


# Food allergy knowledge, attitudes and beliefs of kindergarten teachers in Kuwait: a cross-sectional study

Latifah Madooh, Shaikhah Allahou, Haya Alshallal, Fatemah Alkazemi, Dina Alyaseen, Farah Allahow, Shahad Alsattam, Abdullah Al-Majran, Ali H Ziyab 

**To cite:** Madooh L, Allahou S, Alshallal H, *et al.* Food allergy knowledge, attitudes and beliefs of kindergarten teachers in Kuwait: a cross-sectional study. *BMJ Paediatrics Open* 2023;**7**:e001795. doi:10.1136/bmjpo-2022-001795

► Additional supplemental material is published online only. To view, please visit the journal online (<http://dx.doi.org/10.1136/bmjpo-2022-001795>).

LM, SA, HA, FA, DA, FA and SA contributed equally.

Received 24 November 2022  
Accepted 20 February 2023



© Author(s) (or their employer(s)) 2023. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

Department of Community Medicine and Behavioral Sciences, Kuwait University, Kuwait, Kuwait

## Correspondence to

Dr Ali H Ziyab; [ali.ziyab@ku.edu.kw](mailto:ali.ziyab@ku.edu.kw)

## ABSTRACT

**Background** Food allergy (FA) affects up to 10% of children globally, with clinical symptoms varying from mild to severe, and in rare instances, it is life-threatening. Approximately one in five children with FA experience a food-induced allergic reaction in school, leaving teachers as the first line of intervention. This study aimed to assess kindergarten teachers' knowledge, attitudes and beliefs regarding FA.

**Methods** This cross-sectional study enrolled kindergarten teachers in Kuwait using stratified cluster sampling. The Chicago Food Allergy Research Survey for the General Public was used to assess teachers' knowledge, attitudes and beliefs regarding FA. The overall FA knowledge score was calculated for each participant. The  $\chi^2$  test was used to assess the differences in the distribution of categorical variables.

**Results** Responses were obtained from 882 public kindergarten teachers from 63 kindergartens. Most teachers (81.9%) encountered students with FA in their classrooms. Only 13.5% of the teachers reported receiving training in FA. Overall, participants scored an average of 52.2% on the FA knowledge assessment, with participants receiving prior training in FA scoring on average higher than those with no prior training in FA (55.9% vs 51.6%,  $p=0.005$ ). A few teachers (10.7%) were aware that lactose intolerance was not equivalent to milk allergy. In terms of attitudes regarding FA, only 14.9% of the participants acknowledged that children with FA are teased/stigmatised due to their condition, and 33.7% recognised that avoidance of allergenic food is difficult. Moreover, only 9.9% of the teachers self-reported their ability to use an epinephrine autoinjector.

**Conclusions** Improved knowledge and awareness of FA among public kindergarten teachers in Kuwait are needed to ensure the safety of children with FA in schools. Teachers should be trained to prevent, recognise and manage FA-related allergic reactions.

## INTRODUCTION

Food allergy (FA), defined as 'an adverse health effect arising from a specific immune response that occurs reproducibly on exposure to a given food',<sup>1</sup> is an increasing global public health concern that affects children and adults.<sup>2 3</sup> The prevalence of

## WHAT IS ALREADY KNOWN ON THIS TOPIC

- ⇒ Food allergy affects a considerable proportion of children worldwide, with an increasing trend.
- ⇒ The knowledge of school personnel, specifically teachers, about food allergy has been reported to be inadequate, which hinders proper management of allergic emergencies in classrooms.
- ⇒ There is a need to assess the knowledge, attitudes and beliefs of kindergarten teachers in Kuwait regarding food allergy.

## WHAT THIS STUDY ADDS

- ⇒ Kindergarten teachers in our study sample demonstrated insufficient knowledge about food allergy, with participants answering 52.2% of the knowledge-based items correctly.
- ⇒ Receiving prior training on food allergy was associated with increased food allergy knowledge.
- ⇒ Participating teachers underestimated the impact of food allergy on the quality of life and the social and psychological status of affected children.

## HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

- ⇒ The findings of this study highlight the need for policies and protocols to ensure the safety of children with food allergy in schools.
- ⇒ Schoolteachers should be trained in the prevention, recognition and management of food allergy reactions.

FA varies worldwide, with prevalence estimates ranging between 1% and 10% among children.<sup>4-6</sup> Clinical symptoms of a food-induced allergic reaction can vary from mild to severe and, in rare instances, can be fatal, with manifestations involving multiple body systems, including the skin, respiratory, mucosal, cardiovascular and gastrointestinal systems.<sup>3 7</sup> In its most severe form, FA can lead to anaphylaxis, which has been described as a generalised or systemic, rapid onset, hypersensitivity reaction that may cause death.<sup>8</sup> In addition to its clinical burden, FA has been shown to impact the social and mental health



of affected individuals and, among children with FA, this burden extends to the parents/caregivers.<sup>9 10</sup> For instance, the health-related quality of life of children with peanut allergy and their caregivers was worse in comparison with healthy individuals.<sup>10</sup> Moreover, higher levels of anxiety have been documented among children with FA as compared with children without FA.<sup>11</sup>

Children spend a significant amount of time in school daily, with reports showing that 16%–18% of children with FA experience a food-induced allergic reaction in school.<sup>12 13</sup> Hence, prevention, recognition and management of FA reactions in schools are crucial to the safety of allergic children. Several studies have shown that there is a deficiency in FA knowledge and negative attitudes toward FA among school teachers and nurses.<sup>14–17</sup> Such limitations in FA knowledge and attitudes were attenuated by FA-related training, with studies showing improvements in teachers' FA knowledge, confidence and attitudes following training.<sup>18–23</sup> Given that teachers are considered the first line of management in a school setting and child safety is of utmost importance, ongoing assessments and FA training are needed to better prepare teachers. To this end, there is a paucity of studies on kindergarten (preschool/nursery) teachers' FA knowledge and attitudes, especially in the Arabian Gulf region, where FA is not a rare event.<sup>24 25</sup> A prior study among adolescents in Kuwait estimated the prevalence of FA to be 4.1%.<sup>25</sup> Therefore, this cross-sectional study was conducted to evaluate the knowledge, attitudes and beliefs of kindergarten teachers in Kuwait about FA.

## METHODS

### Study setting, design and participants

Kuwait is geographically divided into six governorates, and the school districts follow a similar geographical division. In the public education system in Kuwait, kindergarten refers to the optional school years before grade 1, which includes kindergarten levels 1 and 2. Kindergarten is also known as preschool, nursery and daycare. In the academic year 2021–2022, the total number of public kindergarten teachers was estimated to be 7086, with all teachers being female. This cross-sectional study enrolled public kindergarten teachers (n=882) throughout Kuwait. A stratified cluster sampling approach was used to select a representative sample of kindergarten teachers. First, Kuwait was stratified according to the six governorates. Second, public kindergartens (clusters) were randomly selected from each governorate (stratum) using a list of kindergartens within each governorate. Since the total number of teachers differed across the six school districts, proportional allocation was used to determine the number of participants (teachers) needed from each school district by estimating weights relative to the total number of teachers in each school district. In total, 63 schools served as recruitment venues, and all the teachers in each selected school were invited to participate. The

recruitment period was 16 October 2022–22 October 2022.

### 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 about FA.<sup>26</sup> Minor modifications were made to the CFARS-GP to make it applicable to our setting (ie, Kuwait) and our target study population (ie, kindergarten teachers). The overall FA knowledge score was calculated for each participant by summing the percentage of knowledge items correctly answered by each respondent. Moreover, the study questionnaire gathered sociodemographic data and teachers' general awareness of the FA emergency plan in the school and their preparedness to manage FA reactions. A variable representing the number of acquaintances with FA a participant knows (ranging from 0 to  $\geq 3$ ) was developed by counting whether the participant's parents, siblings, spouse, children and/or someone else they knew had FA.

