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Epidemiology and morbidity of scabies and pediculosis capitis in resource-poor communities in Brazil

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Summary

Background Pediculosis capitis and scabies are common parasitic skin diseases, especially in resource-poor communities, but data on epidemiology and morbidity are scanty.

Objectives To assess the prevalence, seasonal variation and morbidity of pediculosis capitis and scabies in poor neighbourhoods in north-east Brazil.

Methods The study comprised cross-sectional surveys of a representative population of an urban slum (n = 1460) in Fortaleza, the capital of Ceará State (Brazil) and a fishing community 60 km south of the city (n = 605). Study participants were examined for the presence of scabies and pediculosis capitis. In a longitudinal study in the slum, variation of prevalence in different seasons of the year was assessed.

Results Prevalence of pediculosis capitis was 43·4% in the slum and 28·1% in the fishing community. Children aged 10–14 years and females were most frequently affected. Scabies was present in 8·8% of the population in the slum and in 3·8% of the population in the fishing community. There was no consistent pattern of age distribution. Superinfection was common in patients with scabies, and cervical lymphadenopathy in patients with pediculosis capitis. Multivariate analysis showed that age ≤ 15 years, being of female sex and living in the urban slum were independent factors contributing to the simultaneous coinfestation with pediculosis capitis and scabies. The longitudinal data from the urban slum showed a characteristic seasonal variation of pediculosis capitis, but no fluctuation of scabies.

Conclusions Pediculosis capitis and scabies are hyperendemic in the study areas and are associated with considerable morbidity. There is an urgent need to develop control measures for these parasitic skin diseases in resource-poor communities. This is the first community-based study describing in detail the epidemiology and morbidity of scabies and head lice infestation in Brazil.

During recent years, the prevalence of pediculosis capitis, caused by infestation with the head louse *Pediculus capitis*, has increased worldwide.[1] The ectoparasitosis is more common in younger age groups and infests millions of school-age children. For instance, 58% of school children in Bristol (U.K.) and 50% of school children in rural Brazil were found to be infested.[2,3] In deprived communities the prevalence may reach 20–40% in the general population.[4,5] In developing countries, persistent head lice infestation is frequently associated with considerable morbidity, such as secondary infection and impetigo.[6] In heavily infested children, itching, subsequent sleep disturbances and difficulties in concentration can lead to poor performance in school.[7] Severely affected individuals may even develop anaemia as a consequence of blood feeding by a multitude of parasites.[8]

Scabies, caused by the mite *Sarcoptes scabiei*, is transmitted mainly by person-to-person contact. The ectoparasitosis is endemic in resource-poor urban and rural communities throughout the world.[9–11] Itching is commonly present and, due to subsequent scratching, leads to secondary infection.[12,13] Acute glomerulonephritis caused by nephritogenic strains of streptococci is a known complication, particularly in the tropics.[14–17]

In Brazil, reliable community-based data on the prevalence and morbidity of scabies and head lice are virtually non-existent.[18,19] To fill this gap, two distinct communities in north-east Brazil were examined for the presence of scabies and pediculosis capitis, and associated clinical morbidity was assessed. Additionally, in an urban slum seasonal variation of the parasitic skin diseases was determined by examining the same population three times during 1 year.

Materials and methods

Study areas

The study was performed in two areas in Ceará State (north-east Brazil): an urban slum in the capital Fortaleza and a poor fishing community about 60 km to the south.

The poor neighbourhood Morro do Sandra's is a typical Brazilian shanty town (favela). The slum is close to the beach and has a total population of about 1500 inhabitants. Two-thirds of the households have access to piped water. Sixty per cent of the population has a monthly family income of less than two minimum wages (one minimum wage = U.S. $80). The adult illiteracy rate is 30%, and unemployment rates are high.[20] Many houses are made of recycled materials and do not have cemented floors. Roads and paths are not paved. Back yards usually measure only a few square metres. Waste collection is performed only at the boundaries of the slum, and rubbish of all sorts is scattered throughout the area. There is no public sewage system, and hygiene conditions are precarious. In these aspects, the study area is comparable with the many other favelas in north-east Brazil.

