

Head louse infestations: the “no nit” policy and its consequences

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Abstract

Health authorities in the USA, Canada and Australia recommend a “no nit” policy, i.e. the immediate dismissal of all children who have head lice, eggs and/or nits on their hair from school, camp or child-care settings. These children would be readmitted to the institution only when all head lice, eggs and nits have been removed. The “no nit” policy assumes that all nits seen when examining the scalp are viable and therefore the infested individual should be treated for lice, and all nits must be removed from the scalp. However, it has been repeatedly shown that only a small number of children who have nits on their scalp are also infested with living lice. Accordingly, in the USA alone 4–8 million children are treated unnecessarily for head lice annually, which amounts to 64% of all lice treatments. In addition, 12–24 million school days are lost annually. The annual economic loss owing to missed workdays by parents who have to stay home with their children adds US\$4–8 billion to the country’s economy. The policy also results in serious psychological problems for children and their parents. Therefore, the “no nit” policy should be abandoned and alternative ways of examination and treatment for head lice should be found.

Introduction

The number of cases of human louse infestation has increased world-wide since the mid-1960s,¹ reaching hundreds of millions annually.² Approximately 6–12 million people, mainly children 3–12 years of age, are treated annually for head lice in the USA.^{3,4} An increased rate of louse infestation was reported in recent years from a number of countries including north and south America, Europe, Asia, and Australia.^{1,5–7}

Synergized pyrethrins, permethrin, lindane, malathion and oral ivermectin (“off label” use) are used to treat infested individuals in the USA.⁴ In many other countries sumithrin, bio-allethrin, *d*-phenothrin and carbaryl are also used in the battle against head lice.⁸ However, some organizations in the USA (National Pediculosis Association; NPA: www.headlice.org) and UK (Community Hygiene Concern; CHC: www.nits.net) recommend the use of louse-combs as the only treatment regime.

Despite the use of powerful insecticides and prodigious efforts of parents and health providers, successful control of louse infestation in most countries remains unattainable. In developed countries, the high prevalence of head lice is owing to a variety of reasons, such as:

a) the sale of ineffective pediculicides, which may be a result of changes in formulation, manufacturing processes, or ingredient sourcing over the years;^{9–11}

b) incorrect use of pediculicides, e.g. a single application of lotion formulations, that are not 100% ovicidal; the high dilution of shampoo formulations; applying pediculicidal crème rinse to hair that is too wet;^{9,12}

c) the use of alternative remedies and methods whose efficacy has not been proved in *in vitro* and *in vivo* studies with human head lice;

d) development of resistance to insecticides such as DDT, lindane, permethrin and *d*-phenothrin, malathion and carbaryl;^{13–16}

e) improper attention to possible fomite transmission;^{7,17}

f) difficulty in diagnosing head lice infestations. (Many health providers are not able to accurately diagnose an active infestation, owing to lack of experience, knowledge, time, or equipment, where good lighting, nit combs, magnifiers are required.);
g) embarrassment and social stigma which prevents reporting; and

h) many parents have defective vision and therefore cannot see all the nits to be removed.

In order to ensure more efficient control of louse infestations on a community level, health authorities in the USA, Canada and Australia suggested the “no nit” policy, i.e. the immediate dismissal of a child from a school, camp or child-care setting until all head lice, eggs and nits (dead eggs or empty egg cases) have been removed, before the infested individual could be readmitted to the institution.

The aim of this article was to show that the risks and disadvantages of the "no nit" policy clearly outweigh the benefits and that it should be discontinued.

Finding nits does not prove the presence of lice

In general, louse infestation is diagnosed by direct visual examination by hand or with the help of a screening stick. It normally takes a few seconds for an experienced examiner or few minutes for an inexperienced examiner to detect the eggs/nits on the scalp. Nits are egg casings that could contain a developing embryo or they might be empty shells and consequently they are not all infectious.

The female louse often lays her eggs at the base of the hair, 3–5 mm away from the scalp, attaching them to the hair with its excreted quick-hardening glue. The young louse hatches 6–10 days later, leaving the eggshell behind.^{5,18,19} Dead eggs and eggshells (nits) can remain attached to the hair for as long as 6 months. Human hair grows at a rate of approximately 10 mm/month and the cemented nits move away from the scalp as the hair grows. After 2–3 months, the nits become more visible, particularly on dark hair. The appearance of "eggs" several months after a treatment can lead to a false-positive diagnosis of a present infestation, as most people assume that if eggs are present the child must also have lice.²⁰

The "no nit" policy assumes that all eggs/nits found on the scalp are viable eggs and therefore should be removed for cure or to prevent infestation of others by the index case.