The questionnaire was then 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 who was asked to distribute it among all teachers who completed the study questionnaire. A detailed description of the study questionnaire and its variables is provided in online supplemental appendix 1. A description of the changes made to the CFARS-GP is provided in online supplemental appendix 2, and the study questionnaire is available in online supplemental appendix 3.

### Statistical analysis

Analyses were conducted using SAS V.9.4 (SAS Institute,). The statistical significance level was set at 5% ( $\alpha=0.05$ ) for all the association analyses. Descriptive analyses were conducted to calculate the frequencies and proportions of categorical variables. The FA knowledge score variable was described by calculating the mean and SD. The  $\chi^2$  test was used to assess the associations between categorical variables. To control for false positive results due to multiple testing, we applied the false discovery rate (FDR) method to estimate adjusted p values.<sup>27</sup>

## RESULTS

### Description of study sample

The characteristics of the study sample are presented in [table 1](#). A total of 1801 teachers across 63 kindergartens were invited to participate in the study, of whom 882 (49.0%) completed the study questionnaire. Respondents represented all six governorates proportionally, according to the teachers' geographical distribution ([table 1](#)). Most enrolled teachers were in the age ranges of 30–34 years (33.7%) and 35–39 years (25.4%). Of the total participants, 16.8% ever had FA, 66.2% had at least one acquaintance with FA and 81.9% had a student with FA in their classroom ([table 1](#)). Moreover, only 13.5% had received training in FA.

**Table 1** Characteristics of the study sample (N=882)

Variable	% (n)
Age group (years)	
21–24	2.4 (21)
25–29	13.6 (120)
30–34	33.7 (297)
35–39	25.4 (224)
40–44	15.0 (132)
45–49	8.6 (76)
≥50	1.4 (12)
Education level (degree)	
Diploma (2 years post high school)	0.7 (6)
Bachelor	95.0 (838)
Graduate	4.3 (38)
School's governorate	
Hawalli	10.0 (88)
Asima	13.2 (116)
Jahra	12.5 (110)
Farwaniya	23.7 (209)
Mubarak Al-kabeer	16.1 (142)
Ahmadi	24.6 (217)
Years working as a kindergarten teacher	
≤6	17.5 (155)
7–12	37.4 (330)
13–18	27.6 (243)
≥19	17.5 (154)
Marital status	
Married	82.2 (725)
Single	10.0 (88)
Divorced/widowed	7.8 (69)
Have children	
Yes	84.9 (749)
Ever had food allergy	
Yes	16.8 (148)
Acquaintances with FA*	
None	33.8 (298)
1	35.1 (310)
2	18.7 (165)
≥3	12.4 (109)
Ever had students with food allergy	
Yes	81.9 (722)
Experience or training with food allergy	
Yes	13.5 (119)

\*Refers to the number of acquaintances of the participants with FA: parents, siblings, spouse, children and/or someone else. FA, food allergy.

### Knowledge of FA

Table 2 shows the items used to assess FA knowledge. The overall mean FA knowledge score was estimated to be 52.2% (range 8.3%–87.5%), which represents the

average proportion of correct answers to the total items assessing FA knowledge. Only 10.7% of the participants were aware that lactose intolerance was not the same as milk allergy. Most participants (81.7%) were aware that hives was a common symptom of FA. Peanuts were identified as the most common (83.2%) childhood FA trigger. Very few participants (18.4%) indicated that there was no cure for FA. However, the majority (73.0%) of the participants correctly acknowledged that avoidance was the only way to prevent an FA reaction.

In an additional analysis (online supplemental table 1), we assessed whether FA knowledge scores differed according to whether the participants had received prior training in FA. Participants who received prior training in FA had higher overall mean FA knowledge scores than those who did not receive FA training (55.9% vs 51.6%,  $p=0.005$ , FDR-adjusted  $p=0.042$ ; online supplemental table 1).

