

Does SMS text messaging promote the early introduction of food allergens? A randomized controlled trial

To the Editor,

Infant feeding guidelines now promote early and regular inclusion of common food allergens in infant diets to prevent food allergy; however, tools to translate these guidelines into practice have not been evaluated.¹⁻³ We conducted a randomized controlled trial (RCT) to test whether regular SMS messaging to caregivers with information on allergen introduction improved rates of allergen exposure at one year. We found that nearly all children were exposed to allergens by one year, regardless of SMS messaging, suggesting Australian caregivers were already aware of the importance of early allergen introduction. Some parents were concerned about early adverse reactions to food, highlighting the need for timely advice to prevent unnecessary dietary restrictions.

1 | METHODS

We conducted a two-arm RCT in which caregivers of infants (<6 months) were randomized before starting solid foods to receive monthly mobile phone text messaging (SMS Group) or no messaging (Non-SMS Group) from when their child started solid foods to 1 year. Additionally, to assess community awareness of the infant feeding guidelines for allergy prevention, a Reference Group of caregivers of children aged 12-24 months not in the trial was recruited concurrently.

Study participants were recruited using targeted online advertising. Study activities were conducted online using an electronic survey and data capture platform (REDCap™)⁴ (Appendix 1). The trial was approved by the Women's and Children's Human Research Ethics Committee (HREC/18/WCHN/ 077) and was registered with the Australian New Zealand Clinical Trials Registry (ACTRN 12618001791224).

Upon enrolment, caregivers completed a socio-demographic and family history of allergic disease questionnaire. Participants in the RCT received a link to the Australasian Society of Clinical Immunology and Allergy (ASCI) infant feeding advice, including recommendations to introduce common allergens before one year.⁵ When their infant turned four months, the SMS group received automated SMS messages asking them to indicate if their child had started solid foods. After the caregiver had responded that their child had started solids, they received automated SMS

messages monthly until the child turned one year. The SMS messages encouraged the regular inclusion of peanut, egg, and wheat in their child's diet (Appendix 1). Each message included a survey link where caregivers could report adverse reactions to foods to an Allergy Nurse Practitioner. The Nurse Practitioner then contacted the caregiver to assess the adverse reaction. Where appropriate, the practitioner provided instructions on reintroducing the food or gave advice to avoid the food and seek referral to a Paediatric Allergist. SMS messages about that allergen were stopped.

When the child turned one year of age, all caregivers completed a final survey, including a food frequency questionnaire (FFQ)⁶ (Appendix 1). Questions related to child diagnosis of eczema, food allergy, breastfeeding, formula feeding, the timing of solid foods, the timing of allergen introduction, and consumption of common food allergens during the week before the questionnaire. A sample size of 63 infants per group was needed to detect a 30% difference in allergen consumption between the SMS Group and the Non-SMS Group based on a chi-square test for ordinal data ($\alpha = 0.0167$, power = 80%). A chi-square was used to compare outcomes between the SMS-Group and the non-SMS Group.⁷ The Reference Group was included for comparison but not compared statistically to the RCT groups.

2 | RESULTS

Of the 294 caregivers of infants accessing the study website, 194 were eligible for the RCT and randomized (SMS Group $n = 97$; Non-SMS Group $n = 97$). Of the 188 caregivers of children 1-2 years, 111 were enrolled in the Reference Group. One hundred forty-two participants in the RCT ($n = 96$ SMS Group; $n = 92$ non-SMS Group) and 107 in the reference group completed both primary outcome questionnaires at one year of age (Figure S1).

Caregiver characteristics across the three groups were similar (Table 1) for age, country of birth, and education. Half of the families enrolled in the study had a family history of allergic disease. By 1 year, >90% of caregivers had introduced peanut and egg, with no difference between the SMS and Non-SMS groups (egg 96% vs. 95%, $p = .38$; peanut 98% vs. 93%, $p = .19$) (Table 2). Irrespective of treatment, ~15% and 30% of children received no egg or peanut, respectively, the week before the survey: around 35% and 45% of

children consumed egg and peanuts two or more times. The findings for the Reference Group were similar. Almost a quarter of caregivers in the SMS group reported a potential adverse allergic reaction and were contacted by the allergy Nurse Practitioner. In many cases, caregivers were able to reintroduce the food into their child's diet. (Appendix 2).

