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López-Valencia, David; Medina-Ortega, Ángela; Vásquez-Arteaga, Luis Reinel  
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## ORIGINAL RESEARCH

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# Prevalence and variables associated with pediculosis capitis in kindergarten children from Popayán, Colombia

*Prevalencia y variables asociadas a la pediculosis capitis en un hogar infantil de Popayán, Colombia*

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David López-Valencia<sup>1</sup> • Ángela Medina-Ortega<sup>1</sup> • Luis Reinel Vásquez-Arteaga<sup>2,3</sup><sup>1</sup> Universidad del Cauca - Faculty of Health Sciences - Medical Program - Popayán - Colombia.<sup>2</sup> Universidad del Cauca - Faculty of Health Sciences - Center for Studies in Microbiology and Parasitology (CEMPA) - Popayán - Colombia.<sup>3</sup> Universidad del Cauca - Faculty of Health Sciences - Department of Internal Medicine - Popayán - Colombia.

Corresponding author: David López-Valencia. Medical Program, Faculty of Health Sciences, Universidad del Cauca. Carrera 6 No. 13N-50. Phone number: +57 2 8234118. Popayán. Colombia. Email: [9.ehrlich@gmail.com](mailto:9.ehrlich@gmail.com).

## | Abstract |

**Introduction:** *Pediculosis capitis* is a skin disease that affects the hair and scalp, and is caused by the *Pediculus humanus capitis* ectoparasite. High levels of infestation are reported worldwide, affecting especially children.

**Objectives:** To determine the prevalence and the variables that are associated with *pediculosis capitis* in kindergarten children in Popayán, Colombia.

**Materials and methods:** Cross-sectional descriptive study based on a sample of 148 children aged between 1 and 5 years of age. Only the head was examined. Nits, nymphs and adult lice were mechanically removed using lice combs and wetting the hair, covering the frontotemporal, parietooccipital, mastoid and nuchal regions. An informed consent and a structured survey were filled out by each parent or guardian.

**Results:** The prevalence of *pediculosis capitis* in the studied population was 11.5%. The variables associated with ectoparasitosis were female sex, long hair (>3 cm) and scalp pruritus.

**Conclusions:** *Pediculosis capitis* is present and perpetuated in children from Popayán. Promotion, prevention and pediculicide treatment campaigns are strongly recommended.

**Keywords:** Pediculosis; Lice; Children; Prevalence (MeSH).

**Objetivos.** Determinar la prevalencia y las variables asociadas a la pediculosis capitis en un hogar infantil de Popayán, Colombia.

**Materiales y métodos.** Estudio descriptivo de corte transversal. La muestra estuvo compuesta por 148 niños entre 1 y 5 años. Solo se examinó la cabeza y se realizó la remoción mecánica de liendres, ninfas y piojos adultos por medio de peines liendreras con el pelo húmedo siguiendo las áreas frontotemporal, parietooccipital, región mastoidea y nuca. Cada padre de familia o tutor a cargo diligenció un consentimiento informado y respondió una encuesta estructurada.

**Resultados.** La prevalencia de *pediculosis capitis* en la población infantil estudiada fue del 11.5%. Las variables asociadas a la ectoparasitosis fueron sexo femenino, pelo largo (>3cm) y prurito del cuero cabelludo.

**Conclusiones.** La *pediculosis capitis* está presente y se perpetúa en niños de Popayán. Se recomienda realizar campañas de promoción, prevención y desparasitación.

**Palabras clave:** Pediculosis; Piojos; Niños; Prevalencia (DeCS).

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## | Resumen |

**Introducción.** La pediculosis capitis es una dermatosis que afecta el pelo y el cuero cabelludo; esta es causada por el ectoparásito *Pediculus humanus capitis*. La infestación presenta una distribución mundial y en su mayoría afecta a la población infantil.

## Introduction

*Pediculosis capitis* is the most prevalent ectoparasitosis worldwide. Most cases are found in children between 3 and 11 years of age, more frequently among women than in men (1,2). This infestation is caused by the hematophagous insect *Pediculus humanus capitis* (known as head louse), order *Phthiraptera*, suborder *Anoplura* and family *Pediculidae*. The life cycle of this insect depends entirely on humans, since it is adapted to humidity and temperature conditions found in the scalp, on which it feeds (3-5). Based on a phylogenetic analysis, lice are classified according to four mitochondrial genotypes:

clades A (subclades A1 and A2), B, C and D, each with a different geographic distribution (6,7).

