Human Parasitic Diseases

ORIGINAL RESEARCH

Head Lice Among Primary School Children in Viana, Angola: Prevalence and Relevant Teachers' Knowledge

Pedro Magalhães[1], Emília V. Figueiredo[2] and Daniel P. Capingana[1]

[1]Department of Physiology, Faculty of Medicine, Agostinho Neto University, Luanda, Angola. [2]Department of Pharmacology, Private University of Angola, Luanda, Angola. Corresponding author email: pedromagalhaes24@hotmail.com

Abstract:

Background: A high rate of *Pediculosis capitis* in school children has been reported in some African countries. However, systematic information on ectoparasitosis among school children from Angola is not available. The aim of this research was to determine the prevalence of head lice among school children and ascertain relevant teachers' knowledge about head lice infestation.

Methods: This cross-sectional study was conducted in 171 randomly selected children attending school in Viana. The children were examined for presence of head lice by visual inspection. In addition, a questionnaire was used to assess teachers' and children's' knowledge about this ectoparasite.

Results: The overall prevalence of head lice was 42.1%, with a significance difference between the genders (girls [95.8%] versus boys [4.2%,] $P < 0.001$). Self-reported history of being in contact with another person infested with head lice was the main risk factor for becoming infested.

Conclusion: A high rate of head lice infestation was demonstrated. Female gender and history of contact with someone already infested were the main risk factors. Teachers demonstrated a knowledge of the biology and clinical signs of head lice, but did not have adequate knowledge about its treatment, suggesting a need for increased competence on the part of teachers to be able to teach children about preventative measures. However, further systematic epidemiological studies are required to increase our understanding of ectoparasitosis in Angola.

Keywords: *Pediculosis capitis*, head lice, school children, Viana, Angola

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Introduction

Pediculosis capitis, also known as the head louse, is responsible for a parasitic skin disease affecting millions of children worldwide, especially those aged 5–13 years.[1,2] This form of ectoparasitosis is a major health concern in both schools and in the wider community. In school-aged children, head lice infestation can cause sleep disturbances and difficulties in concentration, potentially leading to poor performance in school,[3] social distress, discomfort, parental anxiety, embarrassment, and unnecessary absence from school.[2] In developing countries, persistent infestation has been associated with high morbidity, including secondary infections and impetigo.[4]

Previous studies on the prevalence of head lice have reported that this ectoparasite is still a public health problem affecting school children,[5–12] and the levels of prevalence are region-dependent.[11] The observed prevalence of head lice have been reported to be strongly influenced by factors such as overcrowding, family size,[8] age, gender, race, socioeconomic conditions, and hair characteristics.[11,13–16] However, the factors reported vary from one epidemiological setting to another, and play different roles in the distribution of head lice.[17,18] Thus, more information from various epidemiological settings is needed to increase our knowledge about the distribution of *Pediculosis capitis*.[11]

In the past few years, an international guideline has been established for controlling head lice among high-risk groups, including children and older adults.[19] The guideline includes information on how to reduce the emergence of strains of head lice resistant to pediculocides worldwide.[19] In addition, the guideline advocates for more active involvement of the public health and educational authorities as well as parents.[19] On the other side, the guideline recommends that more research needs to be done on the biology and epidemiology of head lice in various epidemiological settings.[19] In sub-Saharan Africa, information on this ectoparasite is scarce. For instance, Angola is still recovering from civil war, with weak health and educational systems and a poor infrastructure, where the majority of the population is still living in poor conditions and would be severely affected by ectoparasitosis. However, no systematic studies have been done to assess the prevalence of head lice and its comorbidities at the community level or among school children.

Therefore, the present study was conducted to determine the prevalence of *Pediculosis humanus capitis* among school children attending Ascenção Nicol school in Viana to identify risk factors associated with infestation. In addition, the study investigated the teachers' knowledge related to head lice infestation and its control.