Examination of more than 15 000 children in Israel using a louse-comb revealed that 11–19% of the children were infested with living lice and eggs, while a further 22–30% had nits only.⁴ Approximately 80% of these children had nits that were 20–50 mm away from the scalp, which would indicate that they had been successfully treated for lice during the previous 2–5 months.²¹ Although girls were more heavily infested with lice than boys, the percentage of girls with nits only was even higher than that of boys. The signs of previous infestations are removed from boys after a short haircut, whereas they remain in girls who generally have longer hair. This is probably the reason why in most epidemiological studies, where the presence of nits is a criterion for infestation with lice, the percentage of girls infested is found to be higher than that of boys.⁴

Recently, in a study conducted in the USA it was found that of 1729 children examined for head lice, 28 (1.6%) had lice, whereas 63 (3.6%) had nits without lice. Fifty of these 63 children (79%) with nits alone were re-examined 14 days after the initial screening and only nine children converted, but it was not known how many of these nine children had been re-infested during the 2-week period.²²

Two studies compared the efficacy of visual examination with use of a fine-toothed louse-comb for diagnosis of a louse infestation. In the first study, carried out in Belgium,

224 children were examined and it was concluded that traditional scalp inspection was a poor technique for detecting head lice, as 30% of "positive" results and 10% of "negative" results were false. High values for false positives and false negatives call into question a test's screening efficiency, especially when the prevalence of the disease exceeds 1%.²³

In a second study, conducted in Israel, 280 children were examined with a louse-comb; 25.4% were infested with lice, eggs and nits and a further 31.3% had nits only. Direct visual examination of the same children revealed that 5.7% were infested with lice, eggs and nits, and a further 49% with nits only, showing that the diagnosis of louse infestation using a louse-comb was fourfold more efficient than a direct visual examination.²⁴ The distinction between living lice and nits is especially important as living lice indicate active infestation while nits only indicate earlier, non-active infestation.

Therefore, direct visual examination underestimates active infestation as it is particularly difficult to find the few lice infesting a child's hair by hand examination. It was shown that approximately 78% of the infested children had only 1–10 lice on their scalp, 18.7% had 11–20 lice, while 3.2% had ≥ 20 lice.²⁰ Most of the lice on the scalp were nymphs,¹⁹ 1–2 mm long, and therefore difficult to see without a magnifying glass.

Detecting lice by direct visual examination is only practically feasible for heavily infested children and reveals a higher percentage of children with nits only than an examination using a comb because the examiner concentrates more looking at the hair rather than at the comb.²⁴ Hence, the chance of diagnosing a false-positive infestation is greater when examining by hand, especially if the examiner is experienced in finding nits. However, it is important that the hair is examined for living lice for a number of consecutive days and then again a week later in order not to miss any living eggs. If no living lice are detected, the child should be considered negative for head louse infestation.

Children with nits should not necessarily be automatically treated for lice

When the diagnosis of head louse infestation is based on the presence of nits, up to 66% of children will be treated without justification. Pediculicides will at best kill lice and eggs but will not eliminate the signs of previous infestation, i.e. nits. Therefore, there would be no change in the clinical picture of a head-lice infested scalp after a pediculicidal treatment. In order to overcome this problem in places where the "no nit" policy is implemented, parents have to treat the child against lice and to remove every single nit from their child's scalp. However, if the visible nits are removed from the scalp, it does not necessarily mean that the person is no longer infested with lice.

The "no nit" policy is apparently used because parents and health professionals cannot differentiate between live and dead

eggs and they refuse to use a louse-comb in the examination of the child's head.

When possible, the diagnosis of pediculosis should be based on the observation of live lice rather than eggs. No one should be treated for lice if living lice are not detected on their hair.