Currently, *P. capitis* is considered as a vector of infectious agents such as *Rickettsia prowazekii* (typhus epidemic), *Bartonella quintana* (trench fever), *Borrelia recurrentis* (recurrent epidemic fever), *Yersinia pestis* (plague) and *Acinetobacter baumannii* (7,8). Likewise, complications such as allergies, severe anemia (9) and superinfections (10) have been reported in infested individuals, while resistance to pediculicides has been documented in several regions around the world (11,12). For these reasons, this ectoparasitosis prevails in the population, harming school performance in those affected, and generating anguish within the family and the community.

In Colombia, little is known about the clinical and epidemiological profiles of *pediculosis capitis* for each region. However, two studies conducted in the Cauca Department (13,14), which are more than ten years old, show the magnitude and characteristics of this phenomenon. In consequence, knowing the prevalence and the variables that are associated with lice infestation in the population from this region is highly convenient.

## Materials and methods

This was a cross-sectional study including 200 students enrolled in the institution Los Hoyos, attached to the Colombian Family Welfare Institute (ICBF by its acronym in Spanish), in Popayán, Colombia. A specific sample of 148 students aged between 1 and 5 years was obtained (mean: 3.12 years, standard deviation: 1.056, male sex: 55.4%, female sex: 44.6%). Popayán is the capital of the Cauca department, located at 1 735 meters above sea level, with an average temperature of 19°C, temperate climate and average humidity of 77.75% (15).

Inclusion criteria comprised children aged 1-5 years enrolled in the institution. Individuals who were absent from the kindergarten during the observation and sample collection period were excluded. The bioethical endorsement for this project was granted by the ethics committee of the vice-rector's office of Universidad del Cauca.

## Ectoparasitological diagnosis

Only the head was examined by combing the wet hair, covering the frontotemporal, parietooccipital, mastoid and nuchal regions. The examination was done on wet hair because this condition slows the movement of nymphs and adult lice, which facilitates visualization and collection (5). The criterion for a positive result was the visualization of nits, nymphs or adult lice, which were mechanically removed afterwards. The ectoparasites were collected and stored in alcohol for further studies. Each parent/guardian completed an informed consent and responded to a structured survey.

## Statistical analysis

The collected information was stored in a database that was exported to the SPSS version 10 statistical package to determine the prevalence and most relevant characteristics of the positive and negative groups using the chi-square test.

The variables considered for the study were age, sex, socioeconomic stratum, hair length, hair type, daily hair hygiene, co-sleeping, lice information and lice inspection. Long (>3cm) and short (<3cm) hair were differentiated (16), as well as straight and wavy hair for each inspection. The parents or guardians were asked about their socioeconomic stratum by means of a survey. The variable "lice information" was defined as whether the parent or guardian had

received or read any kind of information about ectoparasitosis in the last 6 months. The variable "lice inspection" was directed to know whether the respondent inspected the child or if, to their knowledge, someone else did it.

Data was incomplete in relation to the variables "hair type" and "co-sleeping." In the first case, information was not obtained because it was omitted; in the second, the guardians of the children could not provide the required information because they did not live together and had no knowledge. No clinical assessment was performed to identify scalp pruritus since this information was asked to the guardians.

## Results

*P. capitis* is a ubiquitous ectoparasite, and the global prevalence of its infestation varies according to the geographical region, the climate and personal habits. Thus, in developing countries, prevalence rates have been determined at around 40% (17). In this study, the prevalence is 11.5%.

Statistical significance was found in the variables female sex, long hair and scalp pruritus. Table 1 synthesizes the variables that were associated with *pediculosis capitis* in the studied children.

