

Head lice are not found on floors in primary school classrooms

Abstract

Background: The control of head lice is frequently based on perceptions rather than evidence, as illustrated by the belief that vacuuming carpets is an essential component of treating head lice, and the less common practice of application of insecticides to floors as an adjunct to head lice treatment.

Objective: To 1) evaluate the importance of floors as a source of infection for head lice in primary schools to provide evidence on which to base decisions about the need to treat floors; 2) determine the prevalence of active pediculosis and average intensity of infection in primary school children in Townsville, north Queensland.

Methods: In Townsville, north Queensland, we examined preschool and primary classroom floors for lice by using a filter on a vacuum cleaner when the children were absent from the rooms. Active pediculosis was treated, head lice were collected and counted.

Results: Of the 2,230 children examined from 118 classrooms, 466 had head lice, a prevalence of 20.9%. A total of 14,033 lice were collected from these children to give an average intensity of infection of 30.1 (95% CI 21.9-38.3) lice per infected child and 129.9 (95% CI 90.7-169.2) lice per infected class. Of the 118 classrooms, 108 (91.5%) had at least one child with active pediculosis. No lice were recovered from the classroom floors.

Conclusion: Classroom floors are not a risk in the transmission of head lice and no special anti-lice measures are required.

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Pediculosis, although a relatively trivial health problem, is perceived as a major issue by parents and guardians of primary school children in Australia. Recent data from a primary school in Brisbane found prevalences of active pediculosis of 21% and inactive pediculosis (hatched or dead eggs only) of 19.4%,¹ thus supporting the parents' and guardians' statement that pediculosis was common. In Australia, the treatment and control of pediculosis is regarded in general as the prime responsibility of the general public, with public health professionals providing guidance and support.² Control strategies, therefore, need to be based on accurate information, easily comprehensible by the general public. Since pediculosis is regarded by the general public and official organisations as being the public's 'problem', the general public appears to give equal weight to most information on head lice irrespective of source. The result is that myths are common in head lice control.^{3,4} This study was undertaken to provide evidence to address such a myth.

The perception that treatment for head lice involves vacuuming floors, treating furnishings and washing bedding appears to be commonly held by the general public. Some people see 'spring-cleaning' as such an essential part of head lice control that they delay treatment of pediculosis until they have time for the more laborious task of environmental cleaning. Some companies marketing head lice products and articles in the popular press also recommend this. Even a paper dealing with head lice myths advised delousing clothing, furniture and toys.⁴ The

recommendation appears to be based on the belief that head lice can live in the environment of the home or school and that people can be infected from this environment. However, the scientific literature contains no data to support this perception, nor to refute it.

Knowledge of the biology of *Pediculus humanus var capitis* and the epidemiology of pediculosis suggests that direct transmission via head-to-head contact with an infected person is the major route.⁵⁻⁷ Although lack of evidence was highlighted 16 years ago,⁸ there has been no data published on the role of fomites and the environment. Without data to quantify the various potential routes of transmission, arguments will be based solely on informed guesses.⁷

Transmission of head lice from floors makes little biological sense, but the lack of data to quantify this potential route of transmission means recommendations cannot be evidence based. No studies have examined how often head lice are found on floors, and whether the lice are viable. The hypothesis for this study was that the risk of pupils acquiring head lice from classroom floors was very low. To assess the risk posed by floors as a potential source of head lice, we counted the number of head lice on the floors of school classrooms and the number of head lice on the heads of children using those classrooms. We also determined the prevalence of active pediculosis and average intensity of infection in primary school children in Townsville, north Queensland. In this paper the word 'infection', instead of the less scientific word 'infestation', is used. We also choose not to use the word 'infestation'

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Table 1: Prevalence of active pediculosis in primary school children and number of head lice removed from their hair and the number found on carpets from the same classrooms occupied by these children.

Class	No. of classes examined	Total no. of students in classes	No. of students examined (%)	No. of students with lice	Prevalence of active pediculosis	Total no. of lice found on heads	Mean intensity of infection per infected student	Lice found on carpets
Preschool	5	209	165 (78.9%)	28	17.0%	2,221	79.3	0
Year 1	12	277	218 (78.7%)	42	19.3%	667	15.9	0
Year 2	18	395	308 (78.0%)	63	20.4%	1,362	21.6	0
Year 3	15	352	283 (80.4%)	81	29.0%	3,159	39.0	0
Year 4	14	351	283 (80.6%)	65	23.0%	1,344	20.7	0
Year 5	19	456	353 (77.4%)	94	26.6%	3,522	37.5	0
Year 6	18	449	328 (73.1%)	66	20.1%	927	14.0	0
Year 7	17	451	292 (66.8%)	27	9.3%	831	30.8	0
Total	118	2,940	2,230 (75.9%)	466	20.9%	14,033	30.1	0

as it carries with it negative connotations of uncleanness and social stigma.⁹

Methods

Seven state primary schools in Townsville, north Queensland, Australia participated in the study as part of a school-based program to control pediculosis. Two schools were involved in two surveys (four and seven months respectively separating the surveys), making a total of nine surveys. Children without permission from a parent or guardian were not included.

