

Differences in hospital attendance for anaphylaxis between immigrants and non-immigrants: a cohort study

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Summary

Background The impact of migration on the risk of anaphylaxis remains unknown. We hypothesized that non-Western immigrants have a lower incidence of anaphylaxis compared to Danish-born. We investigated variations in hospital attendance for anaphylaxis between immigrants and Danish-born including time- and age- trends.

Methods A register-based, historical prospective cohort design. Refugees or family reunified immigrants ($n = 127\ 250$) who, between January 1, 1994 and December 31, 2010, obtained residency permits in Denmark were included and matched in a 1 : 6 ratio on age and sex with Danish-born individuals ($n = 740\ 600$). Personal identification numbers were cross-linked to the Danish National Patient Registry identifying all first-time hospital attendances for anaphylaxis from January 1, 1994 and December 31, 2010. Incidence rate ratios were estimated, stratified for sex and region of birth, adjusting for age using a Cox regression model including the influence of duration of residence and age when residence was obtained.

Results In total 1053 hospital attendances for anaphylaxis were identified: 89 among non-Western immigrants, 9 among Western immigrants and 955 among Danish-born patients. Both male (RR = 0.65; 95%CI: 0.46;0.90) and female (RR = 0.64; 95%CI: 0.48;0.85) non-Western immigrants had a significantly lower risk ratio of hospital attendance for anaphylaxis compared to Danish-born. Compared to Danish-born, non-Western immigrants living in Denmark during the entire follow-up period also showed a decreased risk (RR = 0.65; 95%CI: 0.34;1.25). Compared to Danish-born, non-Western immigrants who obtained residence permission as children had a decreased risk of hospital attendance for anaphylaxis (RR = 0.48; 95%CI: 0.25;0.91).

Conclusion This Danish register-based study using nationwide data revealed fewer hospital attendances for anaphylaxis among non-Western immigrants compared to Danish-born; however this protection was lost over time.

Keywords immigrants, anaphylaxis, hospital attendance, migration, allergy

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Introduction

Over 100 million immigrants live in the more developed regions of the world, including nine million in Northern Europe, 22 million in Western Europe and 38 million in the United States (U.S.) [1]. In Denmark, an estimated 10.7% of the population was immigrants by December

31, 2013. The majority were born outside Western Europe [2], originating in particular from: Turkey, Iraq, Bosnia, Iran, Lebanon, Pakistan, and the former Yugoslavia. Among immigrants, our study focuses on refugees and family reunited immigrants which form the majority of individuals obtaining permanent residence permission in Denmark and many other Western countries [2].

Studying the health status of different immigrant groups and developments over time provides a unique opportunity to learn about how environmental factors interplay with genetic predispositions. The effect of past exposures in the emigrating country on immigrants' health have been hypothesized about and to a limited extent explored in studies for example in relation to the effect of malnutrition on the development of diabetes and cardiovascular disease among immigrants, as well as the risk of developing certain cancer types related to exposure to certain infectious agents [3–5]. However, immigrants' health may also be affected by the exposure to new risk factors in the host country, which is not least relevant in the study of allergic diseases. Studies of allergic disease among foreign-born children in the U.S. have shown a lower prevalence that increased after residing a decade [6, 7]. Similar results were found in studies from Australia and several European countries of the prevalence of atopy and asthma in immigrants [8, 9]. These results suggest that environmental factors are important in the pathogenesis of allergic diseases.

More specifically there is a lack of data on anaphylaxis, the most severe manifestation of allergy, in relation to immigration. No relevant studies could be identified in the literature. Cohort data are especially valuable when investigating the epidemiology and natural history of anaphylaxis in relation to migration because these enable investigation of changes in the risk of anaphylaxis over time. Our hypothesis was that immigrants have a lower incidence of anaphylaxis compared to Danish-born, but that the risk of anaphylaxis in immigrants converges to that experienced by the indigenous population as they are exposed to the same risk factors.

Methods

Institutional Review Board approval

The Danish Data Protection Agency approved the study. The dataset was made available and analysed in anonymous form by remote online access to the dataset stored at Statistics Denmark.

