provided in the Online Appendix 3):

FA Knowledge section (i.e., Q1 to Q19 in the original CFARS-GP questionnaire; Q13 to Q31 in our study questionnaire):

- The “United States” in Q12 and Q16 in the CFARS-GP questionnaire was changed to “Kuwait” (Q24 and Q28 in our study questionnaire).

Note: The changes we made to the FA knowledge section did not affect the scoring of system of FA knowledge used in the original CFARS-GP questionnaire.

FA Attitudes/Beliefs section (i.e., Q20 to Q35 in the original CFARS-GP questionnaire; Q32 to Q44 in our study questionnaire):

- The “United States” in Q20 in the CFARS-GP questionnaire was changed to “Kuwait” (Q32 in our study questionnaire).
- In the original CFARS-GP questionnaire, Q31 to Q34 were directed to parents with school-aged children. In our questionnaire, we asked all teachers these questions while making the following changes to the questions:

- Q31 in the CFARS-GP questionnaire: “Schools should ban all products with nuts.”
We did not make any changes to this question (Q41 in our study questionnaire) as it is applicable to teachers.
 - Q32 in the CFARS-GP questionnaire: “Schools should have special tables where children with food allergies can safely eat lunch.” We did not make any changes to this question (Q42 in our study questionnaire) as it is applicable to teachers.
 - Q33 in the CFARS-GP questionnaire: “It would be unfair if my child could not have a peanut butter sandwich because of another student’s peanut allergy.” To make this question applicable to teachers with and without children, the following modified question was asked (Q43 in our study questionnaire): “It would be unfair if a student could not have a peanut butter sandwich because of another student’s peanut allergy.”
 - Q34 in the CFARS-GP questionnaire: “I would worry about having a child with food allergy play at my house.” To make this question applicable to all teachers, the following modified question was asked (Q44 in our study questionnaire): “I would worry about having a student with food allergy at my classroom.”
- Questions 29, 30, and 35 in the original CFARS-GP questionnaire were not included in our study questionnaire. These questions asked about the best way to help people with food allergy, the best way to learn about food allergy, and the best way to teach parents how to protect children with food allergy. The decision of not including these questions was to reduce the length of the study questionnaire.

Note: We have provided the questionnaire that we have used as a supplemental material (see Online Appendix 3).

Online Appendix 3. Study Questionnaire**Section 1: Sociodemographic Information:**

1. How old are you (years)?

- | | | | |
|---------------------------------------|------------|---------------------------------------|---------|
| <input type="checkbox"/> ¹ | 21 – 24 | <input type="checkbox"/> ² | 25 – 29 |
| <input type="checkbox"/> ³ | 30 – 34 | <input type="checkbox"/> ⁴ | 35 – 39 |
| <input type="checkbox"/> ⁵ | 40 – 44 | <input type="checkbox"/> ⁶ | 45 – 49 |
| <input type="checkbox"/> ⁷ | 50 or more | | |

2. What is your nationality?

- | | | | |
|---------------------------------------|---------|---------------------------------------|-------------|
| <input type="checkbox"/> ¹ | Kuwaiti | <input type="checkbox"/> ² | Non-Kuwaiti |
|---------------------------------------|---------|---------------------------------------|-------------|

3. What is the highest education level you have completed?

- | | |
|---------------------------------------|---------------------------------------|
| <input type="checkbox"/> ¹ | Less than high school |
| <input type="checkbox"/> ² | High school |
| <input type="checkbox"/> ³ | Diploma (two years post high school) |
| <input type="checkbox"/> ⁴ | Bachelor's degree (university degree) |
| <input type="checkbox"/> ⁵ | Graduate degree (Master, Doctorate) |

4. Which of the following categories best represents the combined income for all family members in your household per month?

- | | |
|---------------------------------------|----------------|
| <input type="checkbox"/> ¹ | <1000 KD |
| <input type="checkbox"/> ² | 1000 – 1499 KD |
| <input type="checkbox"/> ³ | 1500 – 1999 KD |
| <input type="checkbox"/> ⁴ | 2000 – 2499 KD |
| <input type="checkbox"/> ⁵ | 2500 – 2999 KD |
| <input type="checkbox"/> ⁶ | ≥3000 KD |
| <input type="checkbox"/> ⁷ | I do not know |

5. In which governorate do you work?

- | | |
|---------------------------------------|-------------------|
| <input type="checkbox"/> ¹ | Hawally |
| <input type="checkbox"/> ² | Assima |
| <input type="checkbox"/> ³ | Jahra |
| <input type="checkbox"/> ⁴ | Farwaniya |
| <input type="checkbox"/> ⁵ | Mubarak Al-Kabeer |
| <input type="checkbox"/> ⁶ | Ahmadi |