### FA attitudes and beliefs

Table 3 shows participants' perceptions, attitudes and beliefs about FA. Few teachers (14.9%) believed that children with FA are teased/stigmatised at school, 33.7% indicated that avoiding allergenic foods is difficult and 47.7% agreed that having injectable epinephrine (EpiPen or Twinject; also called epinephrine autoinjectors) is important for children with severe FA. Most respondents (62.9%) agreed that schools should have plans to keep children with FA safe. However, only 34.9% of participants agreed that schools should ban all products with nuts.

In further analysis (online supplemental table 2), FA perceptions, attitudes and beliefs were stratified according to whether the participant had any acquaintances with FA. This analysis showed that, overall, participants who knew people with food allergies were more engaged in this health issue and were motivated to witness change. For example, those with at least one acquaintance with FA compared with those with none were more likely to agree that it is difficult for people with FA to safely eat at restaurants (51.5% vs 45.0%,  $p=0.008$ , FDR-adjusted  $p=0.010$ ; online supplemental table 2).

### General knowledge of emergency interventions

Online supplemental table 3 presents data on general knowledge of emergency interventions. Of all participants, only 25.2% were aware that their respective schools had an FA emergency action plan. The majority (82.7%) correctly identified the most frequent symptoms of FA (ie, urticaria, stomachache, wheezing), and approximately half (50.1%) correctly identified the most frequent symptoms of anaphylaxis (ie, urticaria, itching, stomachache, wheezing, throat tightness, collapse). Additionally, only 3.1% of the participants knew that intramuscular epinephrine was the best medication for anaphylaxis and severe FA reactions. Lastly, only 9.9% (online supplemental table 3) of the teachers self-reported their ability to use an epinephrine pen (EpiPen).

**Table 2** Overall and itemised knowledge of food allergy among kindergarten teachers in the total study sample (N=882)

Item	Correct answer, % (n)
Overall mean knowledge score (SD)	52.2 (15.2)*
Definition and diagnosis	
Allergic reaction when body considers food harmful (T)	29.1 (257)
Lactose intolerance same as milk allergy (F)	10.7 (94)
Symptoms and severity	
Food allergy reaction can be fatal (T)	56.6 (499)
Hives a common symptom of food allergy (T)	81.7 (721)
Signs of milk allergy reaction	
Hyperactivity (F)	68.3 (602)
Hives (T)	81.2 (716)
Tongue swelling/trouble breathing (T)	65.2 (575)
Stuffy nose (F)	58 (512)
Triggers and environmental risk	
Allergic reaction from touching allergenic food (T)	45.6 (402)
Milk-allergic person: safely drink low-fat milk (F)	42 (370)
Mother can pass food to child through breast milk (T)	59.1 (521)
Acidic food: common cause of food allergy (F)	22.9 (202)
3 Most common childhood food allergies	
Egg	71 (626)
Milk	70.4 (621)
Peanut	83.2 (734)
Most common adult food allergy: shellfish	57 (503)
Perceptions of susceptibility and prevalence	
Allergic diseases run in families (T)	54.1 (477)
Food allergy can go away with age (T)	39.5 (348)
Food allergy more common in children (T)	63.8 (563)
Food allergy increasing in Kuwaiti children (T)	61.6 (543)
Treatment and use of healthcare	
There is a cure for food allergy (F)	18.4 (162)
Avoidance is the only way to prevent food allergy reaction (T)	73.0 (644)
Daily medicine can prevent food allergy reaction (F)	32.8 (289)
Policy issue	
Law in Kuwait requires foods to be labelled (F)	7.0 (62)

Correct answers are indicated in parentheses as T=true and F=false  
\*This figure represents mean knowledge score (SD).

## DISCUSSION

This study evaluated kindergarten teachers' knowledge, attitudes and beliefs regarding FA in Kuwait. Our findings demonstrate that FA knowledge varied across the assessed FA knowledge domains, with most teachers correctly identifying peanuts as the leading food allergen in children. However, very few participants were able to indicate that lactose intolerance is different from milk allergy. Moreover, FA knowledge was higher among participants who had received prior training than among those who had not. Regarding participants' attitudes and beliefs towards FA, very few participants agreed that children with FA were stigmatised. More than half of the participants agreed that schools should have plans to keep children with FA safe. Overall, our study showed

that FA knowledge among kindergarten teachers is insufficient in some domains.

