

## ORIGINAL ARTICLE

## EPIDEMIOLOGICAL ASPECTS OF HEAD LICE IN CHILDREN ATTENDED TO AT A PUBLIC HOSPITAL IN UBERLÂNDIA, MINAS GERAIS STATE, BRAZIL

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### ABSTRACT

*Pediculus capitis* is a public health problem not only in Brazil, but also in many countries worldwide. Children are the most likely population group to be infested. The purpose of this study was to verify the prevalence of head lice in children seen at the public hospital in Uberlândia, Minas Gerais State, and factors associated with ectoparasitosis in this group. In addition, data about the transmission, prevention and control were obtained from the children's parents or guardians. The scalp and hair of every child aged 2 to 12, attended to at the hospital pediatric outpatient clinic from 2015 to 2017, were examined. Questionnaires and characterization sheets were also used to obtain and record the information. The overall prevalence rate observed was 2.8%. The highest prevalence rates were observed in girls with medium length hair. Children presented a relatively low prevalence of head lice in the parasitological examinations. However, the answers to the questionnaires indicated that this ectoparasitosis is common in this population group. All the children examined were of school age, and their parents or guardians indicated the school environment as the main source of infestations. The responses to the questionnaires also highlighted evidence of negligence on the part of guardians of positive children regarding the occurrence of this ectoparasitosis. The information obtained indicates that authorities should design/improve their plans of action regarding guidelines for parents or guardians for adequate prevention and control of this ectoparasitosis.

KEY WORDS: Head lice; epidemiology; children; Brazil.

### INTRODUCTION

The head louse, *Pediculus capitis* (De Geer, 1778) (*Pediculus humanus humanus*) is a hematophagous ectoparasite belonging to the family Pediculidae (Phthiraptera: Anoplura). Transmission occurs mainly through contact between people and indirectly, through sharing fomites, such as combs, brushes and caps (Linardi et al., 1988).

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Received for publication: 10/10/2018. Reviewed: 20/12/2018. Accepted: 22/12/2018.

Human head lice infestation is characterized by intense itching and irritation at the affected site. Secondary infections and anemia may also occur when the ectoparasite is associated with an inadequate diet (Borges-Moroni et al., 2015).

Throughout time head lice have been a public health problem in various countries, including Brazil (Linardi et al, 1995; Chouela et al, 1997; Heukelbach et al., 2003; Carzola et al, 2007; Fornaciari et al, 2009; Sim et al., 2011; Gutiérrez et al, 2012; Vahabi et al., 2013; Amazonas et al., 2015). However, most of the problems resulting from this infestation occur in low socioeconomic population groups, usually presenting additional problems. This parasitism is commonly neglected both by the authorities responsible for the health of the population and by those affected (Linardi et al, 1989; Heukelbach & Feldmeier, 2004).

There are numerous factors which may directly influence the prevalence and level of lice infestation, namely age group, physical characteristics and socioeconomic status (Chunge, 1986; Poudel & Backer, 2004; Borges-Moroni et al., 2011). Children are usually more affected by head lice, but there is no minimum or maximum age limit for the occurrence of this ectoparasitosis (Courtiade et al., 1993; Catalá et al., 2004; Sim et al., 2011; Nunes et al., 2015).

Control is usually by means of natural methods, such as manual removal of lice and nits from the hair, combing with a fine comb and head shaving. The use of chemicals is also common (Budak et al., 1996). However, chemical insecticides can result in the emergence of insecticide resistance by the ectoparasite and some individuals may present side effects to these compounds (Chosidow, 2000).

Studies on epidemiological aspects regarding pediculosis capitis among different population groups in a given locality or region increase awareness of the degree of its importance in the population studied, as well as aiding the definition and implementation of control measures. In addition, this information contributes to the literature on this issue, particularly in Brazil, where this is scarce (Linardi et al., 1989; Borges & Mendes, 2002; Barbosa & Pinto, 2003; Heukelbach et al., 2005; Nunes et al., 2015).