Population

We undertook a register-based, historical prospective cohort study. All family reunified immigrants and refugees who obtained residence permit in Denmark between January 1, 1993 and December 31, 2010 were eligible for inclusion. In total, 142 875 individuals had obtained residency, 116 064 when they were adults (≥ 18 years) and 26 811 as children (< 18 years). The following individuals were excluded: (i) individuals with missing personal identification number (the

majority of which were family reunified individuals who never immigrated and therefore never got a personal identification number); (ii) one individual with invalid age; (iii) individuals who were duplicated in the adult cohort were removed so they only occurred in the child cohort and one person due to being born before year 1900; (iv) individuals with unregistered gender. This resulted in a total cohort of 127 250 immigrants of whom 10 208 were immigrants from Western countries and 117 042 mainly non-Western immigrants (including from the former Yugoslavia)¹. Among these, 26 300 were children and 100 950 were adults. The distribution was 39% refugees and 61% family reunified immigrants.

A comparison group was formed from Danish-born residents with Danish-born parents (to avoid including descendants). Each family reunified immigrant² or refugee was age- and sex-matched with six Danish-born controls. Controls were randomly selected from all eligible controls without replacement, so each control was a control only once for a family reunified immigrant or refugee. The final group of Danish-born comparisons consisted of 740 600 Danish-born.

Data collection

All personal identification numbers were cross-linked to the Danish National Patient Registry identifying all diagnoses of anaphylaxis for first-time hospital contacts from January 1, 1994 to December 31, 2010. Hospital attendances included emergency room contacts, and inpatient and outpatient contacts. Both primary diagnoses and supplementary diagnoses were included based on the ICD-10 (T78.0, T78.2, T80.5, T88.6, T63.4F). The follow-up time was defined as the time from the commencement of the right of residence until the time of the first of the following events: (i) first-time anaphylaxis hospital attendance; (ii) death; (iii) first emigration; or (iv) end of study (i.e. December 31, 2010). The fact that some individuals only had a short follow-up and did not contribute with much information, was taken into account by using censoring. Through the Danish Civil Registration System we obtained data on date and destination of registered emigrations and death. We divided immigrants into those emigrating from Western and non-Western countries in accordance with Statistic Denmark's definition [2].

¹According to Statistics Denmark Western-countries are defined as: All EU-countries including Andorra, Iceland, Liechtenstein, Monaco, Norway, San Marino, Switzerland, the Vatican, Canada, USA, Australia and New Zealand. Non-western countries include all other countries.

²Family reunified immigrants are individuals reunified with families consisting of either refugees, immigrants, or Danish/Nordic citizens.

Data analyses

We estimated rate ratios (RR) and 95% confidence intervals (CI) separately for men, women and total group by region of origin using Danish-born as the reference group. Using first-time contact for anaphylaxis implied that an individual could only be counted once. A descriptive distribution of reported triggers of anaphylaxis was also carried out. Next, we estimated the influence of duration of residence and age when residence was obtained, separately for men and women, and for the overall population among non-Western immigrants using a Poisson regression model (R-version 3.0.1).

Results

Population

Table 1 shows characteristics of the study cohort. Immigrants in the cohort consisted of 8.0% Western and 92.0% non-Western. Non-Western immigrants mainly came from East Europe/Baltics/Balkan/Central Asia (26.6%) and North Africa/Western Asia (28.7%) Mean follow-up in years ranged from 9.24 to 11.31 for immigrants and 12.59 for Danish-born. Mean Age at end of Follow-up (AF) was 44 years for Western immigrants, 41 years for non-Western immigrants and 42 years for Danish-born.

Differences in incidence and triggers of anaphylaxis leading to hospital attendance

A final total of 1053 hospital attendances for anaphylaxis were identified among immigrants (9 in Western

immigrants and 89 in non-Western immigrants) and Danish-born individuals ($n = 955$). Table 2 shows the RRs of hospital attendances for anaphylaxis among all immigrants and divided into Western and non-Western compared to Danish-born. The table shows that among the total group of Western immigrants there were no significant differences in the risk of having a hospital attendance for anaphylaxis compared to Danish-born: (RR:0.91; 95%CI: 0.47;1.75). In contrast, the total group of non-Western immigrants (RR:0.64; 95%CI: 0.52;0.80) showed a significantly lower risk of having a hospital attendance for anaphylaxis compared to Danish-born individuals.

Table 3 shows the descriptive distribution of reported triggers of anaphylaxis. Insect sting and unspecified triggers were more prevalent among Danish-born compared to non-Western immigrants. In contrast, food allergies were more common among Western and non-Western immigrants compared to Danish-born.