The other part of the study was performed in the community Balbino, in the municipality of Cascavel. The village is situated approximately 60 km south of Fortaleza. Balbino is a traditional fishing community and has remained relatively isolated. There has been little fluctuation in the population over the last three decades, and most inhabitants have lived in the village since birth. In contrast to other villages along the coast, the people of Balbino have refused to sell land to real estate agencies, which would eventually have been divided and sold to people from the capital for summer houses. Therefore, the community has conserved its traditional characteristics. Houses are located on relatively large compounds ranging between 300 and 3000 m^2. The economic situation of the majority of households is similar to the slum, and 36% of families live on less than one minimum wage.[21]

Study design

In March 2001, Morro de Sandra's was inhabited by 1460 individuals belonging to 327 households. A survey was carried out in March, and all households were again visited in June and September of the same year. The fishing community Balbino was inhabited by 139 families with a total population of 605. A survey was performed there in April 2001.

During a preparatory phase contacts were made with community leaders and meetings were held with local associations (Associações dos Moradores) of both study areas in which the objectives of the study were explained. Data were collected by door-to-door surveys. If family members were absent, their houses were revisited on two further occasions. Missing individuals were also invited to come to the local health centre during one of the next few days.

To reduce interobserver bias, in both study areas the clinical examinations were performed by the same investigator (T.W.).

Clinical examination

Each member of the family was examined thoroughly for the presence of scabies and pediculosis capitis. Diagnoses were made clinically. Genital examinations looking for pubic lice were not performed. Body lice do not occur in the study areas.

For the diagnosis of pediculosis capitis, the entire head was examined carefully after parting the hair; special attention was paid to the nape of the neck and behind the ears. Current or recently experienced pediculosis was diagnosed when nymphs, adult lice or eggs were present.

Scabies was diagnosed clinically by the presence of burrows or erythematous papular, vesicular, pustular or bullous lesions associated with itching and a positive family history (i.e. at least one other family member with similar symptoms). Other pruritic skin diseases were excluded.

The patients were examined clinically for the presence of lymphadenopathy and secondary infection. Secondary infection was defined as the presence of pustules, suppuration or ulcers. Study participants with an ectoparasitosis were asked to grade itching semiquantitatively as: 0, absent; 1, weak; 2, moderate or 3, severe. To minimize subjective judgements, an analogue scale was used in which the different degrees of itching were visualized.

Statistical analysis

Data were entered twice into a database using Epi Info software package (version 6·04d; Centers for Disease Control, Atlanta, GA, U.S.A.) and checked for errors which might have occurred during their entry. Ninety-five per cent confidence intervals (CIs) of prevalences were calculated using the respective Epi Info modules. The χ^2 test was used to determine the differences of relative frequencies. Multivariate analysis was done with the STATA™ software (version 7; Stata Corporation, College Station, TX, U.S.A.) using age, sex and study area as explanatory variables and the simultaneous presence of pediculosis capitis and scabies as the outcome variable.

Ethical considerations

For the study in the urban slum, permission to perform the study was obtained from the Health Authority of Fortaleza

Municipality. Community associations of the township gave their consent to the study. For the study in the fishing community, the study protocol was approved by the Ethical Committee of the Cascavel Municipality Board. Prior to the studies, meetings with community health workers and community leaders were held and the objectives were explained. Informed oral consent was obtained from all adult participants and from the parents or legal guardians of minors. All study participants with head lice and/or scabies and family members were treated at the end of the study with oral ivermectin (200 μg kg^{-1} in a single dose, repeated after 10 days) or, in the case of contraindication, with 2% deltamethrin lotion (topical application twice daily for 3 days, repeated after 10 days). This treatment scheme has been shown to be highly effective against head lice and scabies in resource-poor settings.[22,23]

Results

During the March survey in the urban slum, 81% of the total population was examined. Individuals belonged to 301 (92·1%) of the 327 households in the study area. In the fishing community 91% of the population was examined for the presence of head lice and scabies. The number of individuals in both study areas, the number of males and females, and the number of examined individuals aged >15 years and ≤15 years are shown in Table 1. In both communities, more females than males (both $P < 0·001$) and more children than adults (both $P < 0·001$) participated in the study.

Head lice and scabies were hyperendemic in the urban slum as well as in the fishing community. The prevalence of pediculosis capitis and scabies in the total population and stratified by sex is shown in Table 2. Pediculosis capitis was more than twice as prevalent in females as in males (both $P < 0·001$). In the case of scabies no sex differences were observed, neither in the urban slum nor in the fishing community ($P = 0·97$ and $P = 0·77$, respectively). Scabies and pediculosis capitis were more common in the urban slum than in the fishing community (both $P < 0·001$).

