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An Investigation on Prevalence and Awareness of Elementary School Students Infested with Head Lice in Hualien County

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Sucking blood by infested head lice would cause the victims to suffer from scalp itching, to be unable to fall into deep, sound sleep at night, and even get

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infected with various transmittable diseases. In this study, we chose two elementary schools in the rural Hualien County in eastern Taiwan, i.e. School A with a pupil population of 117 and located in mountainous Sioulin Township, and School B with 261 pupils and in non-mountainous Guangfu Township, as the sites to conduct this study. The objective of this study was to find out: what those pupils and their parents knew about head lice infestation and what the current prevalence of it was among the pupils attending those two schools. The investigation approaches adopted consisted of a semi-structural questionnaire designed mainly for the first awareness part of the objective, and a down-to-earth naked eye inspection for the second part dealing with infestation prevalence. Understandably, the questionnaire was to be filled out only by elder pupils of Grade 3 and beyond, while the subjects of the naked eye inspection covered the entire pupil population of the two schools.

According to the answers given in the part of filled out questionnaire regarding head louse infestation, it was quite obvious that pupils of the mountainous School A were more seriously infested with head lice all along, both in the past and at the time when the inspection took place (57.7% and 56.3%, respectively) as compared to those figures of the non-mountainous School B (38.6% and 18.9%, respectively). Pupils at both schools, however, appeared to agree upon one thing, i.e. scalp itching derived from head lice infestation was a much bigger problem than spoiling quality sleep at night. We found the percentages of pupils attending School A considering their effect significant for the two problems were 97.5% and 40.0%, whereas the figures for School B were 64.0% and 28.0% instead. Whenever a kid was found infested with head lice, most likely it was one of the kid's parents (52.5% and 44.0% for School A and School B, respectively) or the school nurse (55.0% and 32.0%, respectively) would take the

initiative to have the kid receive medical treatment.

The study also revealed that at least 70.0% or 80.0% of pupils attending the two schools were rather knowledgeable about head lice, possible routes of its infestation, effective approaches for prevention, and proper ways to eliminate them once a person has become infested. Another relevant fact we became aware of due to this study was that up to 50.0% or 60.0% of the pupils having got infested kept sharing with other family members bedding items like pillow covers, comforters, and bed padding. We also noticed that the majority of families suffering from head lice infestation did not wash their bedding items regularly and frequently, and over half the pupils infested with head lice wore their hair much too long. Those observations suggested that the pupils' attitude and behavior did unfortunately not coincide with their rather good knowledge about head lice. By the way, about the costs of head louse treatment, the percentages of infested pupils of these two schools and their parents claiming that they were willing to pick up the tab (about 50 NT dollars per person) to buy the emulsion head lice spray were 70.0% and 80.0%, respectively.

The results of the naked eye inspection showed that the current prevalence of head lice infestation among School A pupils was 47.9% (56/117), whereas that of School B pupils was 16.9% (39/231). We saw that pupils living in more rural and mountainous areas were in much higher risk of being infested by head lice than those living in non-mountainous areas, and this reminds us that we need to pay more attention and put in more efforts to curb the problem in mountainous areas.

Introduction

Head lice are parasitic insects that live in the hair and scalp of humans. They need human blood to survive, and regardless of being baby nymphs or

mature adults. They will suck blood at least once or twice a day and cause the host to suffer from itching scalp, disturbed sleep, becoming disquieted, and withdrawing from work or school [1-2]. Head louse would also be a vector for spreading transmittable diseases such as louse-borne typhus and relapsing fever. Since it does not jump around like a flea, by far the most likely transmitting route between two individuals is through direct physical contact of heads in school or at home. Occasionally, it would also be transmitted through crowded transportation vehicles, public bedding materials, towels, hats, clothing, headdresses, and shared combs and brushes. Even fallen hair may spread head lice and its nits around.

Just about a month ago, a series of head louse infestation events surprisingly broke out at several elementary schools and daycare centers in Taipei City, which is generally hailed as the best region of the nation in the public health category. Such news is definitely worthwhile to catch our attention and concerns. In many countries worldwide, the problem of head louse infestation is often found among preschoolers, elementary school pupils, and junior high school students, with various infestation rates [3-8]. In Taiwan region, the current incidence rate of head louse infestation among kindergarten pupils is 3.4%, whereas that among elementary schoolchildren is 8.5% and junior high school youngsters is 1.3% [9]. The prevalence rate of head louse infestation in Taiwan region varies in different counties and cities, and it ranges from 14.0 to 81.0% for schoolboys and 9.0 to 38.0% for schoolgirls [8, 10-11]. Hualien County Health Bureau did a cross county survey on the head louse infestation among its junior high students and elementary school pupils for the very first time in March 2000. It turned out that the highest number of students found infested with head lice was in Sioulin Township with 1,627 positive ones, which was followed in a decreasing order by Guangfu Township, Wanrung Township, Yuli Town, and Fengbin Township. The

average student infestation rate for schools in mountainous counties with students being almost all indigenous people turned out to be 15.0%, much higher than the 3.0% of the non-mountainous area schools. Categorized by their tribal origins, the highest infestation rate happened to be 26.0% among the Tao (formerly known as the Yami) school children, followed by 23.0% of the Atayal children, 19.0% of the Amis, 7.0% of the Rukai, 4.0% of the Bunun, and 4.0% of the Puyuma (or the Beinan people by outsiders because they have lived in generations in Beinan Plain in Taitung County). Therefore, we believe it is necessary to find out how much the school kids in the area know about the head louse infestation and the factual situation of its prevalence. This article is about the findings of an epidemiological investigation of head louse infestation among the pupils of two selected elementary schools in Hualien County, one locates in a mountainous township and the other in a non-mountainous township, particularly aiming at how much those pupils and their parents knew about head louse infestation and what was the current prevalence of it.

Materials and methods

Subjects of the investigation

We chose School A in a mountainous area (Sioulin Township) and School B in a non-mountainous area (Guangfu Township), both of Hualien County, to carry out our investigation into the entire pupil populations.

Questionnaire project

The questionnaire we used adopted a semi-structural design, and its content covered the school pupil's basic data, status of whether having been infested by head lice at all, the pupil's awareness of head louse infestation, and in case infested, the pupil's symptoms and behavioral attitude. As we believe Grade 1

and 2 pupils are too young to comprehend the meaning of the questionnaire and respond to it in good order, the questionnaire was only directed to all elder pupils attending Grade 3 and beyond, i.e. School A in Sioulin Township had four such upper grade classes then with a total of 71 pupils, and School B in Guangfu Township had seven classes with 132 pupils. Together, the number of pupils answering the questionnaire in this study was 203.

Way of inspecting head lice by unaided or naked eyes

Adult head louse is a grayish white insect with a flat back, and its body size is somewhat smaller than a match head. In most cases, it clings to hair shaft near the root and scalp surface. Louse eggs (called nits) are glued on hair roots, so they look like flakes of dandruff but do not break loose as easily. Usually, by searching along the occipital bone and the back of both ears we can tell if there are nits present by naked eyes, but the adult lice are not so easy to spot. Our investigators went to School A in Sioulin Township on April 10, and School B in Guangfu Township on the next day to do the naked eye inspection. Before the inspection started, we gave the students a health education briefing on head louse and asked them to line up outside the classroom in the order of their classroom seat numbers waiting for their turn to be inspected. For each individual, the inspector first looked for the easier targets or the presence of nits. Whenever the inspector spotted an obvious infestation case of nits, he/she would go one step further to look more carefully once more for adult lice, and use a pair of sharp tipped tweezers to collect the adults, nymphs, and nits one by one and put them into a plastic container filled with 75% ethanol and marked with the pupil's name as the evidence or record of the finding.

Data process and analysis

All data obtained from the answers given to the questionnaire were then

keyed into a computer file set up with "Epi-info" software. After one extra round of checking and confirmation of the accuracy of each entry, we proceeded with the relevant statistic description and analysis. Basically, analogical variables were expressed by frequencies and percentages, while continuous variables were shown in terms of median and range.

Results

Altogether we collected 203 returned questionnaire sets in those two days. At School A, Grade 3~6 pupils who answered the questionnaire were in four classes consisted of 31 boys and 40 girls, and those of School B were in seven classes and made up by 72 boys and 60 girls.

Table 1 shows that percentages of grade3~6 pupils of School A and B having previously been infested by head lice were 57.7% (41/71) and 38.6% (51/132), respectively, and percentages of the same were infested at the time of inspection were 56.3% (40/71) and 18.9% (25/132), respectively. So it was quite obvious that both in the past and at the moment of the inspection, the head louse infestation problem at the mountainous area School A was much more serious than that at the non-mountainous School B. One surprising outcome of this study was that if without the investigation, we would never know that as high as 15.5% (11/71) and 14.4% (19/132), respectively, of the pupils did not even realize whether they had head louse infestation or not before. Among those currently infested with head lice, girls counted for 78.5% (51/65) of the total, while the rest 1.5% (14/65) were boys. Therefore, there was significant statistical relevance between the sex of hosts and head louse infestation ($P < 0.001$).

Table 2 exhibits that 97.5% of the head louse-infested pupils attending School A and 64.0% of those attending School B often felt very itchy scalp.

Also in their opinion, 40.0% of those attending School A claimed that the infestation would spoil their sleep quality, but only 28% of those attending School B maintained the same. In both cases, the effect on sleep quality seemed to be lighter issue than the itchy scalp. After the pupil was infested with head lice, most likely the pupil's parents (52.5% and 44.0% for School A and B, respectively) or the school nurse (55.0% and 32.0%, respectively) would intervene and have the kid treated. However, a small fraction (10.0% and 20.0%) of the infested did not get treated whatsoever. This fact illustrates that part of the pupil population and their parents were not interested or serious enough towards the treatment of head lice. 72.5% of pupils attending School A reported that the school examined their hair regularly, and only 44.0% of School B pupils reported the same, which shows both schools' health administration personnel had room for improvement in their management of school pupils' personal hygiene. Furthermore, we found the ratio of student family members also infested with head lice were 72.5% and 44.0% for the two schools, respectively. The number of infested family members of a pupil ranged from 1 to 7, and the median was 2 persons.

Table 2 also informs us that the percentages of infested pupils attending the two schools sharing combing out and washing gears with the rest of the family on a daily basis were 65.0% and 56.0%, respectively. The percentages of infested kids sharing pillow towels, comforters, and bed padding with their family were 57.5% and 36.0%; those figures of sharing hats, head cloth, or clothing with their family were 27.5% and 24.0%. On the other hand, the percentages of infested kids sharing combing out and washing gears with their fellow schoolmates were 25.0% and 12.0%, respectively, and figures for sharing hats, head cloth, or clothing with their school mates were 12.5% and 12.0%. As to the washing

routine of their comforter cases, pillowcases, and bed sheets at home, the percentages of head louse infested pupils attending the two schools stating that those bedding items were washed frequently (at least once monthly) were 50.0% versus 68.0%; figures for those same pupils stating the items being washed occasionally (once every 2 or 3 months) were 25.0% versus 12.0%; and finally figures for those items being very rarely or never washed were 17.5% versus 8.0%. Among the same infested pupil population, there were 72.5% and 72.0%, respectively, stating that bedding items like pillow (cases), comforters, or bed padding at home had ever been let exposed under the sun. We also paid attention to the infested pupils' hair length and found that 70.0% (28/40) of the ones attending School A wearing their hair too long (long enough to cover up their ears), and 84.0% (21/25) of those attending School B. When we asked why they did not wash their heads often enough, we were told by those infested pupils attending School A that 15% of them had no facility for washing head, 10% lacked water at home, and 7.5% did not feel like to wash head. The ratios for the same answers given by School B pupils turned out to be 4.0%, 8.0%, and 12.0%, respectively. In contrast with what we expected, there were quite high percentages of the pupils not willing to talk about why they did not wash their heads often (67.5% versus 76.0%), and it's rather interesting. Related to the treatment of head louse infestation, we found that as high as 70.0% and 80.0% (for the two schools respectively) of the infested pupils and their parents expressed willingness to pay for the cost (about 50 NT dollars) of purchasing emulsion formula to get rid of head lice.

Details of a statistic analysis for the recognition situation of pupils of the two schools were displayed in Table 3. The highlights in this table include, say, that most of them realized what a head louse was (83.1% versus 75.8% for School A

and School B); that 81.7% of School A pupils and 83.3% of School B pupils correctly thought a person would get infested with head lice when making physical contact with someone already infested. The percentages of the two school pupils that thought poor personal hygiene habits (such as not washing head frequently) would lead to head louse infestation were 84.5% and 81.1%, respectively. The ratios of those considering that often using other people's combing and washing tools would result in head louse infestation were 66.2% versus 69.7%, and those thinking often using other people's clothing, headdress, and hats would bring about head louse infestation were 62.0% versus 73.5%. Separately speaking, pupils attending School A believed effective preventive methods against head louse infestation would include washing head frequently (85.9% of them thought so), avoiding physical contact with any infested person (71.8%), once a person found infested with head lice, the entire family being examined and treated simultaneously (70.4), keeping good personal hygiene habits (69.0%), refusing the use of other people's combing and washing tools (67.6%), not sharing clothing, head wrapper, and hats with others (62.0%), and maintaining living environment clean at home (53.5%). At School B, percentages of their pupils thinking positively towards the same seven methods mentioned above were 85.6%, 73.5%, 77.3%, 75.0%, 65.9%, 72.0%, 78.0%, respectively. As to useful remedies for louse infestation treatment, the preferences of pupils attending the two schools included using medication for getting rid of head lice (85.9% and 84.1% for the two schools), washing head more frequently (81.7% and 80.3%), improving the cleanness of living environment (57.7% and 62.9%), and washing bedding items like pillow towels, comforters, bed padding plus exposing them under the sun (59.2% and 72.9%). Only a small fraction of the pupils thought it no big deal and no need to be

concerned and they counted for 5.6% and 3.0%, respectively. Overall speaking, pupils attending School B appeared having better understanding towards head lice than those attending School A.

Table 4 shows that a great majority of those pupils, having infested with head lice before, knew well about what a head louse was (89.1% versus 70.4%), believed physical contacts with an infested person would bring about new infestations (90.2% versus 76.5%), so effective ways to prevent from getting head louse infestation were avoiding contact with infested people (82.6% versus 66.7%), and keeping living environment clean at home (70.7% versus 46.9%). These four items were more prominent relatively in the category of recognition of the problem. However, those pupils who had never been infested with head lice were clearly not so highly familiar with these four items, and the differences between the infested and non-infested were all statistically significant (each P value < 0.05). Aside from that, the experience of having or having not been infested appeared to be less influential in the individual's recognition of other items including realizing bad personal hygiene (such as not washing head frequently), often using other people's combing and washing facilities, and wearing other people's clothing/headdress/hat would get infested with head lice; effective prevention includes washing head often, examining head louse infestation of all family members altogether simultaneously, keeping good personal hygiene, avoiding sharing combing and washing facilities or clothing/headdress/hats with others; and remedies for head louse treatments. That is, the differences of recognition between the ever infested and the otherwise did not reach the level of statistical significance (individual P value > 0.05).

About the task of inspecting head louse infestation with naked eyes, our subjects were the entire pupil population of the two schools, i.e. 6 grades with 117

pupils in total at School A in Sioulin Township and also 6 grades but with 261 pupils at School B in Guangfu Township. The results are listed in Table 5, which shows the head louse infestation rate of the entire student body of School A at the moment of inspection was 47.9% (56/117). Among the all 6 grades, Grade 3 happened to have the highest infestation rate at 64.7% (11/17), and lowest rate, 27.3% (6/22), went to Grade 1. On the other token, the infestation rate of School B as a whole was 16.9% (39/231), and the highest grade infestation rate belonged to their Grade 4 at 33.3% (7/21), whereas the lowest rate went to their Grade 2 at 10.0% (5/50). Statistically speaking, there was obvious relevance ($P < 0.05$) between grade distribution and head louse infestation, which also means significant relevance the age distribution had with infestation with head lice.