Materials and Methods

Study area

Viana is one of the nine municipalities of Luanda province located in the southeast (8°903″S and 13°372″E), about 20 km from Luanda city. Viana has approximately 300,000 inhabitants, many of whom fled the war in neighboring regions have not returned to their homelands, and the majority are living in poor rural areas without a piped water supply or a public sewerage system.

The Ascenção Nicol primary school is a nongovernmental primary school in a rural area of Viana. This school is located in a poor neighborhood where houses are constructed from cement blocks, and the majority of them lack cemented floors or back yards. Only about one-third of the households have access to piped water. Rubbish of all sorts is scattered about, and waste collection services are not available. Hygiene conditions are precarious. Transport within the area is very difficult and the paths are not paved. There are four private schools in the area, all with the same characteristics as the Ascenção Nicol primary school. The study school belongs to the Catholic Church and is located in the southeast, about 15 km from Luanda city. In 2010, the school had a roll of 636 school children, from preschool to sixth grade, with a staff of 21 teachers. This school was chosen as a convenience sample because it is located in the middle of a poor socioeconomic rural area, and, as such, is representative of the majority of inhabitants in the country.

Study design and population

The present study was conducted as a cross-sectional survey from October to November 2010 and targeted primary school children and their teachers. The school children were examined for head lice and their teachers responded to a questionnaire. We included in the study only children whose parents or guardians gave their written consent. All the teachers involved in the study also gave their written consent.

Recruitment of study participants

All teachers at the school were invited to participate in the study. In total, 19 teachers were surveyed, and two who did not consent to participate were excluded. A total of 171 school children were randomly selected from seven grades (from preschool to sixth grade). Children with signed parental or guardian consent were included in the study. Thus, the sample represented 26.9% of the total population of children at this school.

Questionnaire survey

Data were collected from both teachers and school children by the same trained investigator using a questionnaire containing eight multiple choice questions for the teachers and seven for the school children. Some questions ended with optional open questions, to be filled if the respondent thought necessary. Teachers were asked to complete a written anonymous questionnaire in order to assess what they knew about head lice infestation, particularly regarding biology, transmission, clinic manifestations, treatment, and prevention. Because the school children were of different ages, their interview included only one question concerning knowledge about treatment of head lice, and the rest of the questions canvassed sociodemographic factors associated with ectoparasitosis, such as parent or guardian occupation, number of residents in the home, whether other resident(s) had head lice infestation, and number of individuals who sleep in the same bed as the children interviewed. This approach had previously been piloted in 11 school-aged children who were not included in the final sample because they were not enrolled at this school.

Physical examination

The hair and scalp of each school child was examined for head lice or eggs by a trained examiner (EVF) under the supervision of the principal investigator. Using a handheld magnifying glass, the entire hair and scalp of each child was examined carefully for head lice after parting the hair with the aid of an ordinary plastic comb, mainly for those with more hair and to loosen the braids in girls. The time taken to perform the examination was about 13 minutes per child. Head lice infestation was defined as the presence of adult parasites or eggs at the time of examination.[20–22]

Ethical approval

The study was conducted in accordance with the principles of the Helsinki Declaration after approval by the scientific board of the Department of Physiological Sciences, Faculty of Medicine, Agostinho Neto University. During the first week of the study, the investigators met with the school principal to explain the objectives of the study. The objectives were then explained separately to the school children and to the teachers at staff meetings held at the school.

Before examination, the purpose of the study was explained to the participants. School children who presented with signed consent forms from their parents were included in the study. Teachers who agreed to participate in the study were included after signing the informed consent form. Participants were free to withdraw from the study at any time if they wished. The participants did not receive any financial reward and children found to have infestation were educated on prevention and treatment.

