

ORIGINAL ARTICLE

Allergic gastroenteritis hospital admission time trends in Australia and New Zealand

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Aim: Recent epidemiological studies indicate increases in hospital food allergy-related anaphylaxis admission rates in Australian and New Zealand. The aim of the study was to examine whether non-IgE-mediated food allergy might have increased in parallel.

Methods: We analysed childhood hospital admissions rates by ICD 10 codes for allergic gastroenteritis (AG) and infective gastroenteritis in Australia and New Zealand between June 1998 and July 2014.

Results: In Australia, most AG-related admissions (73%) occurred in those aged <1 year and increased by 7.3%/year (95% confidence interval (CI) 5.5–9.3, $P < 0.0001$) from 6.8 to 26.5/10⁵ population. Similar trends were observed for New Zealand; 81% of admissions occurred in those aged <1 year and increased by 9.4%/year (95% CI 5.5–9.3, $P < 0.0001$) from 7.2 to 30.7/10⁵ population. By contrast there were no significant changes in AG-related admission rates in the older patients and infective gastroenteritis admissions fell in both countries in those aged <1 year; Australia by 4.4%/year (95% CI 4.3–4.6, $P < 0.0001$) and in New Zealand by 5.8%/year (95% CI 5.4–6.2, $P < 0.0001$).

Conclusion: We observed a fourfold increase in AG-related admission rates in two countries with known high rates of IgE-mediated food allergy/anaphylaxis. If confirmed by other studies, it will be of interest to determine if factors thought to contribute to the increase in IgE-mediated food allergy might also play a role in non-IgE-mediated gastroenterological food allergy syndromes.

Key words: allergic gastroenteritis; anaphylaxis; epidemiology; food allergy.

What is already known on this topic

- 1 IgE-mediated childhood food allergy has increased over the last 20 years in Australia and New Zealand.
- 2 It is unknown whether non-IgE-mediated food allergy has increased as well.

What this paper adds

- 1 Hospital admissions for allergic gastroenteritis (but not infective gastroenteritis) increased fourfold between 1998 and 2014.
- 2 If this represents a true increase (and not greater recognition), it remains uncertain whether the same risk factors for IgE-mediated food allergy are relevant for non-IgE-mediated food allergy.

Epidemiological data (e.g. hospitalisation rates) indicate that IgE-mediated food allergy (FA) and anaphylaxis has increased over the past two decades.^{1,2} With the possible exception of eosinophilic esophagitis³ and coeliac disease, it is unclear whether other non-IgE-mediated FA may have increased as well. 'Allergic gastroenteritis' (AG) as classified under the International Statistical Classification of Diseases (ICD-10) encompasses a number of non-IgE-mediated allergic conditions, including food protein-induced enterocolitis syndrome (FPIES), eosinophilic enteritis and colitis, food protein-induced enteropathy, 'other allergic dietetic gastroenteritis and colitis', food hypersensitivity enteritis and colitis (but

specifically not eosinophilic oesophagitis or coeliac disease). We sought to determine whether AG-related paediatric hospital admission rates have increased in parallel with increases in food-related IgE-mediated anaphylaxis in Australia and New Zealand.

Methods

We obtained ICD-10 classified hospital admissions data, as collected by the Australian Institute of Health and Welfare (AIHW) and the New Zealand Ministry of Health (NZMoH). Hospital admissions between July 1998 (Australia) or July 2000 (New Zealand) and June 2014 attributed to AG (K52.2) were examined. Infective gastroenteritis admissions (A0 to A9) and all-cause admissions (available for Australia only) were examined as comparators to control for any trend for overall increased hospitalisation for gastrointestinal disorders that may have confounded analysis. Age ranges of <1, 1–4 and 5–14 years were selected to facilitate comparison with other admission-related studies.² More

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Table 1 Time trends in hospital admissions rates for allergic gastroenteritis and infective gastroenteritis