Age-specific prevalence patterns of pediculosis capitis were similar in both study areas, with a peak in children aged 10–14 years and a constant decrease with increasing age (Fig. 1). Age-specific prevalence patterns were almost parallel for males and females. Whereas in the slum the prevalence of scabies was highest in the younger age groups, in the fishing community the pattern was reversed, with the highest prevalence in the older age groups (Fig. 2).

In the urban slum, pediculosis capitis showed a considerable seasonal variation of prevalence, whereas scabies did not vary throughout the year (Fig. 3). Prevalence of pediculosis capitis was highest in March and decreased stepwise in June and September (both $P < 0·01$). This trend was observed in all age groups.

The multivariate analysis of factors predicting the simultaneous presence of pediculosis capitis and scabies showed that all three explanatory variables (female sex, age ≤15 years and living in the urban slum) contributed significantly to being simultaneously coinfested with both parasite species [adjusted odds ratios 3·13 (95% CI 2·52–3·89), 4·30 (3·44–5·36) and 2·09 (1·65–2·64), respectively; all $P < 0·001$].

Table 3 shows the topographical distribution of scabies lesions and number of sites affected for the age groups <5 years and ≤5 years. In both age groups, the trunk was the body part most commonly affected. The only topographical site that showed a statistically significant different age distribution was the head ($P = 0·001$). There were no sex differences in the topographical distribution of lesions with the exception of the hands, which were more commonly affected in males ($P < 0·05$). The number of topographical sites affected was independent of age and sex.

Morbidity attributable to pediculosis capitis and scabies is summarized in Table 4. In pediculosis capitis, clinically apparent secondary infection was detected in less than 3%, but 12–15% of the individuals with head lice showed cervical lymphadenopathy. Secondary infection was much more frequent in individuals with scabies (19–23%). Interestingly, lymphadenopathy was significantly more common in scabietic individuals in the urban slum than in the fishing community ($P = 0·01$), whereas there was no difference in the prevalence of secondary infection.

Discussion

The vast majority of epidemiological studies on head lice has been conducted in school children, and data on the prevalence in the general population are almost non-existent. The prevalences of pediculosis capitis found in our study areas are comparable with those reported in the general population from Pakistan (37%)[5] and Egypt (19%).[4] Other community-based studies from Nigeria,[24] Tanzania[25] and Poland[26] report prevalences of <10% in the general population. In contrast, there are innumerable studies on the prevalence of head lice in school children from virtually all parts of the world. For

Table 1 Sample of the target population examined in the urban slum and in the fishing village. Data in parentheses indicate percentages of individuals examined in the respective subgroup

	Total	Males	Females	≤15 years	>15 years
Urban slum[a]	1185/1460 (81·2%)	523/686 (76·2%)	662/774 (85·5%)	593/650 (91·2%)	592/810 (73·1%)
Fishing village[b]	548/605 (90·6%)	252/293 (86·0%)	296/312 (94·9%)	223/233 (95·7%)	325/372 (87·4%)

[a]March 2001; [b]April 2001.

Table 2 Total prevalence of scabies and pediculosis capitis in the urban slum and in the fishing community and prevalence stratified by sex

	Urban slum[a] percentage (95% CI)	Fishing community[b] percentage (95% CI)
Pediculosis capitis		
Males	25·3% (21·7–29·3)	12·7% (8·9–17·5)
Females	57·6% (53·7–61·4)	41·2% (35·6–47·1)
Total	43·4% (40·5–46·3)	28·1% (24·4–32·1)
Scabies		
Males	8·8% (6·6–11·7)	3·6% (1·6–6·7)
Females	8·7% (6·8–11·2)	4·1% (2·1–7·0)
Total	8·8% (7·3–10·6)	3·8% (2·4–5·9)

[a]March 2001; [b]April 2001.

