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PRACA ORYGINALNA
ORIGINAL PAPER

Socio-economic determinants of asthma and allergic diseases among students of lower secondary schools in Bytom

Społeczno-ekonomiczne uwarunkowania astmy i chorób alergicznych wśród gimnazjalistów z Bytomia

Elżbieta Czech[1], Agata Wypych-Ślusarska[1], Joanna Kasznia-Kocot[1], Ewa Niewiadomska[1], Michał Skrzypek[1], Jerzy Słowiński[1], Jolanta Malinowska-Borowska[2]

[1]Zakład Biostatystyki, Katedra Epidemiologii i Biostatystyki, Wydział Zdrowia Publicznego w Bytomiu, Śląski Uniwersytet Medyczny w Katowicach
[2]Zakład Toksykologii i Ochrony Zdrowia w Środowisku Pracy, Wydział Zdrowia Publicznego w Bytomiu, Śląski Uniwersytet Medyczny w Katowicach

ABSTRACT

INTRODUCTION: The implementation of prevention programmes requires proper identification of risk factors, including socio-economic conditions. The aim of the study was to determine the socio-economic determinants of asthma and allergic diseases occurring in children from Bytom.
MATERIAL AND METHODS: In 2011 and 2012, an epidemiological cross-sectional study on 1,099 students from lower secondary schools from Bytom was conducted. The students completed a questionnaire which was based on an earlier Health Behaviour in School-aged Children study (HBSC). The impact of the FAS (Family Affluence Scale) and mother's education level on asthma, dyspnoea, wheeze and allergy to house dust, pollen and pet dander were analysed. The questionnaire-derived data were analysed by means of conventional methods (Statistica 6.0). Statistical inference was made against the criterion of $p < 0.05$.
RESULTS: The prevalence of ever diagnosed asthma was 9.9%, dyspnoea – 24.4%, wheeze – 17.5% and these problems occurred more often in children from families with a low FAS score. Asthma occurred more frequently among children whose mothers have a primary or vocational education. Children from families with a high socio-economic status more frequently have allergy tests performed and reported allergies to house dust, pollen and animal dander.
CONCLUSIONS: This study shows the impact of lower maternal education on a higher prevalence of asthma in children, which may be associated with adverse health behaviours. Sensitization to inhalant allergens are specific to children from families with a high SES, which may be associated with the higher frequency of conducted allergy tests in this group.

KEY WORDS

children, asthma, socio-economic status, allergic disease, Family Affluence Scale (FAS)

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Address for correspondence: Dr n. med. Agata Wypych-Ślusarska, Zakład Biostatystyki, Katedra Epidemiologii i Biostatystyki, Wydział Zdrowia Publicznego w Bytomiu, Śląski Uniwersytet Medyczny w Katowicach, ul. Piekarska 18, 41-902 Bytom, tel. +48 501 239 881, e-mail: awypych@sum.edu.pl

STRESZCZENIE

WSTĘP: Wdrażanie odpowiednich programów profilaktycznych, minimalizujących skutki astmy bądź umożliwiających jej skuteczną kontrolę wymaga właściwej identyfikacji czynników ryzyka, w tym również uwarunkowań społeczno-ekonomicznych. Celem badania było określenie społeczno-ekonomicznych uwarunkowań astmy oraz chorób alergicznych występujących u dzieci z Bytomia.

MATERIAŁ I METODY: Na przełomie 2011/2012 r. przeprowadzono epidemiologiczne badanie przekrojowe wśród 1099 uczniów szkół gimnazjalnych w Bytomiu. Kwestionariusz, wypełniany przez uczniów, zawierał pytania pochodzące z kwestionariusza stosowanego w badaniu Health Behavior in School-aged Children (HBSC). Badano wpływ skali zasobów materialnych rodziny FAS (Family Affluence Scale) oraz wykształcenia matki na częstość występowania: astmy oskrzelowej, napadów duszności, świszczącego oddechu, alergii na kurz, pyłki roślin oraz sierść zwierząt, a także na częstość wykonywania testów alergicznych. Analiza danych została przeprowadzona w programie Statistica 10.0. Przyjęto poziom znamienności statystycznej $p < 0,05$.

WYNIKI: Częstość rozpoznanej kiedykolwiek astmy oskrzelowej wynosiła 9,9%, napadów duszności 24,4% oraz świszczącego oddechu 17,5% i problemy te częściej występowały u dzieci z rodzin o niskim FAS. Astma oskrzelowa częściej dotyczy dzieci, których matki legitymują się wykształceniem podstawowym lub zawodowym. Dzieci z rodzin o wysokim statusie społeczno-ekonomicznym (wysoki poziom skali FAS i wyższe wykształcenie matek) częściej mają wykonywane testy alergiczne i częściej też zgłaszają alergię na kurz domowy, pyłki roślin oraz sierść zwierząt.