Statistical analysis

Age was expressed as mean ± standard deviation and the answers of participants were categorized. The proportions in each category were compared in two-dimensional cross-tabulations with Chi-square testing to study the bivariate relationships between prevalence of head lice and independent variables (gender, number of persons per home, history of contact with someone infested, history of sharing a bed with other people, age group, and number of persons per home). Statistical significance was set at $P < 0.05$. Data analysis was performed using SPSS software, version 13.0 (SPSS Inc, Chicago IL).

Results

Sociodemographic characteristics

The mean age of the 171 school children who participated in this study was 9.4 ± 2.2 years, with 86 (50.3%) being male and 85 (49.7%) being female. In our sample, the majority of school children (170, 99.4%) were aged 5–13 years, with one female outlier aged 15 years. The number of persons sleeping per bed was 2.2 ± 0.8, number of residents per home was 7.3 ± 2.1, and number of family members attending school was 3.7 ± 1.7. Of 21 teachers invited, 19 (90.5%) participated in the study, and were of mean age 35 ± 11 years, including six (31.6%) males and 13 (68.4%) females.

Prevalence of head lice infestation

The overall prevalence of head lice infestation was 42.1% (72/171), affecting a higher proportion of females than males (69/171 [95.8%] versus 3/171 [4.2%], respectively, $P = 0.0001$). The prevalence of head lice was 51.4% in the age group 5–9 years and 48.6% in the age group 10–14 years, but was not statistically significant ($P = 0.683$).

Table 1 summarizes the distribution of head lice infestation in school children from preschool to Grade 6 according to gender. The prevalence of infestation varied by school grade from 32% in Grade 4 to 55% in Grade 6. The proportion of subjects with signs of infestation was greater for girls than boys across all school grades.

Of those with head lice infestation, 86.1% reported that they had had contact with someone infested with head lice versus 13.9% who reported not having had contact ($P = 0.01$), and 53.1% of those who had had contact were female. However, the majority (69.4%) of infested school children reported sleeping alone on a bed, and only 30.6% reported having shared a bed with other people.

Table 2 shows the responses of the school children for knowledge about treatment of head lice infestation. The majority (97, 56.7%) reported no knowledge at all. The remainder mentioned using a variety of substances, including naphthalene and common soap (13.5%), naphthalene alone (2.9%), naphthalene and palm oil (1.8%), sheltox (denkavepon + tetramethrin) (1.8%), sheltox and kerosene (1.2%), and vinegar (0.6%). Other substances mentioned included detergents and hair straighteners. Physical and hygiene measures mentioned included hair washing (10.5%), manual removal (4.1%), and hair cutting (2.9%).

Table 1. Prevalence of *Pediculosis capitis* in 171 school children according to grade and gender at a primary school in Viana, Luanda, Angola.

Grade	Total of examined		Infested		Prevalence (95% CI)
	Male (n)	Female (n)	Male (n)	Female (n)	
Preschool	6	4	0	4	40 (30–77)
Grade 1	10	10	2	8	50 (26–74)
Grade 2	23	17	1	14	37.5 (22–53)
Grade 3	9	11	0	9	45 (21–69)
Grade 4	17	14	0	10	32.3 (15–50)
Grade 5	15	15	0	13	43.3 (25–62)
Grade 6	6	14	0	11	55 (31–79)

Abbreviation: CI, confidence interval.

Table 2. Knowledge on treatment of head lice infestation in 171 school children at primary school in Viana, Luanda, Angola.

Treatment	Gender		Total n (%)
	Male	Female	
Don't know	47	50	97 (56.7)
Naphthalene and common soap	11	12	23 (13.5)
Hair washing	10	8	18 (10.5)
Manual removal	5	2	7 (4.1)
Hair cutting	2	3	5 (2.9)
Naphthalene	2	3	5 (2.9)
Hair straightener	2	2	4 (2.3)
Naphthalene and palm oil	1	2	3 (1.8)
Sheltox	1	2	3 (1.8)
Antilouse	2	0	2 (1.2)
Sheltox and kerosene	1	1	2 (1.2)
Detergent	1	0	1 (0.6)
Vinegar	1	0	1 (0.6)
Total	86	85	171 (100)

When respondents were asked about their parents' occupations, all children stated that their parents or guardians were in paid employment. Of those, 51.1% were self-employed, 26.4% were in private employment, and 22.2% were in public employment. Table 3 shows the responses of the children to the questionnaire, and the relationship between prevalence of head lice infestation and various sociodemographic variables are summarized in Table 4.