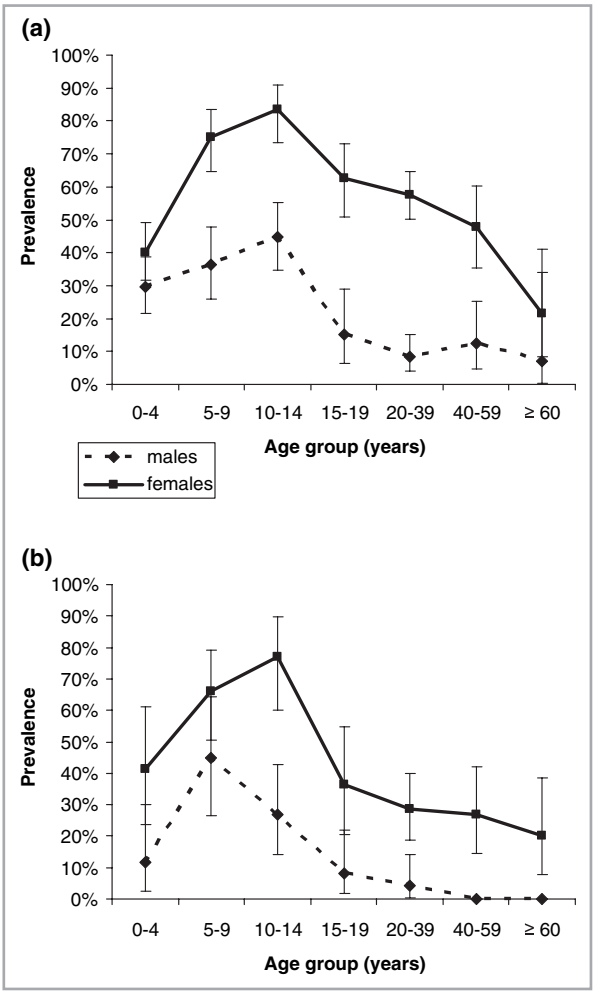

Fig 1. Age-specific prevalence of pediculosis capitis stratified by sex in the urban slum (a) and in the fishing community (b). Vertical bars indicate 95% confidence intervals.

example, in Australia,[27] Brazil,[3,28] Ghana,[29] Pakistan[30] and the U.K.[2] 34–58% of school children were found to be infested.

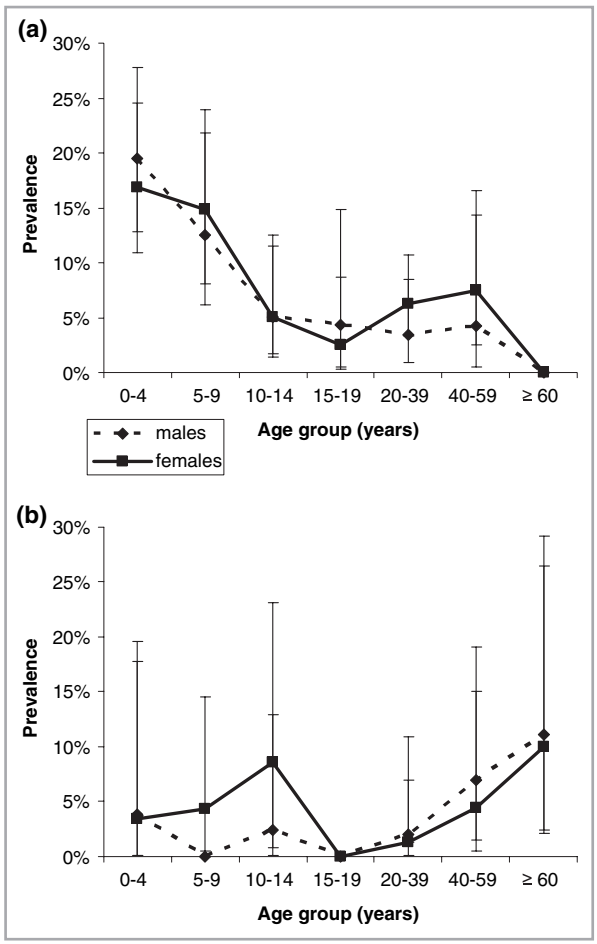

Fig 2. Age-specific prevalence of scabies stratified by sex in the urban slum (a) and in the fishing community (b). Vertical bars indicate 95% confidence intervals.

As the diagnosis of pediculosis capitis in our study was done by visual inspection, some individuals with low infestations may have been missed. Thus, the prevalence in the population may be slightly higher than observed. Our data confirm that head lice are most common in children, but show that pediculosis capitis also occurs to an important degree in adults. This is of practical importance, as control strategies usually focus on treatment of school children, neglecting the family contacts. As a consequence, rapid reinfestation is to be expected.

