Journal of Asthma

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/ijas20

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To cite this article: Emil Xabier San Sebastián, Jon Petter Stoor & Miguel San Sebastian (2023) Prevalence and risk factors for self-reported asthma among sámi in Sweden: a cross-sectional study, Journal of Asthma, 60:9, 1646-1652, DOI: 10.1080/02770903.2023.2169933

To link to this article: https://doi.org/10.1080/02770903.2023.2169933

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Published online: 06 Feb 2023.

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JOURNAL OF ASTHMA
2023, VOL. 60, NO. 9, 1646–1652
https://doi.org/10.1080/02770903.2023.2169933

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Prevalence and risk factors for self-reported asthma among sámi in Sweden: a cross-sectional study

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ABSTRACT

Objective: Literature about asthma among Indigenous communities worldwide is scarce. This study aimed to estimate the prevalence of self-reported asthma and to identify the risk factors associated with it among the Sámi population in Sweden.

Methods: A population-based health study (SámiHET) was conducted among the Sámi population aged 18–84 years in 2021. The asthma outcome was self-reported. Potential risk factors included sociodemographic, socioeconomic, cultural, behavioral and psychosomatic factors. Frequencies and percentages of the independent variables and the outcome were calculated. Then, the magnitude of the association between the independent variables and asthma was summarized with the prevalence ratio (PR) using the 95% confidence interval (95% CI) for inferential purposes.

Results: Overall, 20.6% of participants reported having asthma and 13.9% suffering from asthma with symptoms. Women (PR: 1.19; 95% CI: 1.01–1.42), those living in the Västerbotten region (PR: 1.35; 95% CI: 1.11–1.63) and those suffering financial strain (PR: 1.34; 95% CI: 1.07–1.69) had a higher risk of self-reported asthma. Among the psychosomatic factors, self-reported allergy (PR: 6.45; 95% CI: 5.11–8.17), overweight (PR: 1.46; 95% CI: 1.19–1.78) and obesity (PR: 1.75; 95% CI: 1.41–2.17) were statistically significant associated to asthma symptoms.

Conclusion: A higher prevalence of asthma was found among the Sámi in Sweden compared to the average Swedish population. The associated risk factors were similar to those described in the literature. To understand the reason behind the higher prevalence of asthma among Sámi, more asthma-specific research, including register data, is needed.

ARTICLE HISTORY
Received 6 December 2022
Revised 4 January 2023
Accepted 13 January 2023

KEYWORDS
Asthma; prevalence; risk factors; Sámi; Sweden

Introduction

Asthma is a chronic inflammatory disease of the respiratory system which affects all age groups. It is estimated that more than 300 million people are affected worldwide with an increasing incidence, particularly among younger individuals (1). Global prevalence is estimated to 4.3% but this varies between regions, being higher in Nordic countries with a prevalence ranging from 9–20% (2).

Asthma is developed by an interplay between intrinsic factors, such as genetics and atopy and multiple environmental factors (3). Common extrinsic risk factors for asthma reported in the literature include tobacco use, obesity, air pollution, exposure to viral and bacterial infections, stress, low socioeconomic status and occupational risk factors (1,4).

Literature about asthma among Indigenous communities is scarce. A review from Australia reported a higher asthma prevalence, although with wide differences between studies, among Indigenous compared to non-Indigenous populations (5). Asthma is one of the two most common causes of hospitalization and the second most common self-reported long-term illness among Indigenous Australians, with the asthma mortality rate among Indigenous Australians being 3.2 times higher than that of other Australians (6). A population-based study among Canadian Indigenous people reported a prevalence of diagnosed asthma of 11% among children and 12% among adults, with great variations according to place of residence (7).

The Sámi are the only Indigenous population within the European Union. Their traditional territory, Sápmi, covers the northern regions of Norway,

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Sweden, Finland and the Kola peninsula in Russia. The Sámi demography is largely unknown, as national registers in Nordic countries do not include ethnicity. In Sweden, estimates vary between 20 000 and 40 000 individuals with a minority of them (around 4,600) involved in reindeer husbandry (8). Overall, literature about the Sámi health in Sweden is limited and outdated. Although a review of somatic health among Sámi has been recently published (9), no information regarding asthma was reported. Thus, the objective of this study was to estimate the prevalence of self-reported asthma and identify the risk factors associated with it among the Sámi population in Sweden.