**Table 1.** *Pediculosis capitis* and associated variables in children from Popayán, Colombia.

Variable		Total sample		Total positives		p
		n	%	n	%	
Age	1-2 years	39	26.4	1	2.6	0.253
	3-5 years	109	73.6	16	14.7	
Sex	Male	82	55.4	1	1.2	0.001 *
	Female	66	44.6	16	24.2	
Socioeconomic stratum	1-2	106	71.6	15	14.2	0.284
	3-4	42	28.4	2	4.8	
Length of hair	Long	56	37.8	15	26.8	0.001 *
	Short	92	62.2	2	2.2	
Type of hair †	Wavy	49	37.2	8	16.3	0.428
	Straight	81	62.8	9	11.1	
Daily hair hygiene	Yes	142	95.9	17	12	1
	No	6	4.1	0	0	
Co-sleeping †	No	87	61.7	4	4.6	0.327
	Yes	54	38.3	11	20.4	
Scalp pruritus	Yes	17	11.5	8	47.1	0.001 *
	No	131	88.5	9	6.9	
Information about lice	Yes	119	80.4	16	13.4	0.130
	No	29	19.6	1	3.4	
Lice Inspection	Yes	140	94.6	16	11.4	0.632
	No	8	5.4	1	12.5	

\* Statistically significant.

† Missing data.

Source: Own elaboration based on the data obtained in the study.

## Discussion

Latin America is not the exception to the global trend; prevalence rates and variables associated with *P. capitis* are disparate among regions and vary according to climatic conditions (18-20). In Yucatán, Mexico, Manrique-Saide *et al.* (21) found a prevalence of 13.6% in a population similar to this study (19/140 children aged 7-12 years).

In Venezuela, Cazorla-Perfetti *et al.* (16) also reported similar figures (10.1%), with a significant infestation rate in the variables girls/boys (90%/10%), long hair (>3cm) and straight type. The symptoms associated with *P. capitis* were pruritus and excoriation, which is consistent with this study in terms of a greater association in the female sex (94.1%/5.9%), long hair and scalp pruritus variables.

In Chile, Gazmuri *et al.* (22) found an infestation prevalence of 40.3%, mostly in girls (55.2%). In Brazil, Frago-ro-Rocha *et al.* (23) studied 147 children from a primary school (4-11 years) and found prevalence rates of 44.9% and 32.8% in two different observations, which are higher than the ones presented in this study (11.5%).

There is little research in Colombia about this type of ectoparasitosis. Ríos *et al.* (24) conducted a study in a kindergarten of Bogotá D.C. for 7 months, estimating a *P. capitis* prevalence between 2.9% and 33.3%. The variables associated with infestation were long hair, living with more than five people in the same house and poor hygienic habits. This study also found an association of pediculosis capitis with long hair.

In 2006, at the local level, Hurtado *et al.* (13) studied a sample of 177 children between 3 and 4 years of age, and found that 85.8% of the population were classified in a low socioeconomic stratum and that the prevalence of *P. capitis* was 54.2%, the highest rate nationwide. Associated clinical manifestations were scalp pruritus (62.5%) and neck pruritus (67.34%). The association of *P. capitis* with scalp pruritus was similar in this study (47.1%) (13).

Also in Popayán, Gonzales *et al.* (14) found a prevalence of 39% in a population of 326 students in 2001. In addition, *P. capitis* was more frequent in girls (72.4%) and, according to the socioeconomic stratum, infestation was more prevalent in stratum 1 (61.3%). Most of the children affected by *P. capitis* in this study were also girls (94.1%) and children in low strata (88.2%). The prevalence found in this research was 11.5%, much lower than that reported by the other two local authors. Although the difference in the prevalence of *P. capitis* in the three studies is not similar, it proved that ectoparasitosis is prevalent in the school population and requires greater attention of public health.

The female sex and long hair variables could favor infestation by lice since, usually, girls have long hair and frequently share utensils such as combs or clothing for socialization purposes.

Unlike other studies, hair type was not statistically significant, which could be explained by the loss of data at the time of filling out the survey with the parents. Other authors reported protective factors such as daily hair wash (16,24), previous information on *P. capitis* and children inspection, which were not related to infestation prevalence in this study.

## Conclusions

The results of this study suggest that *P. capitis* in Popayán children is present and tends to be perpetuated, which is evident the three local studies (2001, 2006 and the present).

According to Colombia's Decennial Plan for Public Health 2012-2021 (25), *P. capitis* and other ectoparasitosis are not considered as current public health problems. It is necessary that governmental entities incorporate and implement promotion, prevention and

pediculicide programs, since this problem can affect the learning processes and the general welfare of children and families. Such policies should be implemented in schools, homes, health centers and the community in general to diagnose and treat affected children. Since no one is free from lice infestation, this is a public health challenge that should be categorized as a neglected ectoparasitosis with reemerging potential.

## Conflict of interests

None stated by the authors.

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