The effect of duration of residence

Table 4 shows the effect of duration of residence on the risk of hospital attendance for anaphylaxis for non-Western immigrants compared to Danish-born individuals. Danish-born form the reference group. Non-Western immigrants living in Denmark during the entire follow-up period (13–19 years) showed no significant difference in hospital attendance for anaphylaxis compared to Danish-born (RR = 0.90; 95%CI: 0.59;1.38). However, a significantly decreased risk of hospital attendance for anaphylaxis was observed for newly arrived immigrants (0–4 years) compared to

Table 1. Characteristics of immigrants ($n = 127\ 250$) and Danish-born ($n = 740\ 600$) in the study cohort

	Western ($n = 10\ 208$)	Non-western ($n = 117\ 042$)	Danish-born ($n = 740\ 600$)
Gender			
Female	6407 (62.8%)	65 635 (56.1%)	409 706 (55.3%)
Events			
Emigrated	3147 (30.8%)	15 646 (2.69%)	31 324 (0.42%)
Deaths	169 (1.66%)	2414 (0.14%)	22 719 (0.02%)
Follow-up time (mean years)	9.24 (SE 5.7)	11.31 (SE 5.28)	12.29 (SE 4.85)
Region of birth			
East Europe, Baltics, Balkan and Central Asia		31 134 (26.6%)	
Western Asia and North Africa		33 614 (28.7%)	
Sub-Saharan Africa		16 398 (14.0%)	
South Eastern and Eastern Asia		18 089 (15.5%)	
South Asia		17 087 (15.2%)	
Age at Inclusion (AI) and Age at Follow-up (AF)			
AI children (mean)	10.16 (3.94%)	7.94 (3.43%)	7.95 (3.42%)
AI adults (mean)	32.75 (10.02%)	32.66 (11.22%)	33.04 (11.37%)
AF children (mean)	12.31 (4.57%)	13.95 (3.55%)	13.94 (3.56%)
AF adults (mean)	44.59 (10.77%)	41.43 (13.53%)	42.17 (13.65%)
AI group 0–18 years (n)	254 (2.19%)	24 708 (21.11%)	150 216 (20.28%)
AI group 19–60 years (n)	9702 (37.2%)	85 920 (73.41%)	549 914 (74.25%)
AI group 61–94 years (n)	224 (2.19%)	3705 (3.17%)	24 641 (3.33%)

Table 2. Rate ratios of first-time hospital attendance for anaphylaxis among western and non-western immigrants compared to Danish-born

	Danish-born (<i>n</i> = 740.600)	Western (<i>n</i> = 10 208)	<i>P</i> -value	Non-Western (<i>n</i> = 117 042)	<i>P</i> -value
Incidents					
Men	411	1		38	
Women	544	8		51	
Total	955	9		89	
Time at risk person-years					
Men	4182 867	38 882		598 034	
Women	4920 047	60 471		724 968	
Total	9102 913	94 353		1323 002	
Incidence rates					
Men	9.83 (8.92;10.82)	2.95 (0.42;20.95)		6.35 (4.62;8.73)	
Women	11.06 (10.17;12.03)	13.23 (6.62;26.45)		7.03 (5.35;9.26)	
Total	10.49 (9.85;11.18)	9.54 (4.96;18.33)		6.73 (5.47;8.28)	
IRR (95%CI)					
Men	1.00	0.30 (0.04;2.14)	<i>P</i> = 0.229	0.65 (0.46;0.90)	<i>P</i> = 0.010
Women	1.00	1.20 (0.60;2.40)	<i>P</i> = 0.615	0.64 (0.48;0.85)	<i>P</i> = 0.002
Total	1.00	0.91 (0.47;1.75)	<i>P</i> = 0.776	0.64 (0.52;0.80)	<i>P</i> = 0.000

Table 3. Distribution of anaphylaxis triggers among immigrants and Danish-born from 1.1.1994 to 31.12.2010

Trigger	Code	Western		Non-Western		Danish-born		Total	
		<i>n</i>	%	<i>n</i>	%	<i>n</i>	%	<i>N</i>	%
Insect sting	DT63.4	0	0	3	3.4	64	6.7	67	6.3
Food allergy and/or intolerance	DT78.0	3	33.3	22	24.7	166	17.4	191	18.1
	DT78.0A								
	DT78.0B								
Exercise induced	DT78.2A	0	0	0	0	8	0.8	8	0.8
	DT78.8A								
	DT80.5	0	0	2	2.2	6	0.6	8	0.8
Administration of Serum	DT88.6	2	22.2	21	23.6	199	20.9	222	21.1
Correct drug administration	DT78.2	4	44.5	41	46.1	512	53.6	557	52.9
Unspecified									
Total		9	100	89	100	955	100	1053	100

Danish-born (RR = 0.50; 95%CI: 0.32;0.78). The results were most pronounced for immigrant men compared to immigrant women.