Disadvantages of the "no nit" policy

Over the ages, lice have become a symbol of filth, poverty and shame, although recent epidemiological studies clearly demonstrate that lice infest children from all socio-economic classes; however, the stigma still exists. The psychological effects of louse infestation often exceeds the physical ones – in the majority of cases a mild pruritus is the only sign of a louse infestation.²⁵ Parents, teachers, kindergarten staff, social workers and even nurses and physicians are often distressed by the presence of lice. They may blame the child and make them feel responsible for the infestation.²⁶ The immediate expulsion of a child from a camp, day-care, kindergarten or school operating a "no nit" policy must cause significant damage to the self-esteem of a young child and probably to the parents. There are also negative effects on the parent-child relationship, especially when combing becomes painful and the parent and/or child become impatient. In this stressful situation parents sometime use drastic methods for louse control, which include spraying the entire house with insecticides, use of food-grade oils, hair gels, Vaseline and mayonnaise as well as formulations which should only be used for parasitic and ectoparasitic infestations of pets or free-living insects in the household.

When a child is found to have living lice it is not necessary to send him/her home immediately (unless legally bound) because lice are usually detected only 1–2 months after the child has become infested.^{20,25} Keeping the child in school for a few more hours will not make any significant difference.

The "no nit" policy practically takes the entire responsibility away from the nurse and places it with the parents, as nurses have neither the time nor the desire to examine a child with a louse-comb, and parents are obliged to remove signs of previous infestations, which have no clinical importance. Removing nits from the scalp of a child is a task which could be very difficult for parents of long-haired girls, especially in families with a number of girls.

Exclusion from the school could be between 2–14 days, depending on whether the aim is to ensure therapy or cure.²⁷ It is estimated that children in the USA lost 12–24 million school days in 1998 because of "no nit" policies, which excluded children who had any nits (egg cases) on scalp inspection.²⁸ It is estimated that parents, who remain at home with young children, conduct the treatment and the painful, time-consuming task of removing every nit from the hair, also lose half of these days. Many parents in the USA have lost their jobs because they have had to take so much time off work to deal with the "no nit" policy.

Assuming that parents lose an average 5 days per year each time their child is excluded from school, at an average wage of US\$135/day this would cost US\$4–8 billion/year for the USA alone, where 6–12 million children become infested annually.

Public schools in the USA receive State funding for each child at school. Annually this amounts to US\$10 000/child, and is allotted if a child is in school for the majority of the school year. In school systems throughout the USA that are already burdened with overcrowding and lack of funds, the "no nit" policy is an extra burden on the educational system and costs schools hundreds of millions of dollars in State and Federal funding.

As mentioned earlier, in the USA 6–12 million people, mainly children, are treated annually for head louse infestations.³ In a study by Donnelly *et al.*,²⁹ two thirds of school nurses who responded to a questionnaire stated that they had a "no nit" policy, while Williams *et al.* showed that 1.6% of children in the USA were infested with lice and nits while a further 3.6% had nits only.²²

If we assume that these percentages are similar in areas where the "no nit" policy is not applied, approximately 4.2–8.3 million children are unnecessarily treated for head lice annually in the USA. If we consider only the areas where the "no nit" policy is applied, the number of unnecessary treatments and accordingly the number of children who are sent home unnecessarily is 3.3–6.6 million. Assuming that in areas where the "no nit" policy is not applied, where the infestation rate is similar and where only those children are treated who have lice, the number of unnecessary treatments in areas with the "no nit" policy is 3.9–7.7 million, i.e. 64% of all treatments.

It has been shown that subjects without evidence of louse infestation were nearly fourfold more likely than those infested to have been treated with a pyrethroid. Lindane was applied nearly as often to infested and to non-infested subjects, but less so to those with extinct infestations. Nearly a third of subjects with active infestations, 20% with apparent extinct infestations and nearly 50% without evidence of infestation reportedly applied two or more antilouse preparations during the month preceding the submission of their samples. It was concluded that traditional as well as alternative antilouse formulations are frequently over-applied and that non-infested subjects are treated with pediculicidal products more frequently than infested subjects. Traditional antilouse formulations are over-applied as frequently as "alternative" formulations.³⁰

As a result of misdiagnosis, because of few symptoms and no direct infectious process, exclusion of infested children from school may be more burdensome than the infestation.