The preponderance of the female sex in pediculosis capitis has long been known.[2,4,6,28,31–33] This finding can be attributed to conditions such as the fact that boys prefer playing outside, whereas girls tend to play in small groups with closer contact with each other; and that women who care for their children have more head-to-head contact than men.[6] Our data demonstrate that girls aged 5–14 years are the most vulnerable group for head lice infestation independent of the study site. This age and sex distribution is in concordance with most other studies.[5,6,34]

Seasonal variation of pediculosis capitis differs according to the populations and age groups studied. Outbreaks of head

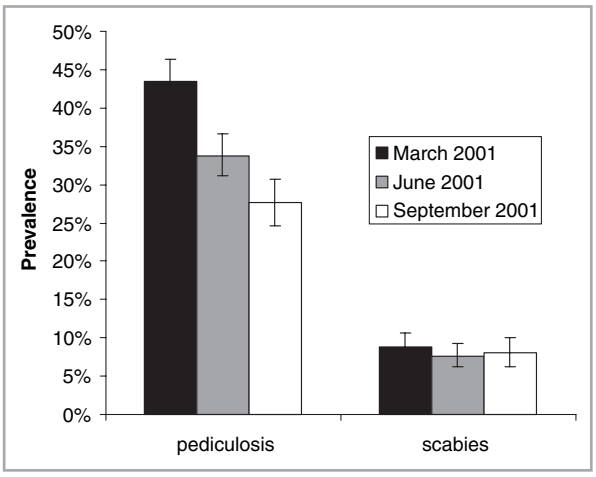

Fig 3. Seasonal variation of prevalence of pediculosis capitis and scabies in an urban slum in north-east Brazil. Vertical bars indicate 95% confidence intervals.

Table 3 Topographical distribution of scabies lesions in infants and young children as compared with older age groups

	<5 years of age (n = 47) n (%)	≥5 years of age (n = 78) n (%)
Head (face, neck and scalp)	16 (34%)	8 (10%)[a]
Axillae	6 (13%)	21 (27%)
Arms	12 (26%)	29 (37%)
Hands (including wrist and interdigital spaces)	4 (9%)	13 (17%)
Breast	12 (26%)	13 (17%)
Trunk (abdomen and back)	41 (87%)	60 (77%)
Legs	17 (36%)	29 (37%)
Feet	8 (17%)	7 (9%)
At least two sites affected	30 (64%)	44 (56%)
At least three sites affected	17 (36%)	23 (29%)
Four or more sites affected	9 (19%)	16 (21%)

[a]P = 0·001, all other comparisons not significant.

Table 4 Morbidity associated with pediculosis capitis and scabies in both study areas

Pediculosis capitis	Urban slum (n = 514)	Fishing community (n = 154)
Intensity of itching (median and interquartile range[a])	1 (1–1)	1 (1–1)
Secondary infection	8 (1·6%)	4 (2·6%)
Cervical lymphadenopathy	60 (11·7%)	23 (14·9%)
Scabies	**Urban slum (n = 104)**	**Fishing community (n = 21)**
Intensity of itching (median and interquartile range[a])	1 (1–1)	1 (1–1)
Secondary infection	24 (23·1%)	4 (19·0%)
Lymphadenopathy[b]	33 (31·7%)	1 (4·8%)

[a]Semiquantitatively assessed (see Materials and methods); [b]Lymph nodes proximal to lesions.

lice occur commonly after school holidays,[35] and previous studies have shown seasonal variation of pediculosis capitis in children, with a lower incidence during summer.[5,34] Other studies in adult populations reported a decrease of prevalence in winter and explained this by a higher temperature in summer which should favour egg laying and hatching closer to the outer surface of the hair, facilitating the spread of lice from person to person.[36,37]

However, in north-east Brazil the temperature does not change much throughout the year, whereas humidity does. In our study, prevalence of head lice was highest in March and significantly lower in June and September, and the fluctuation was observed in all age groups. School holidays are in December/January and July, and therefore cannot have influenced decreasing prevalences in June and September. Humidity is lower in June and September, which may reduce the off-host survival time of head lice and consequently the risk of infestation.

To our knowledge, no study has been performed to quantify clinical morbidity at the population level. Our data show that itching is a predominant symptom. The intensity is, however, perceived as low. Secondary infection was relatively rare, whereas cervical lymphadenopathy occurred in more than 10% of individuals with head lice. This discrepancy may be explained by the fact that superinfection of lesions at the scalp usually resolves rapidly, whereas enlarged lymph nodes persist for weeks even when pediculosis capitis has been treated.

Scabies has been found to be endemic in many resource-poor populations around the globe.[4,11,12,23,38,39] In rural communities in Papua New Guinea, prevalence may reach 80% and more.[23] In a village in Egypt a similar prevalence was found as in our study.[38] In rural Gambia the prevalence of scabies varied between 2·0% and 2·6%.[40] Scabies is thought to be more common in children,[26,38] although one study showed a higher prevalence in adults.[39] In our study we did not find a consistent pattern in the age distribution. Whereas in the urban slum children were more commonly affected, in the fishing community prevalence was highest in the older age groups. However, the number of patients infested in the fishing community (n = 21) was too low to draw conclusions on any age distribution pattern. Results on gender differences in scabies are also inconsistent. One study reported females being more affected than males, whereas two other studies, respectively, showed male predominance and no gender differences.[38,41] We did not find any significant gender difference in either population studied.