Discussion

Head louse is one of many varieties of hygiene pest, which in scientific classification belongs to the suborder of Anoplura, the family of Pediculidae, and the genus of *Pediculus*, and its technical name is *Pediculus capitis*, *P. humanus*, or *P. humanus capitis*. The adult has no wings but a flat body when viewed from the side and in light gray color. The edge of its abdomen is colored dark black rather, and on its head there is a pair of 5-segment antennae. Its mouthpart is a piercing-sucking type with razor sharp teeth in it. When sucking blood, its "teeth" would revert inside out and cling to scalp of the host. Adult head louse has 3-pair strong legs and each one has five segments (called coxa, trochanter, femur, tibia, and tarsus). At the tip of tarsus attaches a sturdy curved claw pointing to the thumb-like tibia and the combination of the two is used to cling to hair shaft of the host. This is one of the most important characteristics of

Anoplura insects. Head louse is a creature of incomplete (should be gradual instead) metamorphosis; its lifecycle is divided into three stages, i.e. the nit, the nymphs, and the adult, and a complete lifecycle lasts about 2-3 weeks. They are parasitic to the head and neck region. After copulation, a female head louse starts to lay eggs in 1-2 days, and then lays 4-5 eggs daily. During her life span she may lay a total of 50-150 eggs. The egg sticks on to hair shaft with glue and colored in yellowish white. An interesting feature of the egg is that it is equipped with a cover for air exchange and the exit of the baby nymph after hatching, which takes place after a 7-10-day incubation period. The appearance of the nymph is quite similar to the adult but smaller in size, with fewer body hairs and immature sex organ. It metamorphoses 3 times before reaches the adult stage. Each time it would shed a layer of skin and grow a bit bigger in size, and it takes 8-9 days to complete the maturation process. Each individual head louse has a life span lasting around one month.

No matter how clean and how careful a person is with his/her personal hygiene, everyone is possible to get infested by head lice. Once a person is infested, the infestation will be swiftly passed on to the person's dear family and friends. To get infested with head lice is not a shameful thing, but shameful it is if you don't get rid of them right away. There are many effective ways to help in keeping them away in advance, such as adopting and keeping good personal hygiene sanitation habits, having bedding items like pillowcases and comforters washed, changed, and exposed to the sun frequently, wearing short hair, washing head regularly, and avoiding using other people's combing and washing facilities. It is best to have a routine check of your hair for head lice once a week. Once head lice were spotted, the whole family should receive a careful and thorough examination and be treated immediately after. Whenever elimination of head

lice is tried, one important caution is to make sure employing only those medications manufactured and marketed under licenses issued by the pharmaceutical administration under Department of Health, and by all means not to be confused with and applying onto human body any of those environment sanitation drugs or pesticides manufactured and marketed under licenses issued by Environmental Protection Administration.

Before 1992, head lice infestation used to be quite prevalent in Taiwan region with prevalence rates somewhere reaching 14%~81%. Then because of the swift transformation of the general lifestyle and economic prosperity, the prevalence went downward and now you rarely see infestation cases except in remote areas where indigenous people live. Between July 1997 and June 1998, Professor Ping-Chen Fan of Institute of Parasitology, National Yang-Ming University did a survey study on head lice infestation and treatment of indigenous people school children living in northern Taiwan mountainous areas (Sioulin Township of Hualien County, Renay Township of Nantou County, Wulai Township of Taipei County, Jianshih Township of Hsinchu County, Fushing Township in Taoyuan County, and Nanao Township of Ilan County). Among his findings, the infestation rate of schoolgirls was always higher than that of schoolboys in the same area, and the overall rate of Sioulin Township of Hualien County, which turned out to be 19.7%, was the highest in the six townships examined. It was followed then in a decreasing order by the 17.3% of Renay Township in Nantou County, 14.7% of Wulai County in Taipei County, 15.1% of Jianshih Township in Hsinchu County, 7.9% of Fushing Township in Taoyuan County, and 3.0% of Nanao Township in Ilan County. The average infestation rate was 12.8%. In our study, we found head lice prevalence among kids attending School A in a mountainous township was 56.3%, which was by far higher than the 18.9%

prevalence found among kids attending School B in a non-mountainous township. We also found that the biggest adverse effect it caused was itching scalp, considered more annoying than spoiling sleep quality at night (see Table 2). There was a study involving measuring amount of blood sucked by head lice, and the report maintained it was related to the number of head lice present and the frequency of their blood-sucking activity [13]. Without any doubt, the more head lice in number and more frequent they suck blood, the infested kid would feel scalp itching more often. Our data shows higher percentage of infested kids attending School A felt scalp itching annoying than kids attending School B (Table 2). Whether the percentage difference came from the difference in the number of head lice involved, or rather due to the difference in blood-sucking frequency we still don't know. Another article described the skin responses after being bitten by head lice. Initially there were no symptoms at all, and then some rash spots would show up along with mid level itching, which was followed by the appearance of linear marks, rash bumps and drastic itch feeling. Finally, the rash bumps would gradually diminish, but still accompanying with light level itching [14]. Besides, it was reported elsewhere that head lice crawling or sucking blood at night would keep the host from falling in sound sleep [15]. However, since the hosts are young children without much worry on mind and thus very easy to fall in sleep when they are tired, maybe that is why more of them thought scalp itching was a more serious problem than not being able to get good sleep at night.

Our results show that at the two schools we surveyed, 55.4% (51/92) of the schoolchildren that had been infested with head lice and received treatment before were found being reinfested by us. Newly infested cases counted for only 3.7% (3/81) in our study, which suggests that therapeutic treatments of head lice are

often just curing the symptom but not the basic cause. Furthermore, among our reinfested cases, 61.5% (40/65) were not the only infested person in his/her own family or household, which illustrates that most infestations with head lice were family business. After the pupil was infested with head lice, his/her major treatment came from the school nurse or the parents. Our data show that at the mountainous School A, the major forces came to rescue when the kid was found infested with head lice were led by the school nurse (55.0%) and followed by the parents (52.5%), while at the non-mountainous School B it was led by the parents (44.0%) and followed by the school nurse (32.0%) instead (Table2). Our data also show that among school kids' families, the head lice infestation rate is higher (72.5%) for the mountainous School A than that (44.0%) for the non-mountainous School B. This demonstrates a positive correlation existed between the family infestation rate and the school kid rate (56.3% versus 18.9%, in Table 1). It was repeatedly emphasized by other researchers that head contact is the major route to catch head lice, followed by sharing combing and washing facilities or hats, headdresses, pillowcases, etc. with infested person [15-16]. We can imagine there are frequent head contacts in elementary schools, so once a pupil somehow get infested with head lice, he/she would quickly pass them on to the rest of the class, and each pupil would bring them home to infest his/her family. In view of this, local Education Bureau should launch a campaign to request those elementary and junior high schools harboring high infestation group to conduct health worker job training aiming at passing on correct head lice control knowledge and techniques, besides regularly examining the pupil's hair to see if there is evidence of head lice. Any pupil once found infested should be treated right away along with the rest of his/her family with proper medication. It gets a little complicated at this point since medical treatment of the infested pupil

happens to be the responsibility of the local Education Bureau, while dealing with the pupil's infested family is under the jurisdiction of the local Health Bureau. Therefore, the results of head lice examination and the treatment outcomes should be submitted to both authorities for reference.

Inspection results also disclose a fact that schoolgirls' infestation rates were clearly higher than those of schoolboys (78.5% versus 21.5%). This coincides with the results obtained by many other similar studies [17-18], and the reason presumably relates to the fact that schoolgirls normally wear long hair [17, 19]. It was reported elsewhere age also had something to do with the infestation rate [17]. Data gathered in our naked eye inspection did show statistically significant difference between head lice infestation rates of different grades. Of course, some report pointed out the naked eye inspection method was not as accurate as a method using louse comb [20], because the former would always underestimate the severity of the head lice infestation, albeit it was more time consuming. Once upon a time when Taiwan Provincial Government was still in existence, it procured louse combs for all schools for head lice inspection. After the provincial government was frozen out, no other authorities took over the administration duty of student head lice control, and most schools did not keep the good tradition of regularly checking head lice infestation of their students because nobody enforced it. Unless there happened to be some apparent infested case exposed, the school usually would not actively initiate an inspection on its own. Taking the two schools we dealt with in this study as an example, we found School A pupils were examined more often because their infestation rate was relatively higher, the school was compelled to check pupils' hair more frequently and regularly than School B with fewer head lice infestation incidences or the problem was less serious. After our inspection, all elementary schools in

Hualien County eventually were requested to carry out pupil hair check every semester.