Condition	<i>n</i>	Rate/100 000 1998 (Aust); 2000 (NZ)	Rate/100 000 2014	% change/year	Lower CI	Upper CI	<i>P</i> value
Australia							
Allergic gastroenteritis							
<1 year	633	6.8	26.5	7.3	5.5	9.3	<0.0001
1–4 years	167	0.5	1.5	2.6	–0.8	6	0.13
5–14 years	62	0.2	0.1	5	–0.6	10.9	0.081
Infectious gastroenteritis							
<1 year	73 132	2179.0	1243.3	–4.4	–4.3	–4.6	<0.0001
1–4 years	169 926	1222.0	486.2	–7.1	–7	–7.2	<0.0001
5–14 years	80 518	171.2	158.7	–1.1	–1	–1.3	<0.0001
Total admissions							
<1 year	2 388 538	54 933.2	57 820.2	–0.1	0	–0.1	<0.0001
1–4 years	2 848 250	17 783.5	15 787.5	–0.9	–0.9	–1	<0.0001
5–14 years	3 784 606	8622.6	9047.6	0.5	0.5	0.5	<0.0001
New Zealand							
Allergic gastroenteritis							
<1 year	104	7.2	30.7	9.4	4	15.1	0.0005
1–4 years	22	0.4	0.4	1.4	–8.6	12.5	0.79
5–14 years	2	0	0	–9	–30	36.4	0.61
Infectious gastroenteritis							
<1 year	12 278	1885.6	864.7	–5.8	–5.4	–6.2	<0.0001
1–4 years	20 320	829.6	368.5	–6.7	–6.4	–7	<0.0001
5–14 years	7058	95.5	55.6	–6.4	–5.8	–6.9	<0.0001

CI, confidence interval.

detailed codes for FPIES (K52.21), food protein-induced enteropathy (K52.22) or the term ‘other allergic dietetic gastroenteritis and colitis’ (K52.29) were unavailable from the institutions providing data (AIHW, NZ MoH). Data are expressed as rates/10⁵ population using concurrent national population data.² Time trends were analysed using Poisson regression with year as a continuous predictor and total population as exposure variable. Analysis was performed using SAS 9.3 statistical software (SAS Institute, North Carolina, USA). The Human Research and Ethics committee of Calvary Bruce/Calvary John James Private Hospitals, Canberra, Australia approved the study.

Results

Hospital admissions for AG increased over the study period in Australia and New Zealand. In Australia, most AG-related admissions (73%) occurred in those aged <1 year with slight male predominance (58%) and increased by 7.3%/year (95% confidence interval (CI) 5.5–9.3, *P* < 0.0001) from 6.8 to 26.5/10⁵ population (Table 1, Fig. 1a).

Similar trends were observed in New Zealand AG-related admissions; 81% occurred in those aged <1 year with slight male predominance (59%) and increased by 9.4%/year (95% CI 5.5–9.3, *P* < 0.0001) from 7.2 to 30.7/10⁵ population (Fig. 1b). By contrast there were no significant changes in AG-related admission rates in the two older age groups in either country (Table 1).

When infective gastroenteritis admissions were examined as comparators, these decreased in Australia by 4.4%/year (95% CI 4.3–4.6, *P* < 0.0001) and in New Zealand by 5.8%/year (95% CI 5.4–6.2, *P* < 0.0001) in those aged <1 year. In Australia there was a minor decrease in all-cause admissions of 0.1%/year (95% CI 0–0.1, *P* = 0.0001).

Discussion

We report a fourfold increase in AG-related hospital admission rates for AG in Australia and New Zealand in infants aged <1 year between 1998–1999 and 2013–2014. These trends (with slight male predominance and very similar rates between the two countries) could not be explained by increase in overall hospitalisation rates, or consistent changes in admission rates for potentially mimicking conditions such as infective gastroenteritis admissions, which decreased over the period of observation (likely related to update of rotavirus immunisation). AG-related admissions were almost absent in older Australasian age groups.