Our study estimated an overall mean FA knowledge score of 52.2%. This overall FA knowledge score is lower than the estimated FA knowledge score (64.9%) among the general public in the USA,<sup>28</sup> and lower than FA knowledge score estimates among teachers in the United States reported by Canon *et al* (70.8%)<sup>19</sup> and Kanter *et al* (69.7%).<sup>11</sup> Our study and the aforementioned studies have used the same CFARS-GP instrument to assess FA knowledge. Hence, these comparisons show that kindergarten teachers in Kuwait lack sufficient FA knowledge compared with teachers in the USA.

We observed variability among the items assessing knowledge of FA. For instance, only 10.7% of the

**Table 3** Perception, attitudes, beliefs and policy consideration of food allergy

Item	Total study sample (N=882), % (n)		
	Disagree	Neutral	Agree
<b>Stigma and acceptability</b>			
Food allergy serious problem in Kuwait	14.2 (125)	41.4 (365)	44.4 (392)
People with food allergies treated differently	13.9 (123)	26.4 (233)	59.6 (526)
Parents of food-allergic child overprotective	31.5 (278)	40.8 (360)	27.7 (244)
Food-allergic children teased at school	51.8 (457)	33.3 (294)	14.9 (131)
Would worry over student with food allergy	31.1 (274)	22.7 (200)	46.3 (408)
<b>Perceptions of quality of life</b>			
Avoiding allergenic food is difficult	30.0 (265)	36.3 (320)	33.7 (297)
People worry a lot about their food allergy	20.0 (176)	25.7 (227)	54.3 (479)
Hard to eat out safely with food allergy	23.9 (211)	26.8 (236)	49.3 (435)
<b>Treatment and use of healthcare</b>			
Having injectable epinephrine (EpiPen) important for child with severe food allergy	19.7 (174)	32.5 (287)	47.7 (421)
<b>Policy issues</b>			
Schools should have plans to keep food-allergic children safe	21.7 (191)	15.4 (136)	62.9 (555)
Schools should ban all products with nuts	29.4 (259)	35.7 (315)	34.9 (308)
Schools should have special table for food-allergic child	29.4 (259)	25.2 (222)	45.5 (401)
Unfair if a student cannot have peanut butter sandwich	27.0 (238)	32.4 (286)	40.6 (358)

participants in our study correctly indicated that lactose intolerance was not the same as milk allergy. This result is much less than what was reported by Kanter *et al* (63%).<sup>11</sup> In contrast, participants scored highest in items pertaining to knowledge about symptoms and severity, with the majority identifying hives as a common sign of an allergic reaction to food. In both our study and the study by Gupta *et al*,<sup>28</sup> peanuts, as compared with eggs and milk, were the most commonly reported FA triggers among children. In a study conducted in Italy to measure FA knowledge among schoolteachers and principals, similar findings were found, with the highest score achieved in questions about symptoms of FA, anaphylaxis and the most common FA triggers.<sup>15</sup> In addition, there was an evident weakness in knowledge regarding FA treatment, where only 32.8% of respondents correctly indicated that daily medicine intake cannot prevent the occurrence of an FA reaction, and only 18.4% of participants correctly stated that there is no cure for FA. In contrast, 65% of teachers in the USA were aware that daily use of medicine cannot prevent FA reactions and 69% were aware that FA cannot be cured.<sup>11</sup> Nonetheless, the majority of respondents (73%) knew that avoiding allergens was the only way to prevent an FA reaction.

We observed higher overall knowledge scores among teachers with prior training in FA than among teachers without previous training (online supplemental table 1). This was also demonstrated in an interventional study conducted among teachers in the USA, which showed that FA knowledge scores increased by 19% in the group that received FA training compared with the control

group.<sup>19</sup> Another study has shown that teachers who received an educational session improved their understanding of causal foods, signs of anaphylaxis, and proper treatment of local and systemic FA reactions compared with the control group.<sup>20</sup> Overall, these findings suggest that proper education and training increase knowledge of FA. Hence, to ensure children's health and safety in schools, training teachers in FA is essential to reduce accidental exposure and adequately manage FA-related emergencies.