Most pupils attending these two schools appeared to be very knowledgeable (at least recognizing 70 to 80% of the correct answers) about, say, what a head louse was, the routes of its infestation, effective methods for infestation prevention, and the right treatments called for in case having become infested, and there was no statistically significant difference in recognition ratio between the two schools (Table 3). However, experience of having been infested previously seemed to have significant effect on outcomes of certain recognition items such as the understanding of head louse, to get infested through physical contact with infested person, and avoiding head contact with individual infested with head lice and keeping living environment clean could effectively prevent infestation from happening, which resulted in significant changes in statistical ratio (Table 4). Nevertheless, many infested schoolchildren still shared combing and washing facilities with his/her family or shared pillow towels, comforters, and bed padding, and such doers counted for as high as 50 or 60% of all infested pupils. Other puzzling findings included quite high ratio of families of infested pupils failing to wash their comforter cases, pillowcases, and bed sheets, over half infested pupils having too long hair, etc. (Table 2). These findings indicate the subjects' attitude and behavior did unfortunately fall short of matching with their rather good knowledge about head lice. It appears necessary for the entire staff of the local Health Bureau to launch a health education campaign regarding head lice aiming at those infested families, and take advantages of villagers' all kinds of assemblies and gatherings to propagate and promote head lice control activity.

Besides, we also found in this study that although the two schools paid a lot attention to the head lice elimination task, but due to lack of education and

necessary health authority funding for head lice control. One example is, when school nurse spotted an infested pupil, she needed proper medications at hand so that she could treat the infested pupil and his/her family immediately. But the reality was she could not help but let the infestation keep on going and resulted in many more people getting infested right before her watchful eyes. Therefore, county and city governments should add into their annual budgets enough funding for head lice prevention and control to guard against possible incidences of head lice infestations and spread on school campuses.

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Table 1. Head lice infestation situations among all pupils attending School A in Sioulin Township and School B in Guangfu Township.

Item	School A (n=71)	School B (n=132)
	No. of persons (%)	No. of persons (%)
Having been infested with head lice before		
Yes	41 (57.7)	51 (38.6)
No	19 (26.8)	62 (47.0)
Don't know	11 (15.5)	19 (14.4)
Being infested with head lice at the time of inspection		
Yes	40 (56.3)	25 (18.9)
No	31 (43.7)	107 (81.1)

Table 2. Symptoms and behavioral attitudes of those pupils found infested with head lice and attending elementary School A in Sioulin Township and School B in Guangfu Township.

Item	School A (n=40)	School B (n=25)
	No. of persons (%)	No. of persons (%)
Often feeling itching scalp	39 (97.5)	16 (64.0)
Infestation affecting sleep quality	16 (40.0)	7 (28.0)
Having it treated	31 (77.5)	12 (48.0)
Who did the treatment (multi-selection)		
Teacher	3 (7.5)	5 (20.0)
School nurse	22 (55.0)	8 (32.0)
Physician	6 (15.0)	0 (0.0)
Local health office personnel	1 (2.5)	1 (4.0)
Family member	21 (52.5)	11 (44.0)
No treatment	4 (10.0)	5 (20.0)
Regularly checked by school	29 (72.5)	11 (44.0)
Other family member also infested	29 (72.5)	11 (44.0)
It's true in daily life (multi-selection)		
Sharing combing and washing facilities with other family members	26 (65.0)	14 (56.0)
Sharing pillowcases, comforters, and bed padding with other family members	23 (57.5)	9 (36.0)
Sharing hats, headdresses, and clothing with other family members	11 (27.5)	6 (24.0)
Sharing combing and washing facilities with schoolmates	10 (25.0)	3 (12.0)
Sharing hats, headdresses, and clothing with schoolmates	5 (12.5)	3 (12.0)
How often were family comforter cases, pillowcases, and bed sheets washed?		
Often (at least once a month)	20 (50.0)	17 (68.0)
Occasionally (once every 2 or 3 months)	10 (25.0)	4 (12.0)
Seldom or never	7 (17.5)	2 (8.0)
No answer	3 (7.5)	2 (8.0)
Often exposing family pillow (cases), comforters, and bed padding under the sun	29 (72.5)	18 (72.0)
Hair is too long	28 (70.0)	21 (84.0)
Reason given for not washing head often		
No head-washing facility at home	6 (15.0)	1 (4.0)
Lack of water at home	4 (10.0)	2 (8.0)
Don't like it	3 (7.5)	3 (12.0)
No answer	27 (67.5)	19 (76.0)
Willing to pay about 50 NT dollars for getting rid of the head lice	28 (70.0)	20 (80.0)

Table 3. How much all individuals of the entire pupil populations know about head lice infestation at School A in Sioulin Township and School B in Guangfu Township.