Methods

Study participants

This study is part of the SámiHET survey, a population-based health study conducted among the Sámi population in Sweden. The Sámi population was defined with the help of three registers: the electoral and reindeer mark register of the Sámi parliament as well as the register of "Labour statistics based on administrative sources" to identify those reporting reindeer herding as a source of income. In total, 9,249 individuals aged 18–84 years were identified and Statistics Sweden sent an invitation to participate in the survey to all of them. Data were collected from February to May 2021. More information about the study design and data collection can be found elsewhere (10).

Questionnaire

The 2021 SámiHET questionnaire included items enquiring about Sámi identity, language, discrimination, sociodemographic characteristics and numerous questions related to lifestyle behaviors and self-reported health. Individual questionnaires were linked to register data through the personal identity number by Statistics Sweden to include information about age, civil status, education and income.

Outcome

The question "Do you have any of the following diseases? - Asthma?" was used to determine the outcome. The participants could choose between four different answers: "No", "Yes, but no symptoms", "Yes, slight discomfort" and "Yes, severe discomfort". The first two answers were joined to indicate "no symptoms" and the last two to represent "asthma symptoms".

Independent variables

The potential risk factors associated to asthma were grouped together as follows: sociodemographic, socioeconomic, cultural, behavioral and psychosomatic factors. These variables were selected based on the literature (1,4) and the availability of data in the survey.

Three variables: sex, divided into men and women; age, further categorized into "18–29", "30–44", "45–64" and "65–84"; and region of residence, split into five categories: "Norrbotten", "Västerbotten", "Jämtland-Härjedalen", "Stockholm" and "other", were included as sociodemographic factors.

Four variables were considered as socioeconomic factors: education, which was divided into high (12+ years), medium (10–12 years) and low (<10 years); financial strain, which was measured by asking if they "would be able to manage within a month an unexpected expense of 12 000 SKR (~1200 USD) without borrowing or asking for help"; difficulties making ends meet, captured by asking if they had experienced troubles affording basic necessities (food, rent, bills etc.), with "no", "yes, once" and "yes, more than once" as possible answers; and individual disposable income, defined as the amount left for consumption or savings after taxes and all positive and negative transfers are made; the income was divided into quintiles (with quintile 1 being the richest).

Two culture-related variables were used: whether the participants were part of a Sámi reindeer herding community, which was divided into "mountain", "forest", "concession" or "none"; and whether they had been involved in reindeer herding activities during the last 12 months.

One well-known behavioral factor associated with asthma, smoking, was also included. The possible answers "No", "Yes, sometimes" and "Yes, daily" were dichotomized into "No" and "Yes". Finally, three psychosomatic factors were explored: whether participants had allergies, divided into "No" ("No" and "Yes, but no symptoms") and "Yes" ("Yes, slight discomfort" and "Yes, severe discomfort"); BMI, which was calculated using the reported height and weight and grouped into "Normal", "Overweight" and "Obese" (participants reporting length <1 m or a weight below 40 or >160 kg were excluded); and stress, which was examined by the question: "Do you feel currently stressed?" with the answers "Not at all" and "To some extent" coded as "No" and "Quite a lot" and "Very much" coded as "Yes".

Statistics

First, frequencies and percentages of independent variables and the outcome of the study sample were calculated. Then, the magnitude of association between

the independent variables and asthma was summarized with the prevalence ratio (PR) using the 95% confidence interval (95% CI) for inferential purposes. Crude regression models were estimated and the statistically significant variables were later included in a multivariable regression model. The variance inflation factor (VIF) was used to assess multicollinearity among the independent variables. Since the VIF was below 1.6 in all variables, the potential correlation was rejected. Sampling weighting was applied in all analyses which were conducted with the R software.

Ethics

The study was approved by the Swedish Ethical Review Authority (Dnr 2020–04803 and Ö 70–2020/3.1). Furthermore, the Ethical Guidelines for Sámi Health Research (11) were also followed and the board of the Sámi parliament in Sweden approved the SámiHET research project. The purpose of the study and the implications of participation in the study were explained in the letter of invitation which was available in Swedish as well as in North-, Lule and South Sámi languages. The participants were also asked to consent to their participation before the start of the survey.