3 | DISCUSSION

Contrary to our expectations, most children in the trial were introduced to allergens before one year, and SMS messaging did not

TABLE 1 Baseline characteristics of caregivers by group enrolled in the BabyEATS Study

	SMS Group <i>n</i> = 97	Non-SMS Group <i>n</i> = 97	Reference Group <i>n</i> = 111
Maternal age (years) ^b	32.2 (+/- 3.5)	32.4 (+/- 3.3)	33.0 (+/- 3.7)
Parent born in Australia ^c	81 (83.5)	82 (84.5)	94 (84.7)
Minimum Education Achieved ^c			
High school	4 (4.1)	6 (6.2)	5 (4.5)
Diploma / Certificate	17 (17.5)	23 (23.7)	23 (20.7)
Degree	38 (39.2)	42 (43.3)	51 (45.9)
Higher Degree	37 (38.1)	25 (25.8)	33 (29.7)
Family history of allergic disease			
Maternal allergic disease ^c	58 (59.7)	46 (47.4)	65 (58.5)
Paternal allergic disease ^c	55 (56.7)	49 (50.5)	55 (49.5)
Child sibling allergic disease ^c	14 (14.4)	14 (14.4)	24 (21.6)
Maternal food allergy ^a	8 (8.2)	7 (7.2)	10 (9.0)
Paternal food allergy ^a	2 (2.1)	3 (3.1)	3 (2.7)
Child sibling food allergy ^a	5 (5.2)	4 (4.1)	8 (7.2)
Child characteristics			
Child Male	57 (58.8)	52 (54.2)	57 (51.4)
Any breast milk since birth	94 (96.9)	92 (94.8)	105 (94.6)
Child history of eczema	10 (10.3)	8 (8.2)	28 (25.2)
Children with siblings	36 (37.1)	36 (37.1)	53 (47.7)

^aIgE-mediated food allergy proven by skin prick testing or allergen-specific IgE.

^bMean (range).

^cNumber (percentages).

promote the earlier introduction of allergens or frequency of consumption. This finding may be due to high awareness of the importance of introducing potential allergens in this group of caregivers, over half of whom had a family history of allergy. Other researchers have reported a high level of awareness of early allergen introduction among Australian caregivers.^{8,9} All caregivers in the RCT, regardless of treatment, were provided with the ASCIA guidelines at the beginning of the study, which may have prompted them to introduce allergens. However, the high rate of allergy introduction in the Reference Group suggests this might not be the case. Moreover, only half of the caregivers in either treatment group could recall the ASCIA guidelines given to them. Finally, caregivers, especially those without a family history, may not have been aware of older guidelines to delay allergen introduction, but we lack data to explore historical trends.

After introducing allergens, the ASCIA Infant Feeding Guidelines encourage allergen consumption around twice a week.⁵ We do not know if caregivers adhered to these guidelines, as we did not ask about the frequency of consumption of allergens after introduction. This is a limitation of our study; however, caregivers reported that 25% of children had not consumed any peanut the previous week in the final survey. In the Melbourne EarlyNuts Study,⁸ most children (76.4%) had consumed peanuts more than four times by one year; some (5.5%) had only eaten peanuts once. While the exact quantity and frequency of peanut intake required to maintain tolerance are unknown, infants with eczema and peanut sensitization can lose tolerance if exposure is not maintained.¹⁰

Our study showed the importance of early assessment of potential adverse food reactions during the introduction to solid foods. Half of the reactions reported by caregivers were likely IgE-mediated allergy, and the children were referred for further assessment. Four of seven peanut reactions reported were mild and likely due to contact, and peanut was safely reintroduced at home. In an Australian survey, about 6% of caregivers sought health professional advice about potential adverse food reactions.⁹ As such, it is essential that health professionals are aware of current allergy prevention advice and manage mild reactions appropriately without unnecessary dietary restrictions.