Teachers' knowledge

Blood obtained from a human host was mentioned to be the food source for head lice by most of the respondents (94.7%). Most of the respondents (94.7%) reported that an itching scalp was the main clinical sign associated with head lice infestation. The majority of respondents (94.7%) also cited benzyl benzoate and hygiene as the recommended treatments for head lice, which is of concern. Of 18 respondents, only one (5.3%) reported lindane to be a recommended pediculocide. Hair washing (16, 84.2%) and hair combing (3, 15.8%) were the most common preventive measures mentioned. When asked about the age group most affected by head lice, all respondents reported that children were highly affected, and all reported knowing about how head lice

Table 3. Responses of 171 school children to a questionnaire about sociodemographic factors regarding head lice infestation.

Question	Gender		Total
	Male	Female	
Do your parent(s)/guardian(s) have a job?			
Yes	86	85	171
No			
Don't know			
If yes, which employer?			
Public	18	20	38
Private	25	21	46
Self-employed	42	44	86
Don't know			
Other			
Did you have contact with anyone infested with head lice?			
Yes	61	69	130
No	25	16	41
Number of residents per home			
2–3	1	2	3
4–5	13	11	24
>6	72	72	144
Number of people in household attending a school			
1	3	4	7
2–3	47	37	84
4–5	27	29	56
>6	9	15	24
Number of people who share a bed with you			
0	58	59	117
1	28	26	54
>2			

Table 4. Relationship between prevalence of head lice and sociodemographic variables in 171 school children at primary school in Viana, Luanda, Angola.

Variable	Head lice infestation detected		*P* value
	Yes	No	
Gender			
Female	69	16	0.0001
Male	3	83	
Contact with someone infested			
Yes	62	68	0.011
No	10	31	
Sharing a bed with others			
Yes	50	67	0.868
No	22	32	
Number of residents per home			
<3	1	2	1
>3	71	97	
Age group			
<9	37	49	0.877
>9	35	50	

are transmitted, which included sharing comb and hat (117, 68.4%) and contact with the head (54, 31.6%). When asked about the complications associated with head lice infestation, 12 teachers (63.2%) mentioned scalp wounds and seven (36.2%) mentioned the pustules as secondary infection.

Discussion

In this study, the overall prevalence of head lice infestation was high, and among the highest reported by studies outside Africa.[12,20,23] Also, the level of infestation we found can be compared with results of previous studies performed in some regions of Africa demonstrated marked variation of prevalence in school children.[24–41] In the present study, the prevalence of head lice infestation in girls was higher than in boys across all school grades, which is consistent with the results of previous studies.[4,8,10,12,21,42] To our knowledge, this is the first study of head lice to be conducted in Angola, albeit with a small sample size. The predominance of head lice infestation in females is well known, and a previous study has demonstrated that females are 2.2 times more likely to have active infestation than males.[42] The cause of this gender-specific prevalence remains unclear, although it has been attributed to gender-related behaviorals,[4] such as girls being likely to have closer and more prolonged social contact in small groups than boys, and the tendency of girls to have long hair.[4,10] The prevalence of infestation that we found in girls was strikingly high when compared with the findings of others. Among the risk factors analyzed in our study, only gender and self-reported contact with another person infested with head lice showed a significant relationship with prevalence of infestation.