6. What is your marital status?

- | | |
|---------------------------------------|------------------|
| <input type="checkbox"/> ¹ | Married |
| <input type="checkbox"/> ² | Single |
| <input type="checkbox"/> ³ | Divorced/widowed |

7. Do you have children?

- ⁰ No
¹ Yes

8. For how many **years** have you been working as a kindergarten teacher?

- | | |
|---|---|
| <input type="checkbox"/> ¹ This is my first year | <input type="checkbox"/> ² 1 – 2 |
| <input type="checkbox"/> ³ 3 – 4 | <input type="checkbox"/> ⁴ 5 – 6 |
| <input type="checkbox"/> ⁵ 7 – 8 | <input type="checkbox"/> ⁶ 9 – 10 |
| <input type="checkbox"/> ⁷ 11 – 12 | <input type="checkbox"/> ⁸ 13 – 14 |
| <input type="checkbox"/> ⁹ 15 – 16 | <input type="checkbox"/> ¹⁰ 17 – 18 |
| <input type="checkbox"/> ¹¹ 19 – 20 | <input type="checkbox"/> ¹² 21 or more |

9. Have you ever suffered from food allergy?

- ⁰ No
¹ Yes

10. Do you currently have or had students with food allergy in your classroom?

- ⁰ No
¹ Yes
² I do not know

11. Have you had any experience or training with food allergy through your job?

- ⁰ No
¹ Yes

12. Do you know if any of the following people suffer from food allergy?

	Yes	No	I do not know	Not applicable to me
Does any of your parents suffer from food allergy?	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³	<input type="checkbox"/> ⁴
Does any of your siblings suffer from food allergy?	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³	<input type="checkbox"/> ⁴
Does your spouse suffer from food allergy?	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³	<input type="checkbox"/> ⁴
Does any of your children suffer from food allergy?	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³	<input type="checkbox"/> ⁴
Do you know someone else who suffer from food allergy?	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³	<input type="checkbox"/> ⁴

Section 2: Please mark one box for each statement below:

	True	False	I don't know
13. An allergic reaction can happen when the body considers a food to be harmful.	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
14. Lactose intolerance (trouble digesting dairy products) is the same as having a milk allergy.	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
15. A person can die from having a food allergy	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
16. Hives (red bumps or blotches on the skin that can be itchy) are a <u>common</u> symptom of a food allergy reaction.	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
17. People with food allergies can have an allergic reaction after touching a food.	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
18. A person with milk allergy can still drink low-fat milk without having an allergic reaction.	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
19. Foods eaten by a mother can be passed to her child through her breast milk.	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
20. Acidic foods (like lemons, oranges, and tomatoes) <u>commonly</u> cause food allergy	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
21. Allergic diseases run in families.	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
22. Food allergies can go away as a person gets older.	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
23. Food allergy is more common in children than adults.	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
24. The number of children in Kuwait who have a food allergy has been increasing over the past ten years.	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
25. There is a cure for food allergy.	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
26. The <u>only</u> way to prevent an allergic reaction is to stay away from the food that causes the allergy	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
27. A person can take a medicine everyday to prevent having food allergy reactions.	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
28. There is a law in the Kuwait that requires all foods to be labeled with allergy information.	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³

29. Which of the following are the **three** most common food allergies in **children**? [Mark **three** answers with “Yes” that you think are the most common causes of food allergy in children]

	Yes, common cause of food allergy in children	No, not a common cause of food allergy in children
Eggs	<input type="checkbox"/> ¹	<input type="checkbox"/> ²
Shellfish (shrimp, lobster, crab)	<input type="checkbox"/> ¹	<input type="checkbox"/> ²
Peanut	<input type="checkbox"/> ¹	<input type="checkbox"/> ²
Milk	<input type="checkbox"/> ¹	<input type="checkbox"/> ²
Wheat	<input type="checkbox"/> ¹	<input type="checkbox"/> ²
Tree nuts (almonds, walnuts, pecans, cashews)	<input type="checkbox"/> ¹	<input type="checkbox"/> ²

30. Which of the following is the **most** common food allergy in **adults**? [Mark **one** answer with “Yes” that you think is the most common cause of food allergy in adults]

	Yes, common cause of food allergy in adults	No, not a common cause of food allergy in adults
Eggs	<input type="checkbox"/> ¹	<input type="checkbox"/> ²
Shellfish (shrimp, lobster, crab)	<input type="checkbox"/> ¹	<input type="checkbox"/> ²
Peanut	<input type="checkbox"/> ¹	<input type="checkbox"/> ²
Milk	<input type="checkbox"/> ¹	<input type="checkbox"/> ²
Wheat	<input type="checkbox"/> ¹	<input type="checkbox"/> ²
Tree nuts (almonds, walnuts, pecans, cashews)	<input type="checkbox"/> ¹	<input type="checkbox"/> ²