The results of this study showed that teachers underestimated the impact of FA on quality of life and mental health, with only 33.7% indicating that avoiding allergenic foods is difficult, and 14.9% agreeing that children with FA are teased/stigmatised at school. A prior study in Italy reported similar findings, with a minority of school personnel acknowledging the emotional consequences (37.2%) and social difficulties (10.2%) of children with FA.<sup>15</sup> Moreover, FA-related bullying is not uncommon, with studies reporting that as many as 40% of children with FA have been bullied for their FA.<sup>29–32</sup> Such bullying experiences might have long-term consequences on a child's development and well-being. Among children with FA (aged 7–14 years), 100% indicated, 'I want other kids in my class to know not to tease or bully someone with food allergy'.<sup>33</sup> Therefore, to protect children with FA from such hardships, it is essential to make schoolteachers aware of the possible psychosocial impact of FA.

Our study is in agreement with previous studies showing deficiencies in establishing and implementing emergency management plans for relieving allergic reactions

in schools.<sup>16 18 34</sup> Only a quarter of our study participants (25.2%) reported that an emergency plan exists in their school for managing allergic reactions. Additionally, only 3.1% knew that intramuscular epinephrine was the best medication for anaphylaxis and severe FA reactions, and only 9.9% of the teachers self-reported the ability to use an epinephrine pen. These results raise serious concerns about the lack of preparedness of kindergarten teachers and schools in Kuwait to manage in-school FA reactions. Since it has been reported that, in most cases, the first adult to become aware of an allergic reaction in school is the teacher, it would be beneficial to train them to recognise and manage signs of anaphylaxis, especially considering that delays in treating anaphylaxis are associated with poor outcomes.<sup>35 36</sup>

The results of this study can only be generalised to public kindergarten teachers. Additionally, the response rate (approximately 49%) was low, which may have resulted in nonresponse bias. We would imagine that non-response (self-selection) bias, if any, will lead to an overestimation of the FA knowledge score, as people interested in the topic would be more motivated to participate. Nonetheless, our study covered a large proportion of the target population: 63 out of 200 schools were included in the study, and data were collected from 12.5% (n=882) of the total target population (kindergarten teachers; n=7086). To increase the representativeness of our study, we used proportional allocation sampling. Furthermore, data were collected anonymously to reduce social desirability bias.

In conclusion, the knowledge and awareness of FA among public kindergarten teachers in Kuwait are insufficient. As the prevalence of FA in children of preschool age is high, teachers, as first-line responders to classroom emergencies, must be trained to prevent, recognise and manage FA-related reactions. In addition, injectable epinephrine must be made available on school campuses and teachers must be trained to administer epinephrine in emergencies promptly to ensure the safety of children. Collectively, policies and protocols that ensure the safety of children with FA are needed and should be enforced.

**Acknowledgements** We would like to acknowledge the help and support of all school administrators in facilitating the conduct of this research. We are sincerely grateful to all teachers who participated in this study.

**Contributors** LM, SAlI, HA, FAI, DA, FAIK and SAIs contributed to the conception, design and planning of the study; contributed to the data analysis and interpretation; and drafted the manuscript. AA contributed to the study design, planning, and data analysis. AHZ contributed to the conception, design and planning of the study; supervised the study implementation; contributed to data analysis and interpretation; and revised the manuscript. All the authors critically revised the manuscript for important intellectual content. The manuscript has been read and approved by all authors. AHZ is responsible for the overall content as the guarantor.

**Funding** The authors have not declared a specific grant for this research from any funding agency in the public, commercial or not-for-profit sectors.