Lice on floors: While children from each class were being examined for head lice at a central area and were absent from their classroom, the floor of the classroom was vacuumed. All classrooms were carpeted with a polyester carpet of short pile length, standard issue for state schools in the region. These floors are vacuumed routinely by school cleaners at the end of each school day. For our study the floor of each classroom was vacuumed with a Remington Dustbuster Mk2 Housemate using a detachable carpet head. A paper filter (Melitta Coffee Filter Bags, Melitta House of Coffee Pty Ltd, Sydney) was placed over the distal end of the head and the end pushed firmly into the proximal end of the vacuum cleaner intake pipe. Each part of the classroom was vacuumed with a particular emphasis on the area under desks and seats so that most areas were covered several times until all visible debris had been removed. This process took approximately 10-15 minutes. The filter was removed and placed in a lock top plastic bag and held at room temperature (15-30°C). Most specimens were examined within 12 hours. Examination was done using a dissecting microscope at x40 power under both transmitted and incident light. At examination, fibres were examined separately and teased apart using jeweller's forceps. The remaining dust was then examined in a similar way. Finally, the sample was weighed. During examination the presence of insect pieces, whole insects and live insects were recorded.

Lice on heads: The hair of children was examined for head lice and eggs by people experienced in checking for head lice. If

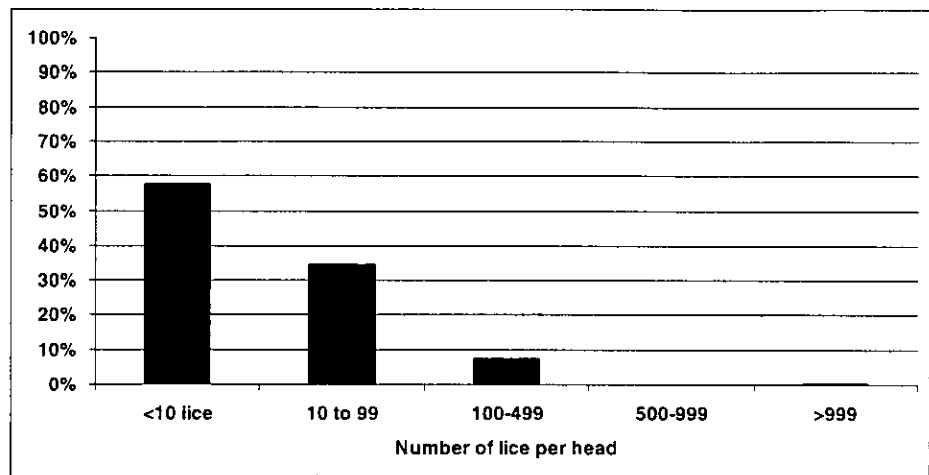
climbers were seen, commercially available head lice product was applied to the hair. If eggs were found but no climbers were detected, to determine if the pediculosis was active, conditioner was applied to the hair and immediately combed off with a fine tooth comb, and the combings wiped on to white paper tissue and examined for climbers. If any climber was found the pediculosis was classed as active, and treatment given after conditioner had been removed by the fine tooth comb. For treatment, head lice product was applied to cover all hairs from root to tip, and after 20 minutes the hair was combed with a plastic fine tooth comb and the combings wiped on to white paper tissue. Since the work was conducted as part of various therapeutic trials, a range of four commercially available insecticidal head lice products were used for treatment. The paper tissues containing combings from treatments and from conditioner were subsequently examined using a dissecting microscope and the number of lice counted to give a total for lice on each head. For classes the individual totals were summed to give a class total.

This study was conducted under approval from the James Cook University Ethics Committee, approval number H844.

