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## PREVALENCE OF PEDICULOSIS CAPITIS IN CHILDREN FROM A RURAL SCHOOL IN YUCATAN, MEXICO

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### SUMMARY

We conducted an analytical cross-sectional survey to estimate the prevalence of and factors associated with active head lice infestation. In total 140 children, aged 6 to 16-years, from a public school in rural Yucatan, Mexico, were examined by wet-combing. A structured questionnaire was used to collect information on individuals and the conditions in the surrounding environment. Head lice infestation was found in 19 out of the 140 children tested (13.6%) and this was associated with both lower income (OR 9.9, 95% CI 2.15-45.79,  $p = 0.003$ ) and a higher frequency of hair washing (OR 8, 95% CI 1.58-50,  $p = 0.012$ ). Intersectoral control programs that take into account the socioeconomic differences of children should be implemented.

**KEYWORDS:** Pediculosis capitis; Head lice; Schoolchildren; Yucatan, Mexico.

### INTRODUCTION

Pediculosis capitis (PC), the infestation of human hair and scalp by the head louse *Pediculus humanus capitis*, is common in schoolchildren<sup>9</sup>. It has been attributed to individual characteristics (*i.e.* gender, age group, hair type and length, race, etc.) and surrounding environmental (*v.gr.* socio-economic) conditions, often with contradictory associations<sup>7,19</sup>. The pathology associated with PC normally includes constant scalp pruritus which can occasionally result in excoriations and superinfections<sup>14</sup>. Moreover, head lice infestation is also associated with the detriment of health, both at individual and family/community levels<sup>7,9,11,19</sup>.

Figures for PC in Mexico are not known in great detail but common knowledge suggests high prevalence is common among Mexican schoolchildren, in both rural and urban areas<sup>6</sup>. The only documents available in the scientific literature about PC in Mexico report a remarkable prevalence (50%-60% calculated from a survey of a total population of 2.8 million) at Ciudad Netzahualcoyotl (a poorly resourced community in Mexico city) in the late 1980s<sup>1</sup> and more recently, from 0.5% to 33% in individuals from the Mexican State of Guerrero<sup>8,15,16</sup> with a prevalence ranging from 18% to 33% in school children<sup>15</sup>. Here we report an analytical study in which we assess the root cause and environmental factors associated with PC infestation in Mexican schoolchildren from Oxcum Yucatan, a rural area in southeast Mexico.

### MATERIALS AND METHODS

In June 2007, a cross-sectional study which included a visual inspection and wet-combing techniques for *P. humanus* (nits or mobile stages) was carried out in all children (N = 140, aged 6 to 16-years) in the only elementary school in Vicente Guerrero. Informed consent was obtained from the children and their parents.

The first phase, a 5-minute, systematic, visual inspection and collection of nits or lice at the temples, behind the ears, and neck was performed by one investigator (R.H.). Thereafter, the same investigator re-examined the participant's entire scalp by wet combing (using a commercial head-lice comb) - the most sensitive method for detecting head lice<sup>5,12,13,18</sup>. The hair was moistened and a commercial conditioner applied. We then systematically combed from the scalp to the end of the hair. The comb was cleaned with a tissue and the tissue was carefully inspected to detect any living head lice. Head lice infestation was defined as the presence of at least one viable head louse or nymph. During the examination, the child sat on a table in a room with good light to facilitate the detection of lice, and specimens detected were removed and destroyed. A Phenothrin containing treatment (HERKLIN® NF SHAMPOO, ARMSTRONG LABORATORIOS DE MÉXICO, S. A. de C. V.) with instruction for its application was supplied to parents of all children who tested positive after the first revision.

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In the second phase, we used a structured questionnaire to gather information on the root causes and surrounding environmental conditions from all the children whose parents had given informed consent (57 children). We classified household education by asking for the most educated member of the household.

Data was entered into a Microsoft Excel database and analyzed using the statistical software package SPSS (version 15.0, SPSS Inc., Chicago, U.S.A). We used a  $\chi^2$ -test to test the distribution frequencies and a logistic regression analysis to obtain adjusted Odds Ratio with confidence limits. A *p*-value of < 0.05 was considered as evidence for an association.

## RESULTS AND DISCUSSION

In total, 140 children (mean age of 8.4 years, ranging from 7 to 12-years-old) were examined at Oxcum. Head lice were found in 13.6% (19/140) of all children examined. Table 1 describes the study population. In children from families with an income < \$4000 the odds of head lice infestation were 10 times higher than in children from wealthier families (OR 9.9, 95% CI 2.15-45.79, *p* = 0.003). In children who reported to wash their hair only once per day, the odds of infestation were eight times lower than in children who reported to frequently wash their hair (OR 0.125, 95% CI 0.02-0.63, *p* = 0.012).

We did not find that other root causes/environment-related factors commonly associated with PC infestation were associated with head lice in Oxcum. Nevertheless, the limited scale of this study and implicit homogeneity (associations may arise only if contrasting populations are studied *i.e.* between localities or regions or different socio-economical backgrounds) may explain this finding.