31. A boy with a milk allergy accidentally drank some milk. Please mark which of the following could be a sign of food allergy reaction. [Mark **All** that apply]

	Yes, a sign of food allergy reaction	No, not a sign of food allergy reaction
After two days he gets hyperactive and cranky and has headaches	<input type="checkbox"/> ¹	<input type="checkbox"/> ²
After 15 minutes he gets hives on his face and chest	<input type="checkbox"/> ¹	<input type="checkbox"/> ²
Immediately his tongue swells and he has trouble breathing	<input type="checkbox"/> ¹	<input type="checkbox"/> ²
He has a stuffy nose that won't go away for weeks	<input type="checkbox"/> ¹	<input type="checkbox"/> ²

Section 3: Please mark one box for each statement below:

	Disagree	Neutral	Agree
32. Food allergy is a serious health problem in Kuwait.	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
33. People with food allergies are treated differently because of their food allergy.	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
34. Children with food allergy have overprotective parents.	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
35. Children with food allergy are teased at school.	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
36. For someone who has a food allergy, staying away from the food that he or she is allergic to is difficult.	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
37. People with food allergies worry a lot about their allergy.	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
38. It is difficult for people with food allergies to safely eat at restaurants	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
39. Having an EpiPen or Twinject (injectable epinephrine) is important for most children with severe food allergies.	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
40. Schools should have plans for keeping children with food allergies safe at school.	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
41. Schools should ban all products with nuts.	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
42. Schools should have special tables where children with food allergies can safely eat lunch.	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
43. It would be unfair if a student could not have a peanut butter sandwich because of another student's peanut allergy	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³
44. I would worry about having a student with food allergy at my classroom	<input type="checkbox"/> ¹	<input type="checkbox"/> ²	<input type="checkbox"/> ³

45. Does the school where you work have an emergency action plan in the case of a child having an allergic reaction in the school?

- ¹ No
² Yes
³ I do not know

46. Did you ever receive information about food allergy and anaphylaxis?

- ¹ No
² Yes

47. What are the most frequent symptoms of food allergy?

- ¹ Urticaria, stomachache, wheezing
- ² Headache, fever, tremors
- ³ Constipation, headache, nausea
- ⁴ Conjunctivitis, tonsillitis

48. What are the most frequent symptoms of anaphylaxis?

- ¹ Asthma, dermatitis
- ² Conjunctivitis, rhinitis, headache
- ³ Urticaria, itch, stomachache, wheezing, throat tightness, collapse
- ⁴ Tonsillitis, cough, temperature

49. Which is the best medication for anaphylaxis and severe food allergy reaction?

- ¹ Orally antihistamine
- ² Cortisone
- ³ Intramuscular adrenaline
- ⁴ Intramuscular antihistamine
- ⁵ I do not know

50. Do you know how to use an adrenaline pen (an EpiPen is shown in the picture below)?

- ¹ No
- ² Yes
- ³ I do not know what an EpiPen is.



Supplementary Table 1. Overall and itemized knowledge of food allergy among kindergarten teachers stratified by previous training in food allergy