Many epidemiological studies rely upon ICD coding to track changes in rates of disease, or changes of distribution and burden of diseases within populations. In addition to the many potential caveats involved in using coding data of this nature³ there are as yet unresolved questions about exactly what the K52.2 ICD code represents in practice and how coders are interpreting admissions data to make this decision about the admission. Accurate coding also relies upon the diagnostic expertise of the health

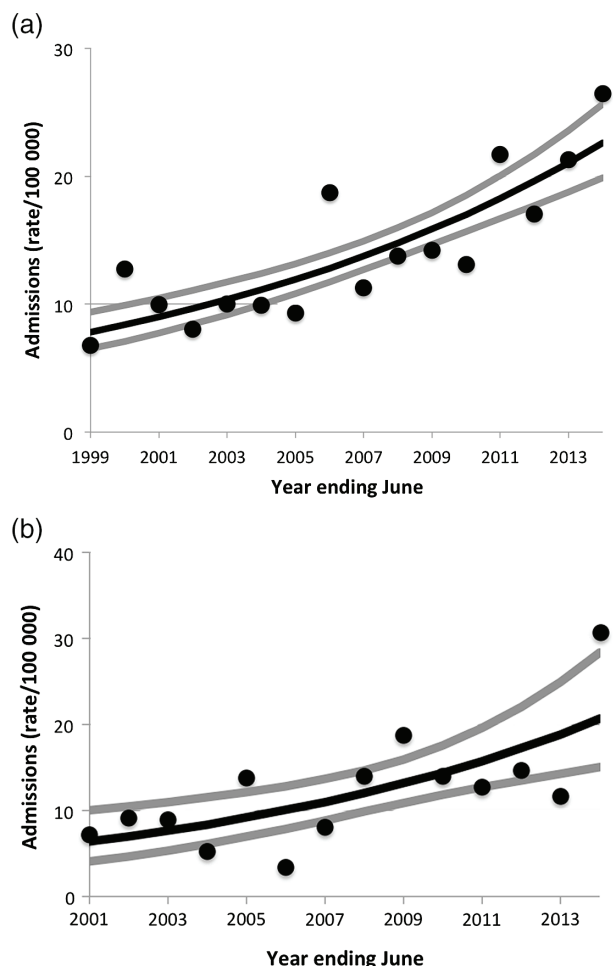


Fig. 1 Allergic gastroenteritis admissions in children aged less than 1 year. Admission rates are shown for (a) Australia and (b) New Zealand with trends lines (—) and 95% confidence interval (—).

professionals making the diagnosis during the hospital admission. The code is designed to identify FPIES, eosinophilic enteritis and colitis, food protein-induced enteropathy, food hypersensitivity enteritis and colitis but specifically not eosinophilic oesophagitis or coeliac disease. While it would have been informative to examine more detailed disease-specific codes, such data is not available for Australia or New Zealand at this time.

Overall, our data suggest a possible increase in non-IgE-mediated FA-related disorders such as has been already reported with eosinophilic esophagitis diagnostic rates³ and is consistent with reports of increasing FPIES presentations to large allergy referral centres in Australia⁴ and Italy⁵ although not the USA.⁶ While it is interesting to speculate that the increase in infant AG admissions might represent FPIES, with increase in infants presenting with the profuse vomiting, pallor and hypotension

characteristic of FPIES requiring admission (rather than emergency department assessment and discharge), such conclusions are precluded by the limitations of coding data and thus inability to differentiate from other related conditions (e.g. food-induced enteropathy with failure to thrive) or mimicking conditions (infective gastroenteritis). The observation that rates of admission for AG in both countries for the <1 year age group were very similar is supportive of the possibility that the majority of these cases represent FPIES. If the increase in AG is confirmed by other studies, and not an solely an artefact of improved recognition of disorders such as FPIES⁷ and coding, it will be of interest to determine if factors thought to contribute to the increase in IgE-mediated FA⁸ might also play a role in non-IgE-mediated gastroenterological FA syndromes.

Conclusion

We present preliminary evidence that non-IgE mediated FA related disorders may be increasing in early childhood. It is uncertain whether risk factors thought to play a role in IgE-mediated FA are relevant in these disorders.

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