Item	School A (n=71)	School B (n=132)
	No. of persons (%)	No. of persons (%)
Understood what head lice are	59 (83.1)	100 (75.8)
Believing the following would cause head lice infestation		
Contact with infected person	58 (81.7)	110 (83.3)
Personal hygiene is poor (such like seldom washing head)	60 (84.5)	107 (81.1)
Often using other person's combing and washing facilities	47 (66.2)	92 (69.7)
Often wearing other person's clothing, headdresses, and hats	44 (62.0)	97 (73.5)
It's effective preventive method		
Washing head often	61 (85.9)	113 (85.6)
Avoiding contact with infested head	51 (71.8)	97 (73.5)
Anyone found infested, the entire family ought to be checked and treated simultaneously	50 (70.4)	102 (77.3)
Good personal hygiene	49 (69.0)	99 (75.0)
Keeping living environment clean	38 (53.5)	87 (65.9)
Refusing to use other people's combing and washing facilities	48 (67.6)	95 (72.0)
Refusing to share clothing, headdresses, and hats with others*	44 (62.0)	103 (78.0)
How to deal with it after discovering infested with head lice		
Using medication to get rid of them	61 (85.9)	111 (84.1)
Washing head frequently	58 (81.7)	106 (80.3)
Cleaning living environment at home	41 (57.7)	83 (62.9)
Washing pillowcases, comforters, and bed padding and exposing them to the sun	42 (59.2)	96 (72.9)
Leaving it alone	4 (5.6)	4 (3.0)

*P<0.05, statistically significant

Table 4. How much the elder pupils (Grade 3 and above) who had or had not been infested with head lice know about head lice infestation at School A in Sioulin Township and School B in Guangfu Township.

Item	Infested (n=92)	Not infested (n=81)
	No. of persons (%)	No. of persons (%)
Understood what head lice are*	82 (89.1)	57 (70.4)
Believing the following would cause head lice infestation		
Contact with infected person	83 (90.2)	62 (76.5)
Personal hygiene is poor (such like seldom washing head)	81 (88.0)	66 (84.5)
Often using other person's combing and washing facilities	67 (72.8)	54 (66.7)
Often wearing other person's clothing, headdresses, and hats	70 (76.1)	55 (67.9)
It's effective preventive method		
Washing head often	82 (89.1)	66 (81.5)
Avoiding contact with infested head	76 (82.6)	54 (66.7)
Anyone found infested, the entire family ought to be checked and treated simultaneously	75 (81.5)	57 (72.8)
Good personal hygiene	71 (77.2)	58 (71.6)
Keeping living environment clean	65 (70.7)	38 (46.9)
Refusing to use other people's combing and washing facilities	68 (73.9)	58 (71.6)
Refusing to share clothing, headdresses, and hats with others	67 (72.8)	61 (75.3)
How to deal with it after discovering infested with head lice		
Using medication to get rid of them	83 (90.2)	68 (84.0)
Washing head frequently	77 (83.7)	63 (77.8)
Cleaning living environment at home	62 (67.4)	43 (53.1)
Washing pillowcases, comforters, and bed padding and exposing them to the sun	64 (69.6)	57 (70.4)
Leaving it alone	2 (2.2)	4 (4.9)

*P<0.05, statistically significant.

Table 5. Result data of a head lice infestation inspection by naked eyes at School A in Sioulin Township and School B in Guangfu Township.

Grade	School A in Sioulin Township			School B in Guangfu Township		
	No. of person examined	No. of person infested	Infestation rate (%)	No. of person examined	No. of person infested	Infestation rate (%)
1	22	6	27.3	49	9	18.4
2	24	10	41.7	50	5	10.0
3	17	11	64.7	41	6	14.6
4	15	7	46.7	21	7	33.3
5	23	14	60.9	26	7	26.9
6	16	8	50.0	44	5	11.4
Total	117	56	47.9	231	39	16.9