WNIOSKI: Przeprowadzone badanie wskazuje na wpływ niższego wykształcenia matek na częstsze występowanie astmy oskrzelowej u dzieci, co związane może być z niekorzystnymi zachowaniami zdrowotnymi. Uczulenia na alergeny wziewne są charakterystyczne dla dzieci z rodzin o wysokim SES, co może być związane z częstszym wykonywaniem testów alergicznych w tej grupie.

SŁOWA KLUCZOWE

dzieci, astma, status społeczno-ekonomiczny, choroby alergiczne, Family Affluence Scale (FAS)

INTRODUCTION

Asthma and allergies in children constitute a significant problem in public health. It is estimated that from 5% to 30% of children and adolescents worldwide may suffer from asthma [1]. Different epidemiological trends in asthma incidence are observed in the world. In some countries an increasing number of children with asthma is still observed, and in other countries, stabilization or even reduction of the incidence and prevalence rates can be noticed [2,3]. However, due to its complex disease etiology and its health, social and economic importance, public health and medical sciences professionals are still focused on it. Furthermore, allergic diseases in developmental age civilization diseases of the twentieth century are still a significant problem [4]. They affect approx. 20% of children in Poland, but depending on the kind of allergy, the percentages may be higher or lower [4]. For example, the results of ECAP (Epidemiology of Allergic Diseases in Poland) show that allergic rhinitis applies to every fourth pupil at the age of 13–14 years [4].

As was previously mentioned, the etiology of allergic diseases and asthma in the developmental age is complex. Genetic, social and economic factors are also significant for the etiology and disease process. Socioeconomic status (SES) is an important indicator of children's health. It can be assumed that it is one of the indicators of social prestige, which refers to the access to goods. It is generally determined by such indicators as income, education, occupation and place of residence [5]. There are few scientific reports on health inequalities related to allergic diseases and asthma in the developmental age. Moreover, the results presented in those reports are often contradictory. Probably, it is implied by different definitions of SES and its various research areas which are taken into account in studies. Some papers indicate that a high percentage of children with asthma come from families with a low SES, while others do not find relationships between SES and the incidence of asthma and allergy [6,7]. In the study by Poyser et al. it was found that asthma is a disease of affluent individuals, while Hancox et al. did not observe any relationship between parents' income and the incidence of asthma in a group of 13- and 15-year-olds [8,9]. This study was designed because of the ambiguous findings concerning the relationship between SES and asthma and allergic diseases. The aim of this study was to recognize the social and economic determinants of asthma and allergic diseases among students of lower secondary schools in Bytom, Poland.

MATERIAL AND METHODS

In 2011 and 2012, an epidemiological cross-sectional study concerning 3 262 students of lower secondary schools in Bytom was done. A questionnaire with several questions based on Health Behavior in School-Aged Children (HBSC) and the International Study of Asthma and Allergies in Childhood (ISAAC) was the main research tool. Students handed over to their parents a letter of intent explaining the aim and scope of the study and a statement of consent to fill out the questionnaire. At stage one, the questionnaires were successfully filled in by 1 099 students. The Family Affluence Scale (FAS) and mother's education level were taken as SES ratios. The education of the father was not analyzed because (as we can conclude from various studies, and from the experience of our scientific team) mostly mothers have a decisive position regarding the nutrition of their children and the quality of chosen products. They shape health habits and affect conditions that can promote or reduce the development of allergens [10].

The FAS is a frequently used measure of the health of adolescents [11]. The FAS reflects the level of material well-being in families. It consists of the following questions and answers evaluated from 0 to 2 points:

1. Does your family own a car or a van? – response categories: no (0 points); yes, one (1 point); two or more (2 points).
2. Do you have your own bedroom for yourself? – no (0 points); yes (1 point)
3. During the past 12 months did you travel with your family on holidays outside your city of residence? – response categories: no I did not (0 points), once (1 point), twice (2 points), more than 2 times (2 points)
4. How many personal computers does your family own? – none (0 points), one (1 point), two or more than two (2 points).

0–3 points are considered a FAS low, 4–5 points for the average level, and 6–7 points indicate a high FAS score [11]. The relationship between SES and the incidence of asthma, attacks of breathlessness, wheezing, allergies to dust, pollen, plants and animals, as well as performing allergy tests was examined. Data analysis was realized with tools in Statistica 10.0 software. The Chi-square test was used to evaluate differences between the variables. Statistical significance was set at the level of 0.05.

RESULTS

1099 students of lower secondary schools (55.6% girls and 44.4% boys) took part in the study. Average and high levels on The Family Affluence Scale (FAS) were assigned to 39.5% of respondents, and every fifth of the examined students comes from a family with a low FAS score (20.9%). The percentage of respondents whose mothers have secondary education is 38.7%, primary or vocational education – 37.7%, and 23.6% – with a higher education degree. The incidence of diagnosed (at any time) asthma declared in the questionnaire is 9.9% (n = 104), asthma attacks occurring at any time – 24.4% (n = 265) and in the last 12 months – 16.7% (n = 182), wheezing occurring at any time – 17.5% (n = 190) and in the last 12 months – 11.3% (n = 123). The analyzed respiratory system symptoms are more frequently observed among girls than boys, and in the case of asthma an inverse relationship was observed, as shown in Figure 1.

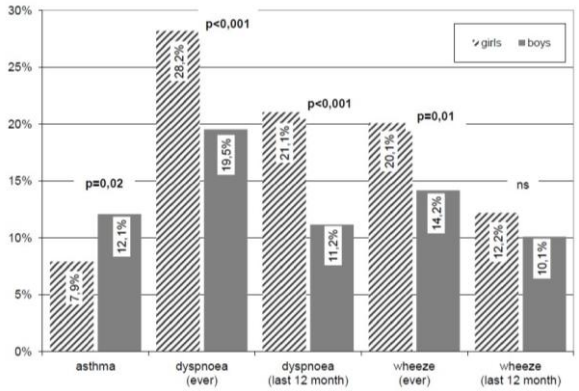

Fig. 1. The incidence of asthma and the symptoms of the respiratory system by sex.
Ryc.1. Częstość występowania astmy i objawów ze strony układu oddechowego w zależności od płci.

630 (57.6%) children had allergy tests performed, more boys (n = 293; 60.5%) than girls (n = 337; 55.3%). An allergy to dust was declared by every fifth respondent (n =2 27; 20.7%), every fourth declared an allergy to pollen (n = 280; 25.6%), and 174 (15.9%) declared an allergy to animal hair. Detailed results are presented in Figure 2.

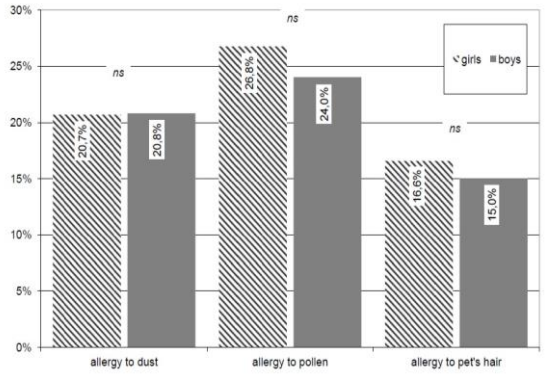

Fig. 2. The prevalence of allergy by sex.
Ryc. 2. Częstość występowania alergii w zależności od płci.

Analysis of the relationship between SES and the discussed health problems showed that bronchial asthma and its symptoms are more common in children from families with a low FAS score. However, only in the case of asthma attacks occurring in the past 12 months were the differences between the groups found to be statistically significant. Children from wealthier families (high FAS score) had allergy tests performed more frequently than children whose families had a very low FAS score (61.6% vs. 50.9%; p = 0.03). They also more often reported allergies to house dust (22.8%), pollen (28.5%) and animal hair (18.4%), though the differences between the groups did not appear to be statistically significant. It also appeared that mothers' education is related to the prevalence of asthma, its symptoms and analyzed allergic diseases. The discussed health problems are more common among children whose mothers have a secondary education. Detailed results of the analysis are shown in Tables I and II.

Table I. Family Affluence Scale (FAS) and prevalence of asthma, respiratory symptoms and allergy
Tabela I. Skala Zasobów Materialnych Rodziny (FAS) a częstość występowania astmy, objawów ze strony układu oddechowego i alergii

Health problem	Total n (%)	FAS			p value
		Low n (%)	Medium n (%)	High n (%)	
Disease/Symptom					
Asthma	104 (9.91%)	24 (10.9%)	38 (9.1%)	42 (10.2%)	p = 0.76
Dyspnoea (ever)	262 (24.5%)	70 (31.1%)	93 (22.0%)	99 (23.5%)	p = 0.03
Dyspnoea (last 12 months)	180 (16.8%)	51 (22.7%)	61 (14.4%)	68 (16.0%)	p = 0.02
Wheeze (ever)	188 (17.6%)	44 (19.7%)	69 (16.3%)	75 (17.8%)	p = 0.54
Wheeze (last 12 months)	121 (11.3%)	35 (15.6%)	42 (9.9%)	44 (10.4%)	p = 0.07
Allergy					
Allergy to house dust	224 (20.8%)	42 (18.6%)	85 (20.1%)	97 (22.8%)	p = 0.39
Allergy to pollen	276 (25.7%)	54 (23.9%)	101 (23.8%)	121 (28.5%)	p = 0.23
Allergy to animal hair	174 (16.2%)	28 (12.4%)	68 (16.0%)	78 (18.4%)	p = 0.14
Allergy tests	621 (57.8%)	115 (50.9%)	245 (57.7%)	261 (61.6%)	p = 0.03

Table II. Education of mothers and prevalence of asthma, respiratory symptoms and allergy
Tabela II. Wykształcenie matki a częstość występowania astmy, objawów ze strony układu oddechowego i alergii

Heath problem	Education of mothers				p value
	Total n (%)	Primary or vocational n (%)	Secondary n (%)	Tetiary n (%)	
Disease/Symptom					
Asthma	81 (9.8%)	25 (7.9%)	42 (13.2%)	14 (7.3%)	p = 0.04
Dyspnoea (ever)	207 (24.6%)	70 (22.0%)	98 (30.1%)	39 (19.8%)	p = 0.01
Dyspnoea (last 12 months)	148 (17.5%)	58 (18.2%)	61 (18.6%)	29 (14.7%)	p = 0.47
Wheeze (ever)	152 (18.1%)	43 (13.6%)	68 (20.8%)	41 (20.8%)	p = 0.03
Wheeze (last 12 months)	99 (11.3%)	24 (7.6%)	48 (14.6%)	27 (13.6%)	p = 0.01
Allergy					
Allergy to house dust	181 (21.4%)	61 (19.1%)	75 (22.8%)	45 (22.8%)	p = 0.45
Allergy to pollen	229 (27.1%)	70 (21.9%)	101 (30.7%)	58 (29.4%)	p = 0.03
Allergy to animal hair	151 (17.9%)	50 (15.6%)	67 (20.4%)	34 (17.3%)	p = 0.28
Allergy tests	495 (58.6%)	177 (55.5%)	203 (61.7%)	115 (58.4%)	p = 0.27

DISCUSSION

Asthma is a chronic disease which undoubtedly greatly affects the quality of life of a patient. However, appropriate treatment makes it possible to control the disease adequately, which means better functioning and performance of daily duties. Therefore, it is important to recognize all the possible risk factors initiating asthma and exacerbating its symptoms. Apart from environmental and genetic factors, socio-economic ones are also significant in this context. They are important in the case of allergic diseases. For example, a higher incidence of asthma and allergies can be observed in developed countries than in developing ones, though some exceptions can be noticed in particular groups. Poor populations in developed countries and wealthy populations in developing countries

more frequently suffer from asthma. Probably it is implied by the factors related to lifestyle [12].

Unfortunately, the impact of socio-economic status (SES) on the examined diseases is not fully understood and explained, while scientific reports on this are inconsistent sometimes. Therefore, further studies that help to understand the mentioned relationships and contribute to better control of the disease are needed.

The aim of this study was to discover the social and economic determinants of asthma and allergic diseases among students of lower secondary schools in Bytom, Poland. The study proved the occurrence of asthma at the level of 10.2%. A similar study conducted in 2004 in Bytom proved that the frequency of declared bronchial asthma ever diagnosed by a doctor was at the level of 4.2% [13]. Taking into account this ratio, it can be concluded that the frequency of asthma in Bytom increased by a factor of 2. However, a clear explanation for this difference could not be made because this study was designed for a different purpose. The higher frequency of asthma among students of lower secondary schools could be a result of the impact of socio-economic, environmental factors or a consequence of medical diagnosis in response to prevention programs.

In the examined population, no significant differences between the SES (measured by the Family Affluence Scale) and incidence of asthma are observed. Differences in the incidence of this disease in children from families with low FAS levels and the group coming from families with high FAS levels are evaluated on the level of 0.7 percentage points. Nevertheless, in the case of asthma symptoms, some regularities can be observed: attacks of breathlessness and wheezing occurring at any time, and in the last 12 months are more frequently related to children whose families are characterized by low FAS levels in comparison to children from families with high FAS levels. It must be noticed that in the case of wheezing, these differences were statistically significant. These results are consistent with observations made by other authors. Most studies point out that children whose families are characterized by a low SES have respiratory system symptoms more frequently than bronchial asthma itself [7,14,15]. Unfortunately, the design of our study does not allow for more detailed explanation of the differences between SES and the incidence of respiratory disease. In other papers it is indicated that this difference could be explained by exposure to other risk factors exacerbating asthma symptoms or affecting the respiratory system e.g. exposure to tobacco smoke, the presence of moisture and mold in homes, and protective factors, e.g. breast-feeding, are less popular in such families [16,17,18].

Similarly, Sternthal et al. show that low mother's SES adversely affects the respiratory health of their children, increases the level of IgE and increases the incidence of wheezing [19]. Moreover, the authors claim that mothers' socio-economic status in their childhood is of the key importance. According to the life cycle theory and socio-ecological attitude, from early childhood there is an accumulation of negative factors which later affect an adult woman's life and furthermore her future offspring [20,21].

This research brings interesting and also surprising results in relation to analysis of the impact of mother's education on the incidence of asthma, symptoms of respiratory disease and some types of allergies. We found a statistically significantly higher prevalence of asthma among children whose mothers have secondary education. These relationships are not related to the economic situation where the incidence of asthma was the highest in the group of children from families with a low FAS level. Possibly, the discrepancy observed here is implied by the scale used to assess the level of material conditions of the family. It is a subjective scale discussed in detail at the beginning of this work. It is not a rule that the lack of one's own room, a small number of computers at home, lack of a car, or rare trips outside the city of residence characterize families with a low material status. However, due to the fact that lower secondary school students are not yet able to objectively assess the level of wealth of their families, the FAS was used. FAS is a useful tool in many national and international studies [22,23]. Many authors also indicate the regularity that the lifestyle and behavior of parents with a worse economic situation does not serve the health of their children, e.g. smoking during pregnancy and in the presence of children, abandoning breastfeeding [16,17,19,24,25].

The results of our study are consistent with the observations of a cohort study by the Dutch Prevention and Incidence of Asthma and Mite Allergy (PIAMA) [25]. A low mother's education was associated with a higher incidence of asthma in their children and it was a result of unhealthy behaviors. On the other hand, lower education was related to the mother's age. Younger mothers were less educated and they bore children earlier. The PIAMA cohort perfectly explains the relationships between the level of mother's education and the health of their children, pointing at numerous conditions related to this factor. In contrast, the results of the respiratory system symptoms are surprising: attacks of dyspnoea occurring at any time and in the last 12 months are more frequent in children whose mothers have a primary or vocational education. Inverted relationships were observed in the case of wheezing: the children of better-educated mothers declared this symptom more frequently.

In the case of allergies, different regularities can be observed. Allergies to dust, animal hair and pollen are more common in children whose families are charac-

terized by higher levels of SES (high FAS levels, and higher education of mothers) than children from families with a lower SES (low FAS levels, basic or vocational education of mothers). The differences presented in our study may have resulted from the frequency of allergy tests. These tests were statistically significantly more frequently performed among children from families with a high FAS level whose mothers had a higher education. The frequency of allergy tests could affect the image of particular allergies, however, the design of this study (cross-sectional study) does not allow the authors to clearly explain the differences between the economic groups. Therefore, the influence of environmental factors cannot be negated.

This study, however, has some limitations associated with the protocol. Firstly, the low participation index (33.7%) could affect the findings of our study. Successful recruitment of respondents is one of the major problems in questionnaire studies. Moreover, the letter of intent and the statement of consent were handed over to parents by students. It cannot be ruled out that some of the letters were not given to parents. Probably, the neglect of this part of the study would have increased the number of respondents. An epidemiological cross-sectional study is a popular type of survey because of its low cost. It is limited, however, by the fact that it gives no indication of the sequence of events. Because of that, it is difficult to determine the relationship between the cause and the effect. In our study, explanation of the causal relationship between SES and respiratory disease is also difficult and could not be verified directly by the results. The incidence of asthma and other respiratory disease could also be influenced by other factors such as the type of heating, the presence of moisture and mold, tobacco smoke exposure, animal allergens, etc.

Therefore, the statistical correlations presented in this study should be viewed with respect to the mentioned limitations of cross-sectional studies. The indicated doubts and concerns can constitute hypotheses in future projects.

CONCLUSIONS

The study shows the impact of lower education of mothers on a higher incidence of asthma in children, which may be associated with adverse health behaviors. The symptoms of asthma are more common in children from families with a low level of family wealth measured by the FAS. On the other hand, allergies to inhalant allergens are typical for children from families with a high SES, high FAS levle and high mother's education, which may be associated with a higher ratio of performing allergy tests in this group.

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