Children attended to at public health institutions are a large population group which may present specific characteristics from the point of view of the epidemiology of pediculosis capitis. The aims of this work were to verify the prevalence of head lice in children attended to by the pediatric sector of a public hospital in the municipality of Uberlândia, State of Minas Gerais, Brazil, as well as analyze associations between pediculosis capitis and potentially relevant factors (sex, age group, hair characteristics, socioeconomic profile), and ascertain the level of awareness concerning head lice among the parents or guardians. This study also investigated the possible relationship between the prevalence of head lice and the school class and vacation periods.

## MATERIAL AND METHODS

The study was conducted in the pediatric sector of a public hospital. This sector attends to children, preadolescents and adolescents by the Brazilian Unified National Health System (SUS) in the municipality of Uberlândia, Minas Gerais.

The clinical examinations were performed from August 2015 to July 2017. Before the examinations began, the minimum number of children to be sampled was calculated using the formula  $n = (z^2.P.Q)$  (Zar 1999), i.e. a minimum sample of 357 children. Authorization from the hospital and the parents or guardians was obtained prior to the examination of 606 children, aged 2 to 12. The study was approved by the Research Ethics Committee of the Federal University of Uberlândia, under Nr. 64369316.0.0000.5152.

Diagnosis of pediculosis capitis was performed according to Borges-Moroni et al., 2011. This consists of a visual inspection of the child's scalp and hair for three minutes, without any instrument, also closely examining behind the ears and around the neck. Children who presented nits (viable and/or non-viable), adult nymphs and/or lice were considered infested. The viability of the nits and the identification of adult specimens were confirmed after removal of the specimens and analysis under a stereoscopic microscope.

Forms were filled in with information about the children examined regarding the following data: age, sex, hair characteristics (length, type, color, thickness and density) and school address. Information about their parents or guardians, such as education level and income, were also obtained. In order to verify the relationship between infestation and the socioeconomic profile, three groups were established: family income lower than one minimum wage; family income between one and three minimum wages and family income higher than five minimum wages. Regarding parent or guardian level of education, the alternatives available in the questionnaire were university graduate or not. In the same questionnaire, parents or guardians were questioned on past occurrences of head lice in their children and the methods used to control the respective infestations.

Researchers were previously trained to determine the hair characteristics, using the following classifications: length (short, up to 3 cm; medium, 3 to 10 cm; and long, over 10 cm); color (fair: blonde or red; and dark: black or brown); type (straight, wavy or curly) (Borges & Mendes 2002).

Analysis of variance (ANOVA) was used for comparisons between groups. In cases where significant differences were observed among at least three groups, multiple comparisons were performed using the Tukey test (Zar, 1999). Prevalence ratios were calculated in cases where significant differences were verified between groups. A significance level of 5% was used.

## RESULTS

The overall prevalence verified in the 606 children examined was 2.8%. Females ( $F = 12.224$ ,  $P=0.001$ ) with medium length hair ( $F = 17.235$ ,  $P < 0.001$ ) were more frequently affected. According to information from the parents and guardians, all the individuals examined were schoolchildren. When analyzing the distribution of the prevalence in relation to the children's school and vacation periods, infestations occurred with greater frequency during school semesters (Table 1) ( $F = 4.245$ ,  $P = 0.040$ ). Data on length, type, color, density and thickness of hair are in Table 2, where only the differences between medium and short or medium and long were significant.

*Table 1.* Prevalence of head lice according to sex, age group and school vacations in children attended to at a public hospital in Uberlândia, Minas Gerais, Brazil.

Characteristics	No. examinations	No. infestations (%)	Prevalence ratio (%) (95%CI)
<b>Sex</b>			
Male	285	2 (0.7) A <sup>a</sup>	
Female	321	15 (4.6) B	6.7 (1.0 - 17.8)
<b>Age groups</b>			
2 - 4	249	2 (0.8) A	
4 - 8	206	12 (5.8) A	
8 - 12	151	3 (1.9) A	
<b>School vacations</b>			
No	449	17 (3.7) A <sup>a</sup>	5.9 (1.2 - 45.0)
Yes	157	0 (0) B	

<sup>a</sup> prevalence rates with different letters are statistically different from each other by the Tukey test at a significance level of 5%.