Interestingly, the number of times children with head lice wash their hair (as declared by parents interviewed) was positively correlated with PC infestation. This is in stark contrast to other studies which could not show a correlation between head lice infestation and the degree of personal hygiene. The finding may be explained by differential misclassification. Responses to queries on personal hygiene can be misleading because interviewed individuals are reluctant to admit inappropriate practices<sup>12</sup>. As the responding parents were already aware of the results of the head lice exams, parents with children who tested positive for PC may have wanted to create a false impression of good hygiene by exaggerating the levels of hair washing. Alternatively, children who tested positive for PC may wash their hair more frequently as a consequence of intense pruritus.

Family income < 4,000 Mexican pesos (approximately 308 U.S. Dollars) per month was associated with PC (OR 9.943, 95% CI 2.15-45.79, *p* = 0.003) even though head lice was present among all socioeconomic groups. Poverty is known to play a role in the transmission dynamics of head lice<sup>17</sup> and the burden of epidermal parasitic skin diseases (including PC) at intolerably high levels has been suggested as an indicator of this inequality<sup>7</sup>. Our findings suggest that Mexican families with a low income may have limited access to health services or may not be able to afford treatment for their children (a regular pediculicide costs 70 Mexican pesos, approximately 5.5 U.S Dollars). Also, head lice infestation is neglected by treating physicians<sup>10</sup>, which could further increase the risk of infestation among inhabitants of poorer areas.

After treatment with commercial pediculicide, 22% of all children

**Table 1**  
Individual and environmental factors and head lice infestation in schoolchildren from Oxcum, Mexico (N = 57).

Individual		Positive cases		
		N	n	%
Gender	Male	28	8	28.6
	Female	29	11	37.9
Age	≤ 9 years	27	10	37.0
	> 9 years	30	9	30.0
School grade*	≤ 3rd grade	27	10	37.6
	> 3rd grade	28	9	32.1
Hair-wash*	Once a day	39	8	20.5
	> Once a day	17	11	64.7
Hair-type	Straight	53	18	34.0
	Curly	4	1	25.0
Hair length	Short	32	8	25.0
	Long	25	11	44.0
Sharing accessories	Yes	6	3	50.0
	No	51	16	31.4
Family		N	n	%
Education level (parents)*	Primary	47	18	38.3
	Secondary	8	1	12.5
Family income (monthly)	≤ \$4000	25	14	56
	> \$4000	32	5	15.6
No. of house inhabitants	< 5	12	2	16.7
	≥ 5	45	17	37.8
House-ground material	Mud	4	1	25
	Cement/Tiles	53	18	34
House-roofing material	Cardboard/Tin	12	7	58.3
	Solid (Concrete)	45	12	26.7

\* missing observations.

who tested positive for PC were free of head lice. As resistance against the active ingredient has never been reported on amongst this population, this suggests that simply providing treatment may not be an effective enough tool for the control of head lice. Also, this intervention certainly does not promote sustainable changes neither in personal hygiene behavior nor for the cooperation between teachers and parents in the prevention of PC, a significant protective measure as demonstrated by PAREDES *et al.*<sup>15</sup>.

As far as we are aware, this is the first report on the prevalence of PC in Yucatan and one of the few reports on PC in Mexico. Therefore, it is not possible to compare results with other local/regional studies. In the last decade, the reported prevalence for PC prevalence in the Americas ranged from 3.6% to 61.4%<sup>6</sup>. It has been particularly variable among schoolchildren ranging from 30% in Costa Rica<sup>4</sup> to between 10% and

73% in Venezuela<sup>3</sup>, with the highest prevalence (> 60%) occurring in Argentina<sup>2</sup> and Brazil where PC is considered a hyper-endemic public health problem<sup>11</sup>. These figures, in conjunction with our findings, emphasize the need for health-care stakeholders and political decision-makers in Latin America to incorporate the prevention of PC in current health promotion programs in primary schools. Such health promotion programs have to take an intersectoral approach as merely treating children infested with head lice does not lead to a sustained control of the infection<sup>17</sup>. Control programs should join together with community nurses, physicians, public health doctors, and teachers to promote self-diagnosis and treatment in children and their families.

## RESUMO

### Prevalência de pediculose em crianças de escola rural em Yucatan, Mexico

Foi conduzido um estudo numa escola publica de área rural em Yucatan, Mexico com o objetivo de estimar a prevalência de pediculose e fatores de risco associados. Das 140 crianças incluídas 19 (13.6%) apresentaram pediculose. A infestação de piolho foi associada com baixa renda (OR 9.9, 95% CI 2.15-45.79,  $p = 0.003$ ) e maior frequência de lavagem de cabelos (OR 8, 95% CI 1.58-50,  $p = 0.012$ ). Programas intersectoriais de controle da pediculose que levam em conta as características socioeconômicas das crianças deveriam ser executados.

## CONFLICT OF INTERESTS

None to be declared.

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