

To Compare the Efficacy of 1% Permethrin Lotion & Manual Reduction of Head Lice in Children

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ABSTRACT

Objective: To compare the efficacy of 1% Permethrin lotion and manual reduction of head lice in children.

Study Design: Prospective study.

Place and Duration: Department of Dermatology, Isra University, Hyderabad, during January 2013 to June 2014.

Material and Methods: Patients were selected from out patient department of Isra university hospital during January 2013 to June 2014, this is an open prospective study, 400 children aged (1 year to 12 years) had participated in study. Randomly divided the patients in two groups, each group contain 200 patients, two interventions were used in this study: manual reduction of head lice and single application of 1% permethrin lotion on the scalp for 12 hours. All patients visited 3 times, once at the time of enrollment, than on 7th day followed by the end of treatment on 14th day.

Results: In both Groups A and B (total 400 children), 25% had no head lice, 60% had active pediculosis and 15% had inactive infestation. Proportion of children with pediculosis was similar in all age groups; female children were 3 times more likely to have active infection than males. Active infestation was detected in 21% of children, 63.8% showing evidence of current or past infestation with head lice. The prevalence of inactive infestation was 12.7%. On day 1, the difference was not statistically significant in both Group A and B.

At day 7 there were significant differences in the numbers of nymphs ($P=0.045$) and adults ($P=0.017$) between the two groups. This pattern was also observed at day 14 (for nymphs $P=0.031$ and for adults $P=0.023$).

Conclusion: The results of this study suggest that manual reduction of head lice is an effective alternative to the use of 1% permethrin lotion in managing head lice infestation. Therefore, manual reduction of headlice can be considered a safe alternative treatment for patients with head lice.

Key Word: Pediculosis capitis, Permethrin, Head lice.

INTRODUCTION

Infestations of human head lice, *Pediculus capitis* are prevalent world-wide and especially common among school children in both developed and developing countries.

The lice belong to three distinct species: *Pediculus capitis*, *Pediculus humanus*, *Pthirus pubis*. Head lice (*Pediculus capitis*) are one of the most common forms of human ectoparasites, although infection is neither life-threatening nor associated with significant complications; it does cause considerable distress, expense and anxiety to sufferers.

Lice are wingless, six-legged insects that cannot jump, fly or swim. The life cycle of the head louse from egg to egg is about 25-26 days. The egg commonly referred to as a 'nit' is attached firmly to the hair shaft with a cement-like biological glue. The adult can start laying eggs from about 2 days after the final moult^{1,2}.

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Infestation usually detected by: itching, inflammation of the scalp and neck, sighting of lice, and detection of eggs attached to hair shafts³. For school children and their families, head lice have an impact in terms of the cost of treatments, days absent from school, time spent in eradication attempts, psychological distress, and individual health⁴.

Treatment methods can be divided into three groups: insecticides, manual removal, or herbal/home remedies⁵. Insecticides can be divided into four categories: pyrethrins, pyrethroids, organophosphates (malathion), and herbal agents. permethrin is the only insecticide that had sufficient efficacy. Malathion and the natural pyrethrins were not effective enough to justify their use⁶.

Manual removal (bug busting) is a detection and eradication method that involves especially designed fine toothed combs⁷, it is recommended that the comb be used four times over a fortnight in order to break the life cycle of the lice, stopping them from spreading and reproducing⁸.

MATERIAL AND METHODS:

DATA COLLECTION:

Patients were selected from out patient department of Isra university hospital during January 2013 to June 2014, this was an open prospective study, 400 children aged (1 year to 12 years) had participated in study, patients were randomly divided into two groups; The inclusion criteria: all children aged 1- 12 years, willing to participate in the trial. The exclusion criteria: children with active symptomatic asthma, persistent skin disorder of the scalp, treatment with other head lice products within the previous 4-week period, known sensitivity to pyrethroid, organophosphate and/or carbamate insecticides. No data from infested parents were included in the data analysis.

INTERVENTIONS:

Group A and Group B each contains 200 patients, two interventions used in this study: Group A with 200 patients were selected for

manual removal and Group B with 200 patients were used 1% permethrin lotion, single application for 12 hours. Infestation was determined by visual examination by the authors, verbal consent was obtained from the parent/guardian of all children participating in the trial. Baseline data regarding age, sex, length of hair were collected, there were no dropouts or losses to follow-up and all children completed the trial. No significant differences in children's characteristics were found between the lotion and the bug busting groups at baseline. People were examined for head lice with plastic combs. Hair oil was applied to the hair of participants, to help detect lice. The clothes, particularly shirts and jumpers, were examined for body lice. In manual reduction group parents are advised to comb through the child's hair with the widest toothed comb, removing any lice and 'nits' as they do so. They are advised to continue this with the finest toothed comb until no further lice or nits can be found. They are then to repeat the process every third day for a 14-day period. Combing lasted between 20 and 45 min (average duration 30 min) for each child, depending on the length and thickness of the hair. The lice retained were only those combed out for evaluation, i.e. at initial combing on day 1, and on the 7th and 14th days. The hair oil used was local made and the same oil was used for every child. Patients were called for two follow ups on 7th and 14th day.

Children in the Group B had their hair combed dry by a nurse, using the widest toