

Improving school teachers' self-efficacy and knowledge on food allergy and management of anaphylaxis using a virtual multidisciplinary workshop

Rubanandhini Nagajothi¹ MBBS, Si Hui Goh^{2,3} MRCPCH (UK), Hwee Hoon Lim² BSN, Wenyin Loh^{2,3} MRCPCH (UK), Kok Wee Chong^{2,3} MRCPCH (UK)

Dear Editor,

Children with food allergies are at risk of inadvertent allergic reactions that range from mild to potentially life-threatening anaphylaxis, even with appropriate dietary avoidance.¹ This risk is often increased in community settings such as schools via accidental exposure to allergens during learning activities or meal times. A quarter of children were found to have their first allergic reaction on school grounds.² Studies of self-reported reactions have shown that 16–18% of school-aged children with known food allergy experienced an allergic reaction in school.³ In Singapore, the prevalence of self-reported food allergy among children aged 11–30 months could be as high as 5%. Food allergies can contribute to reduced quality of life and barriers to participation in day-to-day activities.⁴ Therefore, it is crucial that all schools are prepared to effectively prevent and manage food-related allergic reactions.

Previous studies have identified several deficits in food allergy and anaphylaxis management in school settings.^{5–7} These include failures in recognising allergic signs and in implementing timely management plans. Anaphylaxis requires prompt action to prevent complications, and delayed treatment with adrenaline is a major risk factor for morbidity and mortality.⁸ Gaps in schools' food allergy policies, procedures and protocols may intensify anxiety among parents, and can affect the child's health, well-being and educational outcomes.

The aim of this study was to assess the effectiveness of a virtual multidisciplinary educational workshop in improving the self-efficacy and knowledge of school teachers, in the management of food allergic reactions in school. Participation in this workshop is voluntary and non-obligatory. Data were collected from workshops conducted between June 2021 and June 2022.

The 2-hour long workshop was delivered via the Zoom online meeting platform by paediatric allergists, allergy specialist nurses and dietitians from the Paediatric Allergy Service of KK Women's and Children's Hospital, Singapore. It consisted of 2 components. The theoretical session included didactic lectures on prevention of accidental allergen exposure, recognition and treatment of allergic reactions and roles of all stakeholders based on recommendations in published guidelines. These were followed by a hands-on session requiring participants to perform a return demonstration using an autoinjector training device.

Anonymous online questionnaires were administered to participants before and after the workshop (Supplementary Table S1). The post-intervention questionnaire was administered immediately after the workshop. The School Personnel Self-Efficacy-Food Allergy and Anaphylaxis Questionnaire (S.PER.SE-FAAQ),⁹ a validated instrument, was used to assess participants' self-efficacy in managing students with food allergy. It consisted of 8 questions and comprised 2 main factors: anaphylaxis management and food allergy management. Answers were on a scale from 1 ("Cannot do at all") to 5 ("Highly certain can do"). To objectively assess their theoretical knowledge, participants were also presented with 2 clinical vignettes of food-allergic children who experienced a mild reaction versus anaphylaxis in school (Supplementary Fig. S1). Four possible options for action and treatment were proposed and they were asked to choose the best answer. The study with waiver of informed consent was approved by the SingHealth Centralised Institutional Review Board (reference number 2021/2165).

A total of 444 participants attended the 4 workshops, with no repeat attendees. Most of the participants were women (92.3%) and working in preschools (67.6%). Two-thirds of the participants

The Annals is an open access journal, allowing non-commercial use under CC BY-NC-SA 4.0.

¹ Lee Kong Chian School of Medicine, Nanyang Technological University, Singapore

² Allergy Service, Department of Paediatrics, KK Women's and Children's Hospital, Singapore

³ Paediatrics Academic Clinical Programme, SingHealth Duke-NUS Academic Medical Centre, Singapore

Correspondence: Dr Kok Wee Chong, Allergy Service, Department of Paediatrics, KK Women's and Children's Hospital, 100 Bukit Timah Road, Singapore 229899.