Item	Previous training in FA, % (n)		P-value*	FDR- adjusted P-value [#]
	Yes (n = 119), Correct	No (n = 763), Correct		
Overall mean score	55.9	51.6	0.005 [†]	0.042
Definition and diagnosis				
Allergic reaction when body considers food harmful (T)	36.1 (43)	28 (214)	0.071	0.225
Lactose intolerance same as milk allergy (F)	15.1 (18)	10 (76)	0.089	0.239
Symptoms and severity				
Food allergy reaction can be fatal (T)	61.3 (73)	55.8 (426)	0.259	0.463
Hives a common symptom of food allergy (T)	81.5 (97)	81.8 (624)	0.944	0.944
Signs of milk allergy reaction				
Hyperactivity (F)	59.7 (71)	69.6 (531)	0.030	0.150
Hives (T)	84 (100)	80.7 (616)	0.392	0.516
Tongue swelling/trouble breathing (T)	74.8 (89)	63.7 (486)	0.018	0.113
Stuffy nose (F)	52.9 (63)	58.8 (449)	0.225	0.433
Triggers and environmental risk				
Allergic reaction from touching allergenic food (T)	58.8 (70)	43.5 (332)	0.002	0.025
Milk-allergic person: safely drink low-fat milk (F)	44.5 (53)	41.5 (317)	0.539	0.642
Mother can pass food to child through breast milk (T)	72.3 (86)	57 (435)	0.002	0.025
Acidic food: common cause of food allergy (F)	26.1 (31)	22.4 (171)	0.380	0.516
3 Most common childhood food allergies				
Egg	69.7 (83)	71.2 (543)	0.751	0.816
Milk	73.9 (88)	69.9 (533)	0.363	0.516
Peanut	80.7 (96)	83.6 (638)	0.424	0.530
Most common adult food allergy: shellfish	61.3 (73)	56.4 (430)	0.307	0.484
Perceptions of susceptibility and prevalence				
Allergic diseases run in families (T)	56.3 (67)	53.7 (410)	0.601	0.683
Food allergy can go away with age (T)	46.2 (55)	38.4 (293)	0.105	0.239
Food allergy more common in children (T)	70.6 (84)	62.8 (479)	0.099	0.239
Food allergy increasing in Kuwaiti children (T)	68.1 (81)	60.6 (462)	0.117	0.244
Treatment and use of health care				
There is a cure for food allergy (F)	24.4 (29)	17.4 (133)	0.069	0.225
Avoidance is the only way to prevent food allergy reaction (T)	79.8 (95)	72 (549)	0.072	0.225
Daily medicine can prevent food allergy reaction (F)	33.6 (40)	32.6 (249)	0.832	0.867
Policy issue				
Law in Kuwait requires foods to be labeled	9.2 (11)	6.7 (51)	0.310	0.484

FA: food allergy. The correct answer is indicated in parentheses as: T = true and F = false; FDR: false discovery rate.

* Calculated using chi-squared (χ^2) test.

[†] Calculated using the Wilcoxon rank sum test.

[#] P-values were adjusted for multiple testing using the FDR method.

Supplementary Table 2. Perception, attitudes, beliefs, and policy consideration of food allergy according to having acquaintances with food allergy

Item	Have any acquaintances with FA, Agree % (n)		P-value*	FDR-adjusted P-value#
	Yes (n = 584)	No (n = 298)		
Stigma and acceptability				
Food allergy serious problem in Kuwait	49.0 (286)	36.0 (106)	<0.001	<0.001
People with food allergies treated differently	63.2 (365)	52.7 (157)	<0.001	<0.001
Parents of food-allergic child overprotective	28.1 (164)	26.9 (80)	0.084	0.091
Food-allergic children teased at school	15.9 (93)	12.8 (38)	0.095	0.097
Would worry over student with food allergy	49.0 (286)	40.9 (122)	0.003	0.005
Perceptions of quality of life				
Avoiding allergenic food is difficult	35.5 (207)	30.2 (90)	0.013	0.015
People worry a lot about their food allergy	59.1 (345)	45.0 (134)	<0.001	<0.001
Hard to eat out safely with food allergy	51.5 (301)	45.0 (134)	0.008	0.010
Treatment and use of health care				
Having injectable epinephrine (EpiPen) important for child with severe food allergy	51.7 (302)	39.9 (119)	<0.001	<0.001
Policy issues				
Schools should have plans to keep food-allergic children safe	67.6 (395)	53.7 (160)	<0.001	<0.001
Schools should ban all products with nuts	36.6 (214)	31.5 (94)	<0.001	<0.001
Schools should have special table for food-allergic child	48.3 (282)	39.9 (119)	0.005	0.007
Unfair if a student cannot have peanut butter sandwich	43.7 (255)	34.6 (103)	0.001	0.002

FA: food allergy; FDR: false discovery rate.

* Calculated using chi-squared (χ^2) test.

P-values were adjusted for multiple testing using the FDR method.

Supplementary Table 3. Frequency of general knowledge of food allergy emergency interventions

Variable	%
Does the school where you work have an emergency action plan in the case of a child having an allergic reaction in the school?	
Yes	25.2
What are the most frequent symptoms of food allergy?	
Urticaria, stomachache, wheezing (T)	82.7
Headache, fever, tremors	4.5
Constipation, headache, nausea	7.5
Conjunctivitis, tonsillitis	5.3
What are the most frequent symptoms of anaphylaxis?	
Asthma, dermatitis	34.6
Conjunctivitis, rhinitis, headache	6.0
Urticaria, itch, stomachache, wheezing, throat tightness, collapse (T)	50.1
Tonsillitis, cough, temperature	9.3
Which is the best medication for anaphylaxis and severe food allergy reaction?	
Orally antihistamine	9.9
Cortisone	19.8
Intramuscular adrenaline (T)	3.1
Intramuscular antihistamine	9.7
I do not know	57.5
Do you know how to use an adrenaline pen (an EpiPen is shown in the picture below)?	
Yes	9.9

The correct answer is indicated in parentheses as: T = true and F = false.