In conclusion, SMS messaging did not increase early introduction of potential allergens in this group of caregivers. On a positive note, nearly all caregivers had introduced allergens by one year of age regardless of treatment. SMS messaging may still prove effective in populations where there is less awareness of early introduction of potential allergens to reduce allergy. Our findings suggest timely access to health professional advice after an early adverse food reaction may prevent unnecessary food avoidance. While advising early allergen introduction, ASCIA guidelines also recommend exposure to allergens twice a week thereafter. That many caregivers did not expose their child to allergens the week before the survey suggests there is room for improvement.

TABLE 2 Timing of intake of common food allergens by group at 12 months of age in the BabyEATS study

		SMS Group <i>n</i> = 96 <i>n</i> (%)	Non-SMS Group <i>n</i> = 93	Reference Group <i>n</i> = 110	SMS vs Non-SMS P for χ^2 test
Egg	Child has eaten allergen ^a	92 (95.8)	89 (93.7)	108 (98.2)	<i>p</i> = .39
Age egg introduced	0–4 months	3 (3.1)	0	2 (1.8)	
	4–6 months	25 (26.0)	29 (30.5)	30 (27.3)	
	6–8 months	51 (53.1)	51 (53.7)	54 (49.1)	
	8–10 months	9 (9.4)	8 (8.4)	17 (15.5)	
	10–12 months	1 (1.0)	1 (1.1)	4 (3.6)	
	Unsure	3 (3.1)	0	1 (0.9)	
	Child has never eaten egg	4 (4.2)	4 (4.2)	2 (1.8)	
Peanut	Child has eaten allergen ^a	94 (97.9)	88 (92.6)	102 (91.9)	<i>p</i> = .19
Age peanut introduced	0–4 months	1 (1.0)	0	1 (0.9)	
	4–6 months	28 (29.2)	27 (28.4)	29 (26.4)	
	6–8 months	46 (47.9)	52 (54.7)	48 (43.6)	
	8–10 months	13 (13.5)	6 (6.3)	17 (15.5)	
	10–12 months	6 (6.3)	3 (3.2)	8 (7.3)	
	Unsure	0	0	1 (0.9)	
	Child has never eaten peanut	2 (2.1)	5 (5.3)	8 (7.3)	
Wheat	Child has eaten allergen ^a	96 (100.0)	93 (97.9)	109 (99.1)	<i>p</i> = .80
Age wheat introduced	0–4 months	3 (3.1)	1 (1.1)	3 (2.7)	
	4–6 months	40 (41.7)	40 (42.1)	46 (48.4)	
	6–8 months	45 (46.9)	46 (48.4)	55 (50.5)	
	8–10 months	4 (4.2)	6 (6.3)	4 (3.6)	
	10–12 months	3 (3.1)	0	1 (0.9)	
	Unsure	1 (1.0)	0	0	
	Child has never eaten wheat	0	0	1 (1.8)	
Tree nuts	Child has eaten allergen ^a	76 (79.2)	72 (75.8)	92 (83.6)	<i>p</i> = .16
Fish	Child has eaten allergen ^a	90 (93.8)	89 (93.7)	104 (94.5)	<i>p</i> = .33
Dairy	Child has eaten allergen ^a	86 (89.6)	84 (88.4)	103 (93.6)	<i>p</i> = .39

^aNumber (percentages).**KEYWORDS**

early introduction, egg, food allergy, guidelines, infant feeding, infants, mobile health, peanut, timing of introduction

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CONFLICT OF INTEREST

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AUTHOR CONTRIBUTIONS

Merryn J Netting: Conceptualization (lead); Formal analysis (equal); Funding acquisition (lead); Investigation (lead); Methodology (lead); Software (supporting); Writing – original draft (lead). **Michael Gold:** Funding acquisition (supporting); Investigation (supporting); Supervision (lead); Writing – review & editing (supporting). **Patrick Quinn:** Supervision (equal); Writing – review & editing (supporting). **Sacha Palmer:** Resources (supporting); Supervision (supporting); Writing – review & editing (supporting). **Maria Makrides:** Conceptualization (supporting); Supervision (supporting); Visualization (equal); Writing – review & editing (supporting). **Tim Green:** Conceptualization (equal); Formal analysis (equal); Funding acquisition (supporting); Supervision (equal); Writing – original draft (supporting).

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