Email: chong.kok.wee@singhealth.com.sg

Accepted: 30 October 2024

had not attended any prior training on the administration of adrenaline auto-injectors (AAI) though three-quarters did know of or had looked after children with food allergy. This highlights the discordance in the current knowledge and abilities of our teachers, with what they are expected to do, i.e. care for children with food allergies. Approximately 27% of the teachers were aware of their students carrying an AAI. Most of them (81.3%) had not managed a student with acute food allergic reaction and none of them had administered an AAI before.

Overall, there was a significant improvement in total mean self-efficacy scores (standard deviation), from 28.8 (0.31) pre-workshop to 34.8 (0.21) post-workshop ($P<0.005$). Self-efficacy of all individual factors improved significantly (Table 1). Participants had the lowest confidence in recognising anaphylaxis symptoms and administering drugs before the workshop. However, these 2 factors showed the greatest improvement post-workshop. The proportion of participants who answered Question 1 (mild allergic reaction scenario) correctly improved

from 41.9% to 58.1% ($P<0.001$) and from 36.0% to 64.0% ($P<0.001$) for Question 2 (anaphylaxis scenario) post-workshop. The results for Question 1 were less ideal compared to Question 2, though there was still a significant improvement post-workshop. In this scenario, a known egg-allergic child developed oral itch, facial rashes and lip swelling after ingestion of a slice of cake. Most of the incorrect answers were conservative options, such as asking the student to drink plenty of water or bringing the student to the sick bay for observation. These conservative options may not be ideal (compared to the best answer of prompt administration of antihistamines), but it may reflect the restrictions placed on teachers by school policies where teachers may not be allowed to administer medications to students without explicit and written consent from the parents and/or the child's physician. This underscores the importance of engaging school management in closing this gap, to advocate for better awareness and child safety.

Our study is, to our knowledge, the first reported educational intervention for school teachers that

Table 1. Self-efficacy scores pre- and post-workshop.

Question	Pre-workshop, mean (SD)	Post-workshop, mean (SD)	Pre- and post-workshop difference (95% CI)	P value
Assure a safe school setting for students with food allergy (FAM)	3.85 (0.94)	4.39 (0.65)	0.54 (0.43–0.64)	<0.005
Put in place a personalised care plan for the management of students' food allergy (FAM)	3.76 (0.96)	4.31 (0.72)	0.55 (0.44–0.66)	<0.005
Manage a student at risk of allergic reactions to food (AM)	3.61 (0.93)	4.37 (0.67)	0.76 (0.65–0.86)	<0.005
Recognise anaphylaxis symptoms (AM)	3.18 (1.02)	4.30 (0.674)	1.12 (1.00–1.23)	<0.005
Co-work with other professionals and families in food allergy management at school (FAM)	3.72 (0.94)	4.35 (0.69)	0.63 (0.52–0.74)	<0.005
Manage allergens avoidance (e.g. reading labels, avoiding contaminations) (FAM)	3.82 (0.97)	4.38 (0.68)	0.56 (0.44–0.66)	<0.005
Guarantee full participation to all school activities to students with food allergy (e.g. attending school trips) (FAM)	3.70 (0.99)	4.31 (0.73)	0.61 (0.49–0.72)	<0.005
Administer drugs (e.g. adrenaline auto-injector) to a student having a severe and sudden reaction (AM)	3.19 (1.16)	4.44 (0.69)	1.25 (1.12–1.37)	<0.005
Total FAM SE (Scoring scale 5–25)	18.8 (4.00)	21.7 (3.01)	2.89 (2.43–3.35)	<0.005
Total AM SE (Scoring scale 3–15)	10.0 (2.66)	13.1 (1.85)	3.12 (2.82–3.42)	<0.005
Total SE (Scoring scale 8–40)	28.8 (0.31)	34.8 (0.21)	6.01 (5.28–6.74)	<0.005