*Table 2.* Prevalence of head lice according to the hair characteristics of children attended to at a public hospital in Uberlândia, Minas Gerais, Brazil.

Characteristics	No. examinations	No. infestations (%)	Prevalence ratio (%) (95%CI)
<b>Hair length</b>			
Short	410	2 (2) A <sup>a</sup>	
Medium	130	13 (10) B	20.8 (2.7–43.0)
Long	66	2 (3) A	3.3 (1.7–10.4)
<b>Type of hair</b>			
Curly	210	5 (2.3) A	
Wavy	115	5 (4.3) A	-
Straight	281	7 (2.4) A	
<b>Hair color</b>			
Dark	539	16 (2.9) A	
Fair	67	1 (1.4) A	-
<b>Hair density</b>			
High	170	5 (2.9) A	
Low	436	12 (2.7) A	-
<b>Hair thickness</b>			
Thick	237	4 (1.6) A	
Thin	369	13 (3.5) A	-

<sup>a</sup> prevalence rates with different letters are statistically different from each other by the Tukey test at a significance level of 5%; \* = values calculated for the groups that presented differences.

At least 481 individuals answered the questionnaires, including the questions on the socioeconomic status of the parents or guardians (Table 3), the forms of transmission, prevention, symptomatology, and control of head lice (Table 4). Although the children of those with higher incomes were infested more frequently, the differences were not significant ( $F = 0.396$ ,  $P = 0.673$ ) (Table 3). More than one third of the questionnaires answered showed that the children were re-infested several times. Almost forty percent of the responses indicated the use of natural control methods, while another 23.5% indicated the use of insecticides. The main clinical manifestation associated with the infestations cited was scalp pruritus. More than half of the responses indicated that washing the children's hair was a daily practice (Table 4). The children's parents or guardians reported that 30.1% of the children acquired the infestation at an educational institution. Regarding education level and occupation/area of responsibility, 94.7% of parents or guardians were not university graduates (Table 4).

*Table 3.* Prevalence of head lice in children attended to at a public hospital in Uberlândia, Minas Gerais, Brazil according to the income of parents or guardians.

Income (minimum wages)	No. of responses	No. children infested (%)
< 1	75	1 (1.3) A*
1 – 3	433	12 (2.8) A
> 3	98	4 (4.0) A

\* Results that present the same letter are not different at a significance level of 5%.

*Table 4.* Responses to the questionnaire applied to parents or guardians of children attending a public hospital in Uberlândia, Minas Gerais, Brazil.

Questions/ Answers	Number of replies (%)
Frequency of infestations in the child*	
One infestation during their lifetime	149 (31.0)
Several infestations	173 (36.0)
Number of infestations	118 (24.5)
Total of respondents	481
Control measures*	
Manual removal, use of a fine comb, hair scraping	188 (39.0)
Use of pesticides	113 (23.5)
Total of respondents	481
The child's symptoms *	
Insomnia	9 (1.9)
Itchy scalp and restlessness	153 (31.8)
Total of respondents	481
Frequency of hair washing per week *	
One to four times	51 (10.6)
Every day	257 (53.4)
Total of respondents	481
Places of transmission *	
Educational institutions	145 (30.1)
Home	10 (2.1)
Playgrounds	16 (3.3)
Total of respondents	481
Education level of the parent or guardian	
Graduated university	18 (5.3)
Did not graduate university	322 (94.7)
Total of respondents	340

## DISCUSSION

The prevalence verified in the children's scalp and hair examinations (2.8%) was relatively low when compared with studies conducted in an outpatient clinic for children in the municipality of Manaus, State of Amazonas, Brazil (Amazonas et al., 2015). However, in this study, the information obtained in the questionnaires indicated that most of the children had already been infested at least once. The responses to the questionnaire also indicated that all the children examined attended educational institutions. The occurrence of head lice during school semesters and vacation periods was significantly different. These results corroborate those of the literature that indicate the school environment as one of the main sources of transmission of head lice among children in Brazil (Linardi et al., 1995; Heukelbach et al., 2005; Borges et al., 2007).