In temperate climates, seasonal variation of scabies has long been known, with a higher prevalence in the colder months.[34,39,42–44] This is usually attributed to temperature differences causing people to stay indoors during winter, which

would result in a higher host density as compared with summer.[45] At least in developing countries, and particularly when access to water is restricted, poorer personal hygiene and a lower frequency of washing and changing clothes during the cold season could be contributory factors. In addition, mite survival on and off the host is prolonged in a cooler environment.[39,46] These factors may explain why a clear seasonal fluctuation of scabies prevalence has not been described in tropical countries. Our study showing an absence of seasonal variation confirms similar findings from Malawi, Bangladesh and Gambia.[9,11,40]

Secondary infection was common in our scabietic population, supporting previous observations.[39] Secondary infection presents as pyoderma (usually caused by staphylococci and streptococci) and, if provoked by group A streptococci, may have serious consequences such as poststreptococcal glomerulonephritis.[12,14,15,39] The frequency of secondary infection varies with the hygiene conditions of the populations studied.[41] As a consequence, the frequency of secondary infection was higher in the urban slum, where hygiene conditions are precarious and where crowding is common, in contrast to the fishing community where the hygiene conditions are much better and people live in less crowded conditions.

The disproportionately high frequency of lymphadenopathy in the population of the urban slum as compared with the fishing community may also be related to the hygiene situation and may come from other infestations of the skin, such as sand flea infestation and cutaneous larva migrans. Alternatively, it is possible that secondary infection of the skin is treated early after appearance in the fishing community, but is left untreated by many people from the slum. In fact, disease perception and health-seeking behaviour with regard to parasitic skin diseases is different in the two settings (J. Heukelbach *et al.* unpublished observation).

The topographical distribution of lesions observed in our populations was similar to those described previously, typical predilection sites being the trunk, arms, legs and axillae.[11,39,41,47] Infestation of the genitals seems to occur mainly in certain high-risk groups.[41] As during the door-to-door survey privacy could not be guaranteed, the genitals were not examined. It has been noted that in infants and small children the distribution of lesions is often atypical, with infestations of the face, neck, scalp, postauricular area and soles.[39,41,48] In our study, infants showed disproportionately more lesions on the head, whereas in older children and adults the axillae and the hands were affected almost twice as frequently.

In both populations, study participation was high. However, in the longitudinal study we cannot rule out a certain non-participation bias, especially in the September survey when only 58% of the target population was examined. As adult males, the subgroup with the lowest prevalence of scabies, were under-represented (many male adults are absent from the favela during daytime), the true population prevalence might actually be lower than reported.

Another bias which may have interfered with the data from the second and third survey is that infested individuals might have sought treatment for pediculosis capitis and scabies after they had been informed of the respective diagnoses. In this case the lower prevalences of pediculosis capitis observed at the second and the third survey would be the result of massive treatment rather than an indicator of changing environmental factors. However, a previous study in a similar setting has shown that parasitic skin diseases are neglected by the affected individuals and do not cause people to present for treatment at the primary health care centre adjacent to the slum.[49] In fact, neither the daily outpatient numbers nor the proportion of patients diagnosed as having pediculosis capitis or scabies changed at the primary health care centre responsible for the shanty town in the study period (J. Heukelbach, unpublished observation). Self-treatment can be excluded to have contributed significantly to the lower prevalences, as the over-the-counter treatments are only available at costs which are prohibitive for the majority of the inhabitants of the slum, and lice combs are very rarely used.

Polyparasitism occurred more often in the urban slum and presumably reflects the very low standard of living in this setting. Young age, female sex and living in a slum were found to be independent determinants for the coinfestation with head lice and scabies mites, indicating that demographic, behavioural and environmental factors contribute to polyparasitism in resource-poor settings. Other parasitic skin diseases such as cutaneous larva migrans also occur commonly in the shanty town.[50]

In Brazil, scabies and head lice are commonly treated with topical benzyl benzoate or pyrethroids. Ivermectin is registered as an oral drug for both parasitic skin diseases. In resource-poor settings, mass treatment with oral ivermectin, which after millions of administered doses did not show significant adverse events, may be an approach to control parasitic skin diseases.[22,23,51,52]

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