Results

Characteristics of participants

Among the 9,249 invitations, 3,779 answered the survey, corresponding to a participation rate of 40.9%. Of these, 121 did not unequivocally identify as Sámi and were therefore excluded from further analysis. In total, 3,658 individuals made up the analytical sample of the study.

Table 1 shows the weighted distribution of the different independent variables in the total sample. Women made up to 50.9% of the sample and the largest age participating group was "45–64" (37.7%) followed by the 65–84 year-old group (26.1%). Almost half of the participants were living in Norrbotten region (48.9%) while the lowest proportion was from Jämtland-Härjedalen (7.3%).

The majority of participants had a medium educational level (61.8%) followed by a high one (23.7%). A similar number of participants reported having difficulties making ends meet (14.2%) as those who reported financial strain (16.6%). The mean income was 266 135 SKR per year.

More than half of the participants were not part of a Sámi reindeer herding community (56.9%) while 30.9% belonged to a mountain community, 10.8% to a forest and 1.4% to a concession. Most respondents had not worked with reindeers during the last 12 months (61.6%).

Table 1. Characteristics of weighted study sample, SámiHET 2021.

	N (%)
Socio-demographic factors	
Sex	
Men	1798 (49.1)
Women	1860 (50.9)
Age	
18–29	463 (12.7)
30–44	861 (23.5)
45–64	1381 (37.7)
65–84	954 (26.1)
Region of residence	
Norrbotten	1789 (48.9)
Västerbotten	845 (23.1)
Jämtland	268 (7.3)
Stockholm	282 (7.7)
Other	474 (13.0)
Socio-economic factors	
Education	
High	865 (23.7)
Medium	2258 (61.8)
Low	529 (14.5)
Financial strain	
No	3023 (83.4)
Yes	602 (16.6)
Difficulties to make ends meet	
No	3121 (85.8)
Yes	515 (14.2)
Mean income (sd)	266,135 (245,456.8)
Culture-related factors	
Sámi reindeer herding community	
None	2051 (56.9)
Mountain	1112 (30.9)
Forest	390 (10.8)
Concession	50 (1.4)
Worked with reindeers (last 12 months)	
No	2254 (61.6)
Yes	1404 (38.4)
Behavioral factors	
Smoking	
No	3311 (91.1)
Yes	323 (8.9)
Psychosomatic factors	
Allergy	
No	2128 (58.8)
Yes	1492 (41.2)
BMI	
Normal	1465 (40.7)
Overweight	1419 (39.4)
Obese	717 (19.9)
Stress	
No	3162 (87.2)
Yes	465 (12.8)

A small part of the participants reported to be smokers (8.9%) while almost half (41.2%) reported suffering from allergies. Almost as many participants were overweight (39.4%) as normal-weight (40.7%) and 12.8% reported being currently stressed.

Prevalence of asthma and risk factors

Overall, 20.6% of participants reported having asthma and 13.9% suffering from asthma with symptoms. Women reported suffering from symptoms to a larger

Table 2. Prevalence of asthma symptoms by risk factors, and crude and adjusted prevalence ratios (PR) with their 95% confidence intervals (95% CI); SámiHET study 2021.