The relatively low prevalence of head lice in schoolchildren, a population group that generally presents high occurrence rates of this ectoparasitosis, differs considerably from other studies, including research conducted in the same city in the recent past (Borges & Mendes 2002; Borges-Moroni et al., 2011; Mendes et al., 2017). Since this study was conducted with children presenting health problems which led their parents or guardians to seek medical help, it is possible that at that moment part of the children received more parental or guardian attention regarding their health care, including the control of head lice. This could explain, at least in part, the low occurrence rate of this parasitosis in this population group.

In this study the prevalence of head lice was higher in females (4.6%) (Table 1) as in several previous studies (Linardi et al., 1989; Counahan et al., 2004; Nazari & Saidijam 2007; AL-Zanbagi & AL-Hashdi, 2015; Borges-Moroni et al., 2011; Tohit et al., 2017). Medium length and long hair (Table 2) tends to predominate in females providing a larger contact surface, facilitating transmission, especially while children play.

The socioeconomic status of the population groups analyzed is another factor commonly looked at in the epidemiological studies of pediculosis capitis. Several works indicate the association of head lice with low socioeconomic status (Piquero-Casals et al., 2004; Kamiabi & Nakhaei 2005; Akhter et al., 2010; Manrique-Saide et al., 2011; Koch et al., 2016). This fact could be related to the limitations presented by the parents or guardians regarding improvement in the children's hygiene (Table 3). On the other hand, similar studies noted no such association (Chouela et al., 1997; Sadozai & Kakarsulemankhel, 2008), while Birkemoe et al. (2016), in Norway, found a higher prevalence in children whose mothers had high levels of education and income. The results obtained herein indicate that the relevance of this factor is relative when the socioeconomic differences among the members of the group studied are not very large and/or when the members of the group under study undergo appropriate personal hygiene.

Lower frequency of scalp hygiene could also contribute to the maintenance of the infestation (Heukelbach et al., 2005; Toloza et al., 2009). Considering that most of the children examined washed their hair frequently (Table 4), this behavior could also be a contributing factor to the low occurrence of parasitosis in this group.

Although natural methods were the most commonly used to control head lice in children, it is worth highlighting the considerable proportion of the answers in the questionnaires indicating the use of chemical control (Table 4). All the parents and guardians of the positive children were in the doctor's office seeking medical assistance for other health problems, not the treatment of pediculosis capitis. This indicates that this parasitosis is neglected by the parents and guardians of these children. The results obtained also evidenced that the population group studied commonly uses chemical control without a prescription and/or medical orientation. However, although the use of chemical insecticides has been shown to be effective (Pagotti et al., 2012), its indiscriminate use may result in ectoparasite resistance to one or more of these insecticides and some people may present side effects to these compounds (Chosidow 2000).

The use of relatively effective head lice control methods, and the affirmative response of parents and guardians, who mentioned the existence of head lice control programs at the schools attended by these children, also justify the low prevalence rate determined in children attended to in the pediatric ward of this hospital. However, the results also indicate that parents and guardians have limited knowledge concerning this parasite. Therefore, the information obtained in the questionnaires may only partially portray the epidemiological reality of ectoparasitosis in this population group (Nunes et al., 2015).

The children seen at the pediatric medical outpatient clinic of the public hospital presented a relatively low prevalence of pediculosis capitis in parasitological examinations. However, the responses to the questionnaires indicated that this ectoparasitosis is common in this population group. The fact that all the children examined were schoolchildren strongly suggests that the school environment is the main place where child infestations occur. Evidence of negligence by parents or guardians of children positive for head lice requires the definition or improvement of plans of action by the authorities responsible for the health of the population regarding educational and health care campaigns for integrated pediculosis control, which should focus on guidelines for parents and guardians regarding the adequate prevention and control of pediculosis capitis.



## ACKNOWLEDGMENTS

The Nacional Council of Scientific and Technological Development (CNPq) provided grants to PIBIC/UFU for this study and professors Dr. Daniela M. L. M. Ferreira and Dr. Érica R. M. de A. Rezende.

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