The efficacy of the "no nit" policy has been questioned by several institutions,^{22,30–32} including the American Academy of Pediatrics, the Association of School Nurses in the USA, and the Canadian Pediatric Society (www.cps.ca/english/statements/ID/ID04-02.htm#School). In Australia the policy has been cancelled.

Repeated failure to completely eliminate all offending material (regardless of type and viability) and extended absences owing to school-enforced exclusion occasionally cause schools to start legal action charging parents with neglect or abuse, thus making parents aggressive towards the school authorities. In the USA, some parents who have applied all remedial treatments to remove nits and get their children back to school have been reported to State authorities as being negligent and are then legally engaged in keeping their children from being sent to foster care. It should be stressed that no such exclusion measures are taken with any other infectious diseases, including child-borne diseases and influenza, which are much more dangerous.

Furthermore, we are unaware of any convincing data which demonstrates that enforced exclusion policies are effective in reducing the transmission of lice. It is our professional opinion that the "no nit" policy is imprudent and unjust, as it is based on intolerance, hysteria and misinformation rather than on objective healthcare. The National Pediculosis Association (NPA) (www.headlice.org), which initiated the "no nit" policy, is practically the only institution trying to influence public opinion to retain this policy, and advocates on its web site that combing alone should be used instead of pediculicides. However, to our knowledge, there is no scientifically based published data showing that using their specific comb and instructions for combing can rid lice, eggs, and nits. In fact, when published data compared combing with a Lice-meister (NPA, Needham, MA, USA) used as directed daily in conjunction with the use of a pediculicidal treatment, Nix (Pfizer Inc, New York, NY, USA), against not combing using the same treatment (Nix), the combing arm was found to be less effective than the group randomized to not receive a Licemeister.¹⁶

The situation is most probably similar in Canada where the "no nit" policy is also applied. It would be educational and instructive if the "no nit" policy could be addressed with comparative international data and from different cultural settings.

What is the alternative?

Children should be examined regularly by school nurses and parents informed by letter. Parents of noninfested children should be notified to encourage them to examine their children's hair regularly for new infestations. Parents of children infested with nits should be urged to examine the child as well as other family members (especially siblings) as soon as possible with a louse comb and treat all louse-infested individuals immediately. Letters should include information on how to examine and apply treatment where necessary and how to check whether the treatment has been effective.

Infested children should be sent home at the school finish-time with a letter to their parents urging that the child should be treated immediately. It would be helpful to give parents a

pamphlet explaining how the treatment should be conducted, an advisory contact, and the pediculicides to be used or other treatment methods. Parents should complete a questionnaire with details of when the first treatment was carried out, the consecutive treatments given and which pediculicide was used. Children should be allowed to return to school immediately after the first treatment. Infested children should be treated immediately but should not be prevented from attending school until the last nit is removed from the hair. Only children whose parents refuse to treat them should be excluded from school.

The school nurse should check the child with a louse-comb 10 days after the letter has been sent to the parents and then should contact the parents if lice are detected. Infested children should be followed up until the treatment is successful.

Removal of nits with a louse-comb is easier when the hair has been wetted with water, or after shampooing or treatment with a conditioner. As this method is not suitable for removing freshly laid eggs, it should be repeated weekly for several weeks. Acid shampoos (pH 4.5–5.5), 5% acetic acid, vinegar (diluted 1 : 1 with water), conditioners and vegetable oils also make it easier to detach eggs from the hair. Acid solutions probably make the surface of the hair smoother, while oily compounds make the surface more slippery, making it easier to slide the eggs off the hair (Mumcuoglu, unpublished observations). There are, however, no nit removal remedies on the market that have been tested under clinical conditions. The development of such remedies would facilitate the removal of nits from the hair and prevent false-positive diagnoses of louse infestations.

We also recommend that a louse-comb be used to screen children for lice infestation and also to confirm that treatment with a pediculicide has been effective. Wetting the hair makes combing easier and probably makes it easier to remove lice from the hair.

In children with long and/or curly or frizzy hair, where the use of a comb in dry or wet hair is not possible, inspection should be made by direct visual examination by hand or with the help of a screening stick. As the detection of lice with this method is more difficult, the examination time would have to be increased.

When louse infestations are a serious problem in kindergartens and schools weekly examination of children, especially 3–13 years of age, should be carried out by parents after receiving instructions from the school nurse or other health providers.