AM: anaphylaxis management factor; CI: confidence interval; FAM: food allergy management factor; SD: standard deviation; SE: self-efficacy

was conducted virtually. The use of telehealth and tele-education has been dramatically accelerated during the SARS-CoV-2 pandemic and these platforms have brought us new opportunities to deliver patient education.¹⁰ Prior to the pandemic, our hospital conducted these workshops physically and the number of participants was limited by the size of training ground as well as teachers' availability to travel to the training venue. From 2021, we adapted by converting the training curriculum to an online platform and arranged for autoinjector training devices to be couriered to schools. This has seen an increase in participation numbers, translating to better training efficiency. The results of this study demonstrated that virtual multidisciplinary workshops that include hands-on practice with an AAI training device are efficacious in improving the self-efficacy and knowledge of school teachers, and in the management of food allergy and anaphylaxis.

Our study also showed that the majority of teachers lacked prior training despite caring for children with food allergy, highlighting the need for a coordinated national strategy to facilitate education of school staff in allergy management. Lack of follow-up data from this study limits our understanding of the long-term efficacy of this training modality. Re-evaluation of workshop participants to assess practical real-life application of knowledge and AAI skills is presently being considered. In conclusion, we believe that such an outreach programme plays an important role in patient advocacy, enabling schools to provide children and their families the support and information needed to create a safe and inclusive school environment for food-allergic children.

Disclosure

The authors declare they have no affiliations or financial involvement with any commercial organisation with a direct financial interest in the subject or materials discussed in the manuscript. The authors did not receive any financial support for this

study. No generative artificial intelligence (AI) or AI-assisted technologies have been used.

Acknowledgements

The team would like to thank all trainers involved in the workshop—from KKH Allergy Service: Prof Anne Goh, Dr Lee May Ping Samantha, Dr Tan Liling Lynette and Dr Ong Lin Xin; allergy nurses Ms Sindhu Raveendran and Ms Kaira How; and dietitians Ms Chong Yan Fong and Ms Phuah Kar Yin; as well as all the teachers who had participated in the study.

Keywords: anaphylaxis, food allergy, paediatrics, self-efficacy, virtual workshop

REFERENCES

1. Nguyen-Luu NU, Ben-Shoshan M, Alizadehfar R, et al. Inadvertent exposures in children with peanut allergy. *Pediatr Allergy Immunol* 2012;23:133-9.
2. McIntyre CL, Sheetz AH, Carroll CR, et al. Administration of epinephrine for life-threatening allergic reactions in school settings. *Pediatrics* 2005;116:1134-40.
3. Nowak-Wegrzyn A, Conover-Walker MK, Wood RA. Food-allergic reactions in schools and preschools. *Arch Pediatr Adolesc Med* 2001;155:790-5.
4. Shaker MS, Schwartz J, Ferguson M. An update on the impact of food allergy on anxiety and quality of life. *Curr Opin Pediatr* 2017;29:497-502.
5. Canon N, Gharfeh M, Guffey D, et al. Role of Food Allergy Education: Measuring Teacher Knowledge, Attitudes, and Beliefs. *Allergy Rhinol (Providence)* 2019;10:2152656719856324.
6. Rodríguez Ferran L, Gómez Tórn timer N, Cortés Álvarez N, et al. Anaphylaxis at school. Are we prepared? Could we improve? *Allergol Immunopathol* 2019;48:384-9.
7. 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.
8. de Silva D, Singh C, Muraro A, et al. Diagnosing, managing and preventing anaphylaxis: Systematic review. *Allergy* 2021;76:1493-506.
9. 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.
10. Wijesooriya NR, Mishra V, Brand PLP, et al. COVID-19 and telehealth, education, and research adaptations. *Paediatr Respir Rev* 2020;35:38-42.