	N (%)	Crude PR (95% CI)	Adjusted PR (95% CI)
Socio-demographic factors			
Sex			
Men	207 (11.7)	1	1
Women	295 (15.9)	1.36 (1.15–1.63)	1.19 (1.01–1.42)
Age			
18–29	66 (14.4)	1	
30–44	118 (13.8)	0.96 (0.70–1.31)	
45–64	207 (15.0)	1.05 (0.78–1.40)	
65–84	111 (11.9)	0.83 (0.61–1.12)	
Region of residence			
Norrbotten	213 (12.1)	1	1
Västerbotten	143 (17.1)	1.41 (1.15–1.73)	1.35 (1.11–1.63)
Jämtland-Härjedalen	39 (14.6)	1.19 (0.86–1.66)	1.30 (0.95–1.77)
Stockholm	40 (14.2)	1.18 (0.86–1.62)	1.10 (0.81–1.50)
Other	67 (14.2)	1.18 (0.91–1.53)	1.01 (0.79–1.29)
Socio-economic factors			
Education			
High	127 (14.7)	1	
Medium	317 (14.1)	0.96 (0.80–1.16)	
Low	60 (11.6)	0.78 (0.57–1.07)	
Financial strain			
No	378 (12.5)	1	1
Yes	123 (20.4)	1.63 (1.34–1.99)	1.34 (1.07–1.69)
Difficulties to make ends meet			
No	404 (12.9)	1	1
Yes	100 (19.3)	1.49 (1.21–1.85)	0.92 (0.71–1.19)
Income			
Q1 (richest)	84 (11.9)	1	
Q2	106 (14.8)	1.25 (0.95–1.64)	
Q3	104 (14.4)	1.21 (0.92–1.59)	
Q4	100 (14.1)	1.19 (0.90–1.57)	
Q5 (poorest)	109 (14.2)	1.19 (0.90–1.57)	
Culture-related factors			
Sámi reindeer herding community			
None	303 (14.6)	1	
Mountain	138 (12.3)	0.85 (0.69–1.03)	
Forest	53 (13.6)	0.93 (0.69–1.25)	
Concession	9 (18.0)	1.21 (0.63–2.34)	
Worked with reindeers			
No	327 (14.6)	1	
Yes	175 (12.6)	0.86 (0.72–1.03)	
Behavioral factors			
Smoking			
No	461 (13.9)	1	
Yes	43 (13.3)	0.95 (0.69–1.30)	
Psychosomatic factors			
Allergy			
No	89 (4.2)	1	1
Yes	417 (27.7)	6.70 (5.32–8.43)	6.45 (5.11–8.17)
Weight (BMI)			
Normal	148 (10.1)	1	1
Overweight	205 (14.3)	1.41 (1.15–1.74)	1.46 (1.19–1.78)
Obese	149 (20.7)	2.06 (1.65–2.56)	1.75 (1.41–2.17)
Stress			
No	411 (13.0)	1	1
Yes	94 (20.1)	1.55 (1.25–1.93)	1.21 (0.98–1.49)

extent (15.9%) than men (11.7%), observing a higher prevalence of asthma among individuals living in the Västerbotten region (17.1%).

Among the socioeconomic factors, the highest levels of asthma were found among those with difficulties making ends meet (19.3%) and those experiencing financial strain (20.4%). It is interesting to note the high prevalence of asthma found among individuals belonging to a concession community (18.0%), although the number of participants was low.

Those suffering from allergies (27.7%), obese (20.7%) and feeling stressed (20.1%) also reported the highest prevalence of asthma within their groups.

From the crude analysis (Table 2), sex, region of residence, financial strain and difficulties making ends meet were statistically significant associated with

asthma. Regarding behavioral and psychosomatic factors, all except smoking were significantly related to outcome. However, none of the culture-related factors were associated with asthma.

After adjustment, women (PR: 1.19; 95% CI: 1.01–1.42), those living in the Västerbotten region (PR: 1.35; 95% CI: 1.11–1.63) and those suffering financial strain (PR: 1.34; 95% CI: 1.07–1.69) had a higher risk of self-reported asthma. Among the psychosomatic factors, self-reported allergy symptoms (PR: 6.45; 95% CI: 5.11–8.17), overweight (PR: 1.46; 95% CI: 1.19–1.78) and even more, being obese (PR: 1.75; 95% CI: 1.41–2.17) remained statistically significantly associated with asthma symptoms. Finally, feeling currently stressed was strongly associated, almost significantly (PR: 1.21; 95% CI: 0.98–1.49), to our outcome.

Discussion

This study found a prevalence of self-reported asthma of 20.6% and of 13.9% when symptoms were included among the Sámi population in Sweden. Risk factors that were statistically significantly associated with asthma included sex, region, financial strain, being overweight or obese and self-reported allergies.

The Sámi population reported a higher prevalence of asthma compared to a similar population-based study conducted by the Public Health Agency of Sweden nationally, where the same question was used. The prevalence was almost double among the Sámi, both in the general question about asthma (20.6% vs 11.0%) and in the symptom-related question (13.9% vs 7.0%) (12). While the prevalence findings are difficult to compare with other Indigenous populations due to the different context and study designs, the pattern of an increased prevalence among Indigenous compared to non-Indigenous is commonly found in the literature (6,7). For instance, the prevalence of asthma among Indigenous Australians (16.5%) has also been reported to be higher than among other Australians (10.2%) (6).

The international (1) and national (12) literature describes asthma among adults as being more common among women, which was also reported in our study. Although some of the mechanisms remain unclear, sex hormones are considered responsible for this higher prevalence (13).