In this study, the higher prevalence in girls may be partially explained by following factors. First, although we did not measure hair length or describe in detail the hair characteristics of our sample of children, we noted that the majority of girls had braided hair while the boys had either shorter hair or

a shaved head. Braided hair is considered to be a risk factor for head lice infestation in females[8] because it is difficult to comb braided hair, which is usually tied up in small bundles. However, regular use of a louse comb has been recommended as one of the best measures to protect against head lice infestation.[26] It is also common practice for black African girls and women to leave their hair unwashed for some weeks after braiding,[14] and it has been suggested that mothers should examine the hair of girls more frequently and more thoroughly than the hair of boys.[10]

It has already been demonstrated that if one member of a family is infested with head lice, other family members had a high risk of infestation.[4] For example, in a study that examined 6814 school children, the investigator found that 60.8% of subjects infested with head lice reported that their contacts were siblings, sleeping partners, or classmates.[8] However, we found that more than two-thirds of school children infested with head lice did not share a bed, suggesting that transmission may have been more via social contacts at home or at school. Furthermore, we found that school children did not have correct knowledge about treatment of head lice infestation, although some of them mentioned physical measures and the using a variety of substances, including unspecified chemicals. Thus, our results are consistent with those of previous studies in school children reporting use of nonpediculocide substances, in particular kerosene and salt.[8]

We also assessed the knowledge of teachers regarding head lice infestation using basic questions. They answered all questions correctly, except for those about the treatment and control of head lice infestation. In a previous survey of parental knowledge about treatment of head lice, most were found to have good knowledge about the signs and symptoms, but reported using potentially dangerous prevention and treatment methods.[43,44] The current strategies to combat *Pediculosis capitis* emphasize the active role of teachers and schools in health education to prevent and manage this condition.[19,45] When teachers have the correct knowledge, the school becomes the preferred setting to teach school children about prevention and remove the stigma associated with head lice infestation. For example, a cross-sectional study demonstrated that children younger than nine years of age who attended a school without information on health were 3.6 times more likely to have head lice infestation.[20] The recommendation has been made that teachers should have access to scientifically sound information, because it has been reported that in areas of high prevalence of head lice, teachers tend to have relevant information but not enough to enable them to be competent enough to manage ectoparasitosis effectively.[46] Our findings suggest a need to encourage teachers to look for good sources of scientific information. In this regard, teachers have expressed a preference to learn more about this ectoparasitosis using simple, flexible, and convenient formats, eg, videotapes and brochures.[47] Cooperation between health authorities and educational system through the "health school programs" could integrate these learning tools into educational material on head lice targeted at the children.

The present study had some limitations. First, although our sample was appropriately selected, the small sample size of the children interviewed may limit the relevance of our findings to all school children in Angola. Second, the type of questionnaire we used was unable to assess the knowledge and practices of school children according to age and school grade. Third, because diagnosis of head lice infestation was made by direct visual inspection, some individuals with a low level of infestation may have been missed. Several authors have demonstrated that visual inspection is less accurate than use of a louse comb, and could underestimate the actual prevalence of active infestation.[48,49] The most important implication for clinical practice is the diagnosis of active head lice infestation in order to prescribe appropriate treatment. Therefore, visual inspection has been reported to be the best method for determining the frequency of carriers of head lice.[48] Thus, the true prevalence of active infestation in our sample may be more than reported.

In conclusion, we found a high rate of head louse infestation in this study of Angolan school children. Gender and a history of contact with an infested person were the main modifiable risk factors. Teachers showed good knowledge on the biology and clinical presentation of head lice, but lacked appropriate knowledge about treatment of an infestation, suggesting the need to increase teachers' competence to communicate effective prevention and treatment strategies to their pupils. Further systematic epidemiological

studies are required to glean more information on ectoparasitosis in Angola.

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Disclosure

This manuscript has been read and approved by all authors. This paper is unique and is not under consideration by any other publication and has not been published elsewhere. The authors and peer reviewers of this paper report no conflicts of interest. The authors confirm that they have permission to reproduce any copyrighted material.

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