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Pediculosis capitis among schoolchildren in urban and rural areas of eastern Poland

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Abstract. The objective of this study was to compare the prevalence of head pediculosis in the rural and urban environments of Lublin Province (eastern Poland) in 1996–2000 and to examine socioeconomic factors influencing distribution among schoolchildren. A total of 95,153 schoolchildren living in urban and rural areas were examined twice yearly by school nurses. The overall rate of head pediculosis differs significantly between rural (1.59%) and urban (0.48%) schools in eastern Poland. Children between 8 and 12 years old were most frequently infested. Pediculosis was observed most frequently in girls both in the urban (63.5%) and rural (75.3%) schools and this was related with hairstyles. The prevalence of pediculosis decreased with increasing life standards, i.e. with high income, accessibility and consumption of water and better health care systems. Our findings showed that prevalence of pediculosis capitis depends on the age and sex of the schoolchildren and their living conditions. Hygienic controls of schoolchildren by nurses are important in the elimination of *Pediculus humanus capitis*. Our results confirmed pediculosis capitis is still a problem in different environments, particularly with lower life standards and poorer economic conditions of health care.

Key words: Epidemiology, Health care, Pediculosis capitis, *Pediculus humanus capitis*, Socioeconomic factors

Introduction

Pediculus humanus capitis is a permanent human ectoparasite throughout the world. In recent years an increase in the prevalence in different countries has been observed [1–3]. The rate of headlice infestation differs in various countries through the world [2–7], varying from 1.92% in Barcelona (Spain) [8] to as high as 81.5% in Buenos Aries (Argentina) [9]. In Europe, pediculosis prevalence were reported 1.92–9.4% in Spain [8, 10], and 15–30.5% in France [11, 12]. However, little is known about the distribution of headlice in Eastern Europe [13–15]. In Poland, studies on the occurrence of head pediculosis had been carried out mostly in the industrial north and west regions [16–18].

Different host factors are related with increased risk of pediculosis. Body lice are associated with poor socioeconomic conditions, with infestation occurring when hair is not wash or clothes are not changed or washed regularly [19]. Homeless, refugee-camp [19], and slum [20] populations are frequently affected. Mozer [21] related the increasing number of plica polonica in Hungary with the growing poverty of society.

Thus, the aim of the present study was to investigate the extent of headlice infestation both in rural and urban areas of south-eastern Poland as well as to evaluate the importance of some population related factors.

Methods

The research was conducted in 13 urban primary schools from Lublin and 54 rural ones located near the Polish–Ukrainian border (Figure 1). The examined schools were chosen randomly. During the years 1996–2000, a total of 95,153 schoolchildren (42,759 from the country and 52,394 from the city) were examined. The observations were performed by school nurses twice yearly. The data in the inquiry except age and sex are listed below:

1. The average monthly disposable income per family member (in $).
2. Unemployment defined as a ratio of total number of unemployed people to total number of people who can work (in %).
3. Water supply expressed by annual per capita household water consumption (in cubic meter).
4. The length of water supply system per one square kilometer of area (in km/km^2).
5. The number of nurses and number of physicians per 10,000 inhabitants in the area.

Data on the socioeconomic and medical structure were obtained from Central Statistics Office in Lublin

Figure 1. Area observed.

and primary health care institutions situated in different parts of Lublin Province [22]. In 1998 the territory of Poland was structured into new territorial units. There was a change of administrative borders of Lubelskie voivodship, its poviats and gminas, which influenced statistical parameters used in the study.

Differences between groups were analyzed by test for percentage of population, test for correlation coefficient, with the use of the analysis of variances (ANOVA) to verify the equality of means and Bartlett test for equality of variances. The differences were examined between administrative subunits (gminas) in the experimental area.

Results

A total of 934 children, 682 (73%) from rural and 252 (27%) from urban schools, were infested with *P. h. capitis* between 1996 and 2001. Mean rate was 1.59% in the country and 0.48% in the city. Similar distribution of this parasite occurred in each year of observation (Table 1).