The distribution of asthma among the Sámi was similar throughout the different age groups, which is consistent with the pattern observed in Sweden (12), although not necessarily in other contexts, where a higher prevalence is often seen among young people (1,3,14).

A higher prevalence was expected in the most northern areas of the country such as in the Norrbotten region due to colder temperatures, but this was not the case; a higher risk was found in the Västerbotten region which, while in the north, is warmer than Norrbotten. If this was a random finding or whether there are specific factors operating at this region will require further investigation.

Financial strain remained as the only socioeconomic factor associated with asthma. Different studies have shown a relationship between low socioeconomic status and asthma, even among Indigenous populations (15,16). Higher levels of environmental exposure to indoor allergens due to poor housing conditions and/or outdoor pollution, increased smoking or stress due to economic pressures and an elevated comorbidity in this vulnerable group may be mediating factors in the association found (1,7).

Smoking, usually associated with asthma (1,4), had no significant effect in this study, which could be partly due to the low prevalence of smoking among the Sámi. However, overweight and obesity, common risk factors for asthma, were associated with the outcome in this population. Extra body weight can affect the immune system, leading to airway inflammation and modifying the way the lungs function, thus leading to asthma (4,17).

The relationship with allergy was also expected. Exposure to allergens is an important trigger for asthma symptoms and can lead to increased morbidity. This includes indoor allergens such as dust mites, molds and furry pets such as cats and dogs, or outdoor allergens such as pollen. Allergic rhinitis is also often associated with difficult-to control asthma (1).

Stress also showed a strong association with asthma. Recent studies have implied changes in the expression of genes that regulate behavioral, autonomic, neuroendocrine and immunological responses to stress as potential mechanisms underlying this association (18). Identifying the relevant factors leading to stress in this population will require further investigation.

Neither of the cultural-related factors had any significance for asthma which suggests that reindeer herding might not be behind the increased asthma prevalence found in the study. However, it may also be the case that the reindeer-herding-related questions failed to separate out the small group of active reindeer herders, who are more exposed to risk factors such as cold climate exposure. Other risk factors, found for example in Canadian aboriginals, like smoking, urban residence, low education and low household income (7,19,20), were not relevant for this Sámi population.

The large difference in asthma prevalence between this sample and the national study (12) was to some extent surprising. While no ethnic differences in financial strain or stress have been found between these two populations, a higher risk of overweight, obesity and allergy have been found among the Sámi, which could partly explain the observed gap (12,21). Also, the geographical distribution of the Sámi in Sweden (most living in the three northernmost regions) may also lead to higher exposure to cold climate. However, further investigation would be required to elucidate the reasons for the asthma prevalence disparity.

Methodological considerations

Several issues should be considered when interpreting the findings of this study. A clear strength is the large sample of Sámi participants and the use of the same question for asthma as in the national HET study conducted routinely by the Public Health Agency of Sweden, therefore allowing comparability. The use of registers for certain demographic (age, residence) and economic (education, income) variables contributes to an increase in the validity of the study.

The SámiHET study was not designed to ask specific questions about asthma and its risk factors, limiting the availability of the data on the one hand and the accuracy of the asthma diagnosis on the other. Further research considering register sources to identify asthma would be necessary to better understand our finding. As in any population-based study, with a moderate response rate and self-reported variables, selection and reporting bias could be operating; however, the extent of the impact of them on the study results is difficult to assess.

Conclusion

A higher prevalence of asthma was found among the Sámi in Sweden compared to the average Swedish population. The associated risk factors found are similar to those described in the literature, except in the case of smoking. To further understand the reason behind the higher prevalence of asthma among Sámi, more asthma-specific research, including register data, is needed. Specific policies targeting avoidable risk factors such as financial strain, obesity and stress among the Sámi population should also be implemented.

Acknowledgements

We are grateful to the Sámi participants in the SámiHET and to the authorities supporting the data collection: the Sámi Parliament in Sweden and the Public Health Agency of Sweden.

Data availability

The raw/processed data required to reproduce the above findings cannot be shared at this time due to legal/ethical reasons.

Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

Funding

This work was mostly funded by the Public Health Agency of Sweden with some contributions from the Swedish Research Council (grant 2020–01779) and the Strategic Funding from the Faculty of Medicine at Umeå University, Sweden (grant FS 2.1.6–339-20).

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