**Competing interests** None declared.

**Patient and public involvement** Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

**Patient consent for publication** Not applicable.

**Ethics approval** The study was approved by the Health Sciences Center Ethics Committee for Students Research at Kuwait University (no. 2736/2022). Participants gave informed consent to participate in the study before taking part.

**Provenance and peer review** Not commissioned; externally peer reviewed.

**Data availability statement** Data are available on reasonable request.

**Supplemental material** This content has been supplied by the author(s). It has not been vetted by BMJ Publishing Group Limited (BMJ) and may not have been peer-reviewed. Any opinions or recommendations discussed are solely those of the author(s) and are not endorsed by BMJ. BMJ disclaims all liability and responsibility arising from any reliance placed on the content. Where the content includes any translated material, BMJ does not warrant the accuracy and reliability of the translations (including but not limited to local regulations, clinical guidelines, terminology, drug names and drug dosages), and is not responsible for any error and/or omissions arising from translation and adaptation or otherwise.

**Open access** This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

#### ORCID iD

Ali H Ziyab <http://orcid.org/0000-0003-3099-4424>

#### REFERENCES

- Boyce JA, Assa'ad A, Burks AW, *et al*. Guidelines for the diagnosis and management of food allergy in the United States: summary of the NIAID-sponsored expert panel report. *Nutr Res* 2011;31:61–75.
- Sicherer SH, Warren CM, Dant C, *et al*. Food allergy from infancy through adulthood. *J Allergy Clin Immunol Pract* 2020;8:1854–64.
- Renz H, Allen KJ, Sicherer SH, *et al*. Food allergy. *Nat Rev Dis Primers* 2018;4.
- Prescott SL, Pawankar R, Allen KJ, *et al*. A global survey of changing patterns of food allergy burden in children. *World Allergy Organ J* 2013;6:21.
- Gupta RS, Warren CM, Smith BM, *et al*. The public health impact of parent-reported childhood food allergies in the United States. *Pediatrics* 2018;142:e20181235.
- Peters RL, Koplin JJ, Gurrin LC, *et al*. The prevalence of food allergy and other allergic diseases in early childhood in a population-based study: healthnuts age 4-year follow-up. *J Allergy Clin Immunol* 2017;140:145–53.
- Waserman S, Watson W. Food allergy. *Allergy Asthma Clin Immunol* 2011;7 Suppl 1(Suppl 1):S7.
- Turner PJ, Worm M, Ansotegui IJ, *et al*. Time to revisit the definition and clinical criteria for anaphylaxis? *World Allergy Organ J* 2019;12:100066.
- Cummings AJ, Knibb RC, King RM, *et al*. The psychosocial impact of food allergy and food hypersensitivity in children, adolescents and their families: a review. *Allergy* 2010;65:933–45.
- Nowak-Wegrzyn A, Hass SL, Donelson SM, *et al*. The peanut allergy burden study: impact on the quality of life of patients and caregivers. *World Allergy Organ J* 2021;14:100512.
- Kanter AB, Yasik AE, Zaccario ML, *et al*. Self-Reported anxiety ratings in children with and without food allergies and teacher knowledge of food allergies. *J Sch Health* 2022;92:541–9.
- Nowak-Wegrzyn A, Conover-Walker MK, Wood RA. Food-allergic reactions in schools and preschools. *Arch Pediatr Adolesc Med* 2001;155:790–5.
- Sicherer SH, Furlong TJ, DeSimone J, *et al*. The US peanut and tree nut allergy registry: characteristics of reactions in schools and day care. *J Pediatr* 2001;138:560–5.
- Twichell S, Wang K, Robinson H, *et al*. Food allergy knowledge and attitudes among school nurses in an urban public school district. *Children (Basel)* 2015;2:330–41.
- Polloni L, Lazzarotto F, Toniolo A, *et al*. What do school personnel know, think and feel about food allergies? *Clin Transl Allergy* 2013;3:39.
- Ashworth J, Cardoso J da S, Pinto D, *et al*. Food allergy in preschool age: knowledge evaluation of teachers and educational assistants. *Acta Paediatr* 2022;111:2390–2.
- Santos MJL, Merrill KA, Gerdtz JD, *et al*. Food allergy education and management in schools: a scoping review on current practices and gaps. *Nutrients* 2022;14:732.