Effect of age when residence was obtained

Table 5 shows the effect of age when residence was obtained on the risk of hospital attendance for anaphylaxis for non-Western immigrants compared to Danish-born individuals. Danish-born form the reference group. Compared to Danish-born, non-Western immigrants, who obtained residence permission as children had a significantly decreased risk of hospital attendance for anaphylaxis (RR = 0.48; 95%CI: 0.25;0.91). However, when comparing non-Western immigrants who had arrived at ages 60–89 years this group did not show any significant differences in hospital attendance for anaphylaxis compared to Danish-born (RR = 0.68; 95% CI: 0.21;2.22). Results were similar for both genders over age groups.

Discussion

Summary

This large national Danish cohort study revealed an overall lower incidence of hospital attendance for anaphylaxis among non-Western immigrants compared to Danish-born individuals. As hypothesized, these non-Western immigrants had increased risk of hospital attendance for anaphylaxis with increasing time of residence in Denmark. Also, higher age when obtaining residency resulted in an increased risk for hospital attendance for anaphylaxis.

Differences in incidence of hospital attendance for anaphylaxis

Our main finding was that the incidence of hospital attendance for anaphylaxis was lower among non-Western immigrants compared to Danish-born. The study is

Table 4. The effect of duration of residence on the risk of first-time hospital attendance for anaphylaxis for non-Western immigrants

Time since inclusion (TSI)		0–4 years		5–8 years		9–12 years		13–19 years	
		Immigrants	Danish-born	Immigrants	Danish-born	Immigrants	Danish-born	Immigrants	Danish-born
Women									
Incidents		13	153	19	144	9	135	10	112
Incidence rate		5.27 (3.06;9.08)	9.62 (8.21;11.27)	9.39 (5.99;14.73)	10.58 (8.98;12.45)	5.61 (2.92;10.79)	12.08 (10.20;14.30)	8.62 (4.64;16.03)	13.18 (10.95;15.86)
(pr. 100 000 years)									
Time at risk		246 453	1590 991	202 192	1361 319	160 355	1117 919	115 953	849 758
Risk ratio (95%CI)		0.55 (0.31;0.97)	1.00 (ref)	0.89 (0.55;1.43)	1.00 (ref)	0.46 (0.24;0.91)	1.00 (ref)	0.65 (0.34;1.25)	1.00 (ref)
Men									
Incidents		7	110	9	109	8	106	14	86
Incidence rate		3.62 (1.73;7.59)	8.55 (7.09;10.30)	5.45 (2.84;10.48)	9.57 (7.93;11.55)	5.82 (2.91;11.64)	10.8 (8.94;13.08)	13.72 (8.12;23.16)	11.08 (8.97;13.68)
(pr. 100 000 years)									
Time at risk		193 453	1287 103	165 062	1138 869	137 450	980 357	102 059	776 478
Risk ratio (95%CI)		0.42 (0.20;0.91)	1.00 (ref)	0.57 (0.29;1.12)	1.00 (ref)	0.54 (0.26;1.10)	1.00 (ref)	1.24 (0.70;2.18)	1.00 (ref)
Total									
Incidents		20	263	28	253	17	241	24	198
Incidence rate		4.55 (2.93;7.05)	9.14 (8.10;10.31)	7.62 (5.26;11.04)	10.12 (8.95;11.45)	5.71 (3.55;9.18)	11.49 (10.12;13.03)	11.01 (7.38;16.42)	12.18 (10.59;14.00)
(pr. 100 000 years)									
Time at risk		439 917	2878 093	367 254	2500 188	297 805	2098 276	218 013	1626 236
Risk ratio (95%CI)		0.50 (0.32;0.78)	1.00 (ref)	0.75 (0.51;1.11)	1.00 (ref)	0.50 (0.30;0.81)	1.00 (ref)	0.90 (0.59;1.38)	1.00 (ref)

Table 5. The effect of age when residence was obtained on the risk of first-time hospital attendance for anaphylaxis for non-Western immigrants