Results

A total of 2,230 children in 118 classrooms from preschool to year 7 were examined for head lice. Total enrolment in these classes was 2,940 students, a participation rate of 75.9%. The distribution of classes and number of children examined is shown in Table 1. Of the 2,230 children examined, 466 had head lice, a prevalence of 20.9%. A total of 14,033 lice were collected from these children to give an average intensity of infection of 30.1 (95% CI 21.9-38.3) lice per infected child and a median intensity of infection of six lice. For the 466 children with head lice, 269 (57.7%) had fewer than 10 lice, 161 (34.5%) had 10-99 lice, 35 (7.5%) had 100-499 lice, 0 had 500-999 lice and 1 (0.2%) child had 1,623 lice (see Figure 1). This latter student was a four-year-old girl in preschool and her infection skewed the average intensity for this grade (see Table 1). Of the 118 classrooms, 108 (91.5%) had at

Figure 1: Pattern of intensity of infection with head lice in 466 preschool and primary school children with active pediculosis.



least one child with active pediculosis. The average number of lice per infected class was 129.9 (95% CI 90.7-169.2). In all, the seven schools' prevalence of active pediculosis was high (see Table 2), average 20.5% (95% CI 16.5-24.6%).

The median weight of debris examined from each classroom was 1.6 g. In debris vacuumed from the 118 classroom floors, no lice or eggs were found. All samples contained parts of insects or occasionally whole insects; ants and their parts were the most easily identifiable insects found.

Discussion

This study found no head lice on carpeted floors of preschool and primary school classrooms. The floors in these classrooms are vacuumed by cleaning staff at the conclusion of each school day. Classroom floors were vacuumed by us over the course of the school day (09:00-15:00) as each class was examined, with the first vacuuming occurring usually at 09:30 and the last after 15:00. Hence, the time spent in classrooms by students prior to examination ranged between 0.5 and five hours, allowing for rest breaks out of the classroom. If lice are potentially going to leave the head, the range of times involved in this study appears adequate to detect such an event. On the heads of the children working in these classrooms, we found 14,033 head lice. A ratio of 14,033 to zero indicates that the risk of children being infected by lice transferring from carpets to their heads is zero. Floors are not a risk in the transmission of head lice. In control of head lice there is no benefit in any activities to remove head lice from floors. This result supports our recommendation that control of head lice should focus on the head, not on the environment.^{7,10}

The epidemiological data on head lice in these Townsville primary school children is similar to that obtained for primary school children in Logan City, south-east Queensland.¹ Prevalence (20.9%) of active pediculosis in these tropical north Queensland state primary schools is similar to the prevalence (21%) in the state primary school in the temperate zone in Australia.¹ For schools, a prevalence of active pediculosis greater than 5% is considered epidemic.¹¹

Table 2: Participation rates and prevalences of active and inactive pediculosis in seven primary schools in Townsville (active pediculosis = climbers or live eggs found; inactive pediculosis = hatched or dead eggs only found).

School	Participation rate (%)	Active pediculosis (%)	Inactive pediculosis (%)
1	61.5	24.2	12.5
2	81.7	17.2	9.0
3	77.2	25.9	13.0
4	67.7	12.7	11.0
5	50.9	21.6	22.2
6 1 Jul 1999	84.3	25.8	17.2
6 2 Nov 1999	68.8	12.6	9.8
7 1 Apr 1999	95.0	29.2	19.6
7 2 Nov 1999	75.2	15.5	8.7
Mean (95% CI)	73.6 (65.0-82.1)	20.5 (16.5-24.6)	13.7 (10.5-16.9)
Median	75.2	21.6	12.5

Prevalence was high for all primary school grades in these Townsville schools, showing a trend that peaked at 29% for year 3, with a drop in year 6 falling further to the lowest value of 9.3% in year 7. This may be an accurate indication of the true prevalence or the lower rate of participation of year 7 students could have resulted in an underestimation if students with pediculosis refused to participate. Since a previous study¹ had indicated that the reported prevalence of pediculosis in non-participants was the same as for participants, the result seems more likely to equate the true prevalence.

This is the first paper to report intensities of infection for Australian primary school children. The average of 30 lice per infected child is skewed by occasional children with high numbers of lice. The median of six lice per infected child is reflected in the distribution pattern of intensity of infection with 57% of children having less than 10 lice, and 98.8% having less than 500 lice. The detection of 1,623 lice on the head of one preschool child is unusual.

This study's negative finding of no head lice on classroom floors has important implications for the management of pediculosis in general and in schools in particular. Schools do not have to initiate any special strategies with respect to delousing classroom floors even in preschools, where pupils spend more time than other grades on the floors. By extension the same will apply to the floors in day care centres and homes. Public health professionals should promote this message clearly to parents and guardians to decrease effort and time wasted by the general public on cleaning floors, seen by some people as an essential part of head lice control.

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