Health providers and the public must be educated about the biology, prevention and control of lice. The media, internet, brochures and articles in popular and scientific journals should be used for this purpose. Information sheets in different languages, with visual aids for parents of limited literacy, should be developed by schools and health authorities. The advantages and disadvantages of existing treatment methods, recommended pediculicides, and the psychological and

emotional aspects related to louse infestation should be discussed. It is very important for everyone to realize that an infested child must not be stigmatized or punished.

Parents should regularly inspect and if necessary treat their children for head louse infestation and try to avoid creating emotional problems for the child. They should inform the health providers in their area about epidemics of louse infestation and treatment failures. Parents could also volunteer to examine other children in their schools after appropriate training.

Examination of the child's head at regular intervals using a louse-comb allows the diagnosis of a louse infestation at an early stage. Early diagnosis makes treatment easier and reduces the possibility of infesting others.

Essential oils such as rosemary, citronella and piperonal have been tested for repellency using laboratory colonies of body lice,³³ but they should also be tested in placebo-controlled clinical trials to produce conclusive evidence of safety and effectiveness.³⁴

Not sharing brushes and combs with other family members or friends, keeping a girl's hair tidy, being well informed about the biology and control of lice and regular examinations may help prevent head louse infestations.

Anti-lice products, which have been specifically approved for the treatment of lice by health authorities, should be used. It is necessary to carefully read and follow the instructions for use. It is particularly important to note the start time and to treat the hair for the period specified in the instructions.

When a person is found to be infested, all other family members should be examined and only infested persons should be treated immediately on the same day. It might be necessary to treat all the family members if no one is knowledgeable in examining the scalp for lice.

Ten days after the first treatment or 1 day after the last treatment the hair should be re-examined with a louse-comb. If living lice are not found in the next 2–3 days, the treatment can be considered successful even if nits are still visible on the scalp. If living lice are still present, the treatment should be continued using a pediculicide with a different active ingredient.

Outwith the host, lice can live for only 1–2 days. Clothes, towels, bedding, combs and brushes which came in contact with the infested individual can be disinfected either by leaving them outside the home (unused) for 4–5 days or by washing them at 55–60 °C for 30 min.^{19,35}

The use of a louse-comb should be an integral part of any antilouse control strategy. Systematic use of the louse-comb over the 10-day period in which the eggs hatch can remedy an infestation. Treatment of an infestation by combing alone is possible if repeated daily or every second day. However, this technique is indicated only for children with short or medium length, straight or wavy hair. Two clinical studies in the UK showed that combs removed the entire population of lice from the hair in 38–53% of the children treated.^{36,37}

A fine-toothed louse-comb can be used for: (a) the diagnosis of louse infestation, (b) the prevention of louse infestation by suppressing the establishment of lice on the scalp after the initial infestation, (c) as an accessory tool to any antilouse treatment method, (d) the treatment of a long-term head louse infestation, (e) verification that treatment with a pediculicide was successful, and (f) the removal of nits.

Gasoline or kerosene, alone or in combination with vinegar and oil, is toxic and highly-inflammable so should not be used for the treatment of lice. The use of vitamins for prevention or control is not recommended, as there is no scientific evidence for their efficacy. Shaving the head or even a short haircut for prevention or control of lice is not recommended owing to the psychological stress it could cause the child. Prophylactic treatment with pediculicides is not recommended owing to possible adverse effects and to prevent rapid selection for resistance. Insecticides for the treatment of parasitic arthropods in animals or free-living insects such as cockroaches and ants are not permitted for use as pediculicides, and use of insecticides for the treatment of lice on cloths, bedding, sofas and carpets is unnecessary.

Conclusions

- A louse-comb should be used for the detection of lice.
- Diagnosis and treatment of an active louse infestation should be based only on the detection of living lice.
- No treatment should be initiated if living lice are not found on the scalp.
- Children presumed to be infested with lice should not be immediately excluded from their school, camp or child-care establishment.
- No child should lose valuable school time because of head lice.
- Head louse control can be achieved through more frequent inspections by the school nurse, increased awareness, better recognition of infestation, intelligent epidemiologic assessment, improved education of school staff, parents and communities, and treatment campaigns in which effective therapies are instituted. Disease control measures must be cost-effective and target major risk factors.
- The "no nit" policy should be abandoned in its present form.

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