		Age upon arrival				60–94 years			
		0–17 years		18–59 years		Immigrants		Danish-born	
		Immigrants	Danish-born	Immigrants	Danish-born	Immigrants	Danish-born	Immigrants	Danish-born
Women									
Incidents		3	52	46	467	2	25		
Incidence rate (pr. 100 000 years)		1.76 (0.57;5.46)	5.40 (4.11;7.08)	8.64 (6.47;11.53)	12.37 (11.30;13.54)	9.08 (2.27;36.22)	13.81 (9.33;20.44)		
Time at risk		170 359	963 188	532 590	3 775 819	22 017	181 027		
Risk ratio (95%CI)		0.33 (0.10;1.04)	1.00 (ref)	0.70 (0.52;0.95)	1.00 (ref)	0.66 (0.16;2.78)	1.00 (ref)		
Men									
Incidents		7	72	30	328	1	11		
Incidence rate (pr. 100 000 years)		3.97 (1.89;8.33)	6.61 (5.24;8.32)	7.36 (2.15;10.53)	11.02 (9.89;12.28)	6.97 (0.98;49.46)	9.34 (5.17;16.86)		
Time at risk		176 173	1 098 658	407 507	2 975 413	14 354	117 788		
Risk ratio (95%CI)		0.60 (0.28;1.31)	1.00 (ref)	0.67 (0.46;0.97)	1.00 (ref)	0.75 (0.10;5.78)	1.00 (ref)		
Total									
Incidents		10	124	76	795	3	36		
Incidence rate (pr. 100 000 years)		2.89 (1.55;5.36)	6.06 (5.07;7.20)	8.08 (6.46;10.12)	11.78 (10.98;12.62)	8.25 (2.66;25.57)	12.05 (8.69;16.70)		
Time at risk		346 532	2 052 846	940 108	6 751 232	36 371	298 815		
Risk ratio (95%CI)		0.48 (0.25;0.91)	1.00 (ref)	0.69 (0.54;0.87)	1.00 (ref)	0.68 (0.21;2.22)	1.00 (ref)		

unique in that, to our knowledge, no previous studies have explored the risk of anaphylaxis in immigrants. The risk of anaphylaxis by ethnic group has been explored, but not in ethnic minority groups or among immigrants in a European context [10–12]. Some studies have investigated the risk of allergic disease and asthma in immigrants and these suggest that the lower incidence of allergic disease found in immigrants reflects a lower incidence of allergic disease in their country of origin [7, 13]. Similarly, the low incidence of anaphylaxis among non-Western immigrants found in our study may reflect a lower incidence of allergic disease in the countries of origin compared to European/Western countries. At the same time, the incidence of anaphylaxis might be on the increase in European countries [10, 14]. Consequently upon entry there is an initial protective effect about being a non-western immigrant, the exact nature of which remains unknown. In this exploratory study we have divided by region of origin but future studies should include other characteristics to disentangle this effect i.e. latitude or gross domestic product. An alternative explanation for our results may be inadequate access to health care among immigrants compared to Danish-born resulting in a lower proportion of registered hospital attendance for anaphylaxis among immigrant groups. The literature shows that non-Western immigrants experience a number of informal barriers in access to care including language related problems, lack of knowledge about how to utilize different sectors of the health care system, including hospitals, and misunderstandings arising in cross-cultural encounters [4, 15–17]. This may hinder or change immigrants' pathways to care in case of severe anaphylaxis requiring hospital attendance. However, Danish studies have shown that in fact several groups of non-Western immigrants were more likely to use the emergency room as well as primary care compared with Danish-born; it is therefore uncertain how these factors contribute to the attendance rates found in our study [18, 19]. Moreover, one may hypothesize that there are cultural differences in how individuals react to severe allergic symptoms and that Danish-born further may be more educated on signs of anaphylaxis.

Unlike the study by Clark et al. [20] we were unable to determine visits to allergists/immunologists or epinephrine autoinjector prescriptions prior to hospital attendance which could differ between immigrants and Danish-born individuals, and partly explain the lower incidence rate of anaphylaxis in hospital settings among non-Western immigrants. Recent large surveys conducted in the U.S. have found a high prevalence of anaphylaxis in the general population with a substantial proportion never presenting to health care facilities as well as inadequate awareness of symptoms and management of anaphylaxis. It is likely that immigrants

originating in countries with low real or estimated burden of severe allergic reactions and/or less awareness of this issue will face additional barriers in accessing hospitals when experiencing symptoms indicating anaphylaxis [21].