- 18 Wasserman S, Shah A, Cruikshank H, *et al.* Recognition and management of food allergy and anaphylaxis in the school and community setting. *Immunol Allergy Clin North Am* 2022;42:91–103.
- 19 Canon N, Ghafteh M, Guffey D, *et al.* Role of food allergy education: measuring teacher knowledge, attitudes, and beliefs. *Allergy Rhinol (Providence)* 2019;10.
- 20 Shah SS, Parker CL, Davis CM. Improvement of teacher food allergy knowledge in socioeconomically diverse schools after educational intervention. *Clin Pediatr (Phila)* 2013;52:812–20.
- 21 Polloni L, Baldi I, Lazzarotto F, *et al.* Multidisciplinary education improves school personnel's self-efficacy in managing food allergy and anaphylaxis. *Pediatr Allergy Immunol* 2020;31:380–7.
- 22 Lanser BJ, Covar R, Bird JA. Food allergy needs assessment, training curriculum, and knowledge assessment for child care. *Ann Allergy Asthma Immunol* 2016;116:533–7.
- 23 Gonzalez-Mancebo E, Gandolfo-Cano MM, Trujillo-Trujillo MJ, *et al.* Analysis of the effectiveness of training school personnel in the management of food allergy and anaphylaxis. *Allergol Immunopathol (Madr)* 2019;47:60–3.
- 24 Al-Herz W. A systematic review of the prevalence of atopic diseases in children on the Arabian Peninsula. *Med Princ Pract* 2018;27:436–42.
- 25 Ziyab AH. Prevalence of food allergy among schoolchildren in Kuwait and its association with the coexistence and severity of asthma, rhinitis, and eczema: a cross-sectional study. *World Allergy Organ J* 2019;12.
- 26 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.
- 27 Benjamini Y, Hochberg Y. Controlling the false discovery rate: a practical and powerful approach to multiple testing. *J R Stat Soc Series B Stat Methodol* 1995;57:289–300.
- 28 Gupta RS, Kim JS, Springston EE, *et al.* Food allergy knowledge, attitudes, and beliefs in the United States. *Ann Allergy Asthma Immunol* 2009;103:43–50.
- 29 Brown D, Negris O, Gupta R, *et al.* Food allergy-related bullying and associated peer dynamics among black and white children in the forward study. *Ann Allergy Asthma Immunol* 2021;126:255–63.
- 30 Cooke F, Ramos A, Herbert L. Food allergy-related bullying among children and adolescents. *J Pediatr Psychol* 2022;47:318–26.
- 31 Fong AT, Katelaris CH, Wainstein BK. Bullying in Australian children and adolescents with food allergies. *Pediatr Allergy Immunol* 2018;29:740–6.
- 32 Merrill KA, Abrams EM, Simons E, *et al.* Social well-being among children with vs without food allergy before and during coronavirus disease 2019. *Annals of Allergy, Asthma & Immunology* 2022;129:519–21.
- 33 Ross N, Dalke S, Filuk S, *et al.* It takes a village: perceptions of Winnipeg parents, students, teachers and school staff regarding the impact of food allergy on school-age students and their families. *Allergy Asthma Clin Immunol* 2022;18:47.
- 34 Ercan H, Ozen A, Karatepe H, *et al.* Primary school teachers' knowledge about and attitudes toward anaphylaxis. *Pediatric Allergy and Immunology* 2012;23:428–32.
- 35 Fleming JT, Clark S, Camargo CA, *et al.* Early treatment of food-induced anaphylaxis with epinephrine is associated with a lower risk of hospitalization. *J Allergy Clin Immunol Pract* 2015;3:57–62.
- 36 Robinson M, Greenhawt M, Stukus DR. Factors associated with epinephrine administration for anaphylaxis in children before arrival to the emergency department. *Ann Allergy Asthma Immunol* 2017;119:164–9.