Prevalence of head pediculosis differed between the schools examined. In one school it ranged from 0 to 7.75% in rural and from 0 to 2.5% in urban environments. A group of 4 urban and 15 rural primary schools were free from infestation *P. h. capitis* during the whole investigation period.

The most frequently affected children were aged between 8 and 11 years in the urban schools and 8 and 12 years in the rural ones. The rarest infestation occurred in children between 13 and 14 years old (Figure 2). The girls were more frequently infested with headlice both in urban (63.5%) and in rural schools (75.3%).

The analyses of socioeconomic status in Lublin Province showed lower unemployment rates and higher monthly income in the city during the whole examination period. Summarized data are given in Table 2. Statistical analysis found a correlation between *P. h. capitis* infestation and unemployment rate. Water supply system in the city was approximately 6 times longer than in the country (Table 2). Consumption of water was twice as high in the urban communities than in the rural ones. There was a reverse correlation between accessibility and consumption of water and pediculosis prevalence. The number of medical staff per 10,000 inhabitants was bigger in the city than in the country. The school health care systems of these two environments were not identical. Data from the city included employees working both in primary and speciality health care institutions. There was a relationship ($p = 0.001$) between the number of school nurses and extent of head pediculosis among children in primary schools.

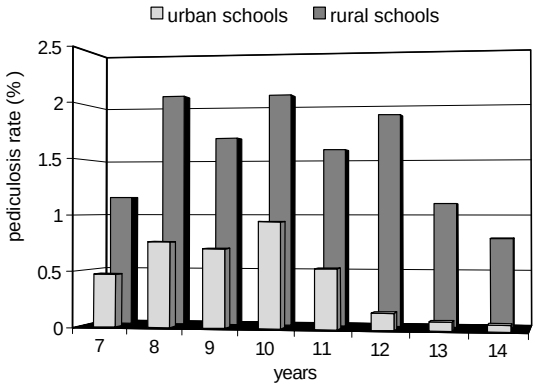

Figure 2. The infestation rate of pediculosis among children from rural and urban schools in different age groups.

Table 1. Prevalence of head pediculosis among different sexes

	Rural area of Lublin Province N = 42,759				Urban area – Lublin N = 52,394			
		Pediculosis prevalence (%)				Pediculosis prevalence (%)		
Year	Number of children examined	Total	Girls	Boys	Number of children examined	Total	Girls	Boys
1996	9065	2.05	1.63	0.42	11,104	0.62	0.43	0.19
1997	9237	1.57	1.11	0.47	10,496	0.53	0.32	0.21
1998	9251	1.28	0.95	0.33	11,697	0.26	0.15	0.11
1999	8162	1.71	1.34	0.37	11,128	0.4	0.26	0.14
2000	7044	1.21	0.81	0.4	7969	0.61	0.41	0.2

Differences between rates of infested girls and boys were verified by the test for percentage of two populations.

Table 2. Factors influencing risk of pediculosis capitis in rural urban communities of eastern Poland between 1996 and 2000

	1996		1997		1998[a]		1999		2000		Average of 5 years	
	Rural N[b] = 1,027,522	Urban N = 355,415	Rural N = 1,027,488	Urban N = 356,010	Rural N = 2,239,500	Urban N = 356,251	Rural N = 2,234,937	Urban N = 356,024	Rural N = 2,232,054	Urban N = 355,803	Rural N = 1,752,300	Urban N = 355,901
Pediculosis (%)	2.05	0.62	1.57	0.53	1.28	0.26	1.71	0.4	1.21	0.61	1.59	0.48
Unemployment rate (%)	11.7	7.9	10.2	8.3	10.3	7.2	12.8	9.1	14.0	10.3	11.8[d]	8.56[d]
Annual per capita water consumption (m^3)	36.9	54.7	35.7	51.7	28.1	48.4	27.1	46.5	26.9	45.7	30.94[d]	49.4[d]
Length of water supply system (km/km^2)	0.72	2.92	0.79	3.0	0.54	3.07	0.56	3.15	0.58	3.29	0.63[d]	3.09[d]
Monthly income per one person ($)	126.8	156.9	100.48	138.28	[c]	[c]	118.03	155.2	116.68	157.1	115.5	151.9
Number of physicians per 10,000 people	27.6	50.3	27.2	49.2	21.0	47.8	23.9	68.9	24.4	69.5	24.8	57.1
Number of nurses per 10,000 people	58.5	95.9	59.1	96.9	56.8	98.1	60.1	112.8	59.3	111.6	58.8[d]	103.0[d]

[a] The change of administrative division of Lubelskie voivodship in 1998.
[b] Number of inhabitants in the experimental area.
[c] Lack of data.
[d] $p < 0.05$, differences examined between different gminas in the experimental area.

Discussion

In the present study, the frequency of pediculosis capitis in eastern Poland was smaller 2% during the whole period of observations among schoolchildren. Our results are similar to other epidemiological studies performed in Poland. Piotrowski [17] determined that 0.01–0.56% of children were infested with *P. h. capitis* in 1987–1988 while Wegner et al. [18] gave rates of 3.2% between 1990 and 1992 in Gdansk (northern Poland) and Lonc and Okulewicz [16] 0.4–0.7% in Wroclaw city (western Poland) during 1990–1997, respectively.

In our study, higher headlice infestation rates were observed in the country schools like other epidemiological studies [1, 3]. For example, the infestation rate in the rural schools in Libya was 85.5%, whereas in the urban schools 44.3% [3]. Higher infestation rate in rural areas can be explained by lower life standards, a worse medical care system, lower availability of anti-pediculosis agents, and, possibly, higher index of suspicion among rural nurses.

Our data confirm the association between headlice infestation and social and hygienic conditions of Polish families. Distribution of *P. h. capitis* increased with lower life standards, poorer economic conditions and health care. Courtiade et al. [11] noted the highest prevalence of pediculosis was among suburban schoolchildren of whom 17% of parents were unemployed in France. Magra et al. [10] found a direct correlation between percentage of infested children and lower socioeconomic conditions of their parents in Spain. In Lebanese, the most frequent the headlice infestations were noted among children with small family income [23].

Differences in the distribution of pediculosis in rural and urban schools in Poland can be explained by different organizations of health care. Each urban school examined had a full-time working nurse. On the other hand, in the rural area hygiene control is only one of the responsibilities of nurses employed by primary care institutions. An inverse relationship between number of nurses per 10,000 inhabitants and headlice frequencies in different rural areas in Lublin Province has previously been reported [24]. The lowest infestation rate was noted with the greatest number of nurses employed.

The number of physicians had no influence on infestation level of *P. h. capitis*. This can be explained by organization of hygienic control for schoolchildren in Poland. A school nurse is responsible for head inspections, detecting new cases, informing parents of infested children, the elimination of the parasite, encouraging correct treatment and providing follow up, so she is more important than the physician.

In general, the infestation rates were higher in younger schoolchildren, as reported by some other epidemiologists before [1, 10, 25]. This is probably caused by behavioral characteristics of children aged 6–12. They tend to gather in big groups, try to get closer in school and in living place, have lower hygienic standards and are unaware of transmission mechanism. The observed decrease in the frequency of parasitosis in children between 12 and 14 years of age in urban schools and 13 and 14 in urban ones, can be explained by getting hygienic behaviors in this period. Their friendships are based on emotional relationships and their social groups are smaller. The earlier decrease in the number of pediculosis cases in the cities can be connected with earlier acquirement of proper hygiene habits. Our data confirm the general tendency to a higher infestation rate in girls, which has also been observed by other studies [1, 5, 11]. This can be explained by the difference of hair length and hair styles between sexes.

Due to the political and economic reforms in Poland during the 1990s, the organization of health care system, educational levels and social conditions of people changed. We do not know how these factors will influence the distribution of permanent human parasites. So, monitoring of pediculosis is necessary.

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