We may only speculate about the reasons that may be driving the differences in incidence with respect to exposures. Unfortunately, our data on exposures and the data on the anaphylaxis triggers were not very detailed and numbers were very small. Hypothetically, they may include exposure to new allergens, differences in genetic susceptibility, cumulative exposures and/or wider environmental co-factors such as risk of infection, drugs and psychological stress. We have no data that can help explain the differences between males and females, but we suggest that this is an important line of future enquiry that is best pursued through looking at differences in exposure to the above and other candidate risk factors. This also includes the importance of early life on the risk of developing allergic disease as this group of migrants may in some respects be considered immunologically naïve to certain factors that were not previously encountered in their countries of origin.

The effect of duration of residence and age when obtaining residence

Our main finding is nuanced by our two additional findings. First, immigrants' incidence appears to rise during follow-up from being significantly lower to not being significantly different from that of Danish-born. This is in line with our hypothesis that the risk of anaphylaxis increases due to a cumulative exposure to new allergens/triggers in the new post-migration environment. Unfortunately, there are no studies on anaphylaxis in immigrants, but only studies exploring allergic disease and sensitization; however those studies appear to support our results [6, 8, 22]. Second, we found that immigrants, who were <1 years when obtaining residence, were less likely to have a hospital attendance for anaphylaxis compared to Danish-born. However, this tendency became insignificant for those who were 18–59 years upon arrival. This finding is in accordance with recent studies that have found an association between older age, higher comorbidity burden and anaphylaxis [20, 21]. However, we do not know why the risk increase in those who arrive later on in life and our result warrants further exploration in future research.

Methodological strengths and limitations

The main strength of this study lies in that we were able to identify and follow a large cohort of immigrants

prospectively by linkage to nation-wide health registry data. Ensuring that all first-time anaphylaxis events were included represented a considerable challenge. We tried to achieve as accurate data as possible by including both primary and secondary diagnoses and ensuring that all relevant ICD-10 codes were included. Moreover, we included first-time attendances both in emergency rooms and from in- and out-patient contacts [23].

However, there are also limitations to our study. First, The Danish National Patient Registry is considered to be a sound source of data with good validity and coverage, but there are changes in the content and definitions of individual variables over time, which must be considered when appraising our results [24]. Second, although the study was based on a relatively large cohort of immigrants, absolute numbers become small especially when studying a rare event such as anaphylaxis. Consequently, we had to exclude Western immigrants and we were not able to divide non-Western immigrants into subgroups. Third, an important limitation was that we did not know the extent of *unregistered* emigrations in our cohort, but only the number of registered emigrations. Individuals may emigrate for up to 6 months yearly without registering this with the authorities. Our inability to include unregistered emigrations may thus underestimate the incidence of anaphylaxis among immigrants. Fourth, our outcome of hospital attendance included a combination of emergency room (ER), outpatient and inpatient (i.e. admission) attendances. We initially considered focusing on hospital admissions, but preliminary analyses showed that the numbers were insufficient for this kind of separate analyses. Consequently, we choose to pool all hospital attendances albeit it may weaken our conclusions. Unfortunately, we could not include contacts to primary care as the National Danish Health Service Register, which registers primary care contacts on a nationwide basis, does not include diagnosis. Finally, the lack of data from primary and specialist care is another limitation since some cases may have been seen and treated initially in community settings without further referral to hospital. The incidence rate would most likely be higher if we had been able to include data from primary care, specialized allergy clinics and prescribed medicine since recent studies, based on data from primary and secondary care, have found considerably higher incidence rates [21, 25, 26]. Consequently, we cannot rule out that our results may be biased by immigrants more often contacting their primary care physician for anaphylaxis compared to Danish-born.

Conclusion

This novel register-based study using nationwide data revealed a lower incidence of hospital attendances for

anaphylaxis among non-Western immigrants compared to Danish-born; this protection was however lost during the follow-up period. Information on the burden of anaphylaxis and its variations with time, place, and person is important to understand disease aetiology, but also for ensuring adherence to evidence-based anaphylaxis guidelines in clinical management and patient support for persons at risk of this potentially life-threatening event [27]. We consider this an initial agenda setting study, which will hopefully lead to studies from other countries with

larger migrant populations to investigate this issue further.

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Conflict of interest

The authors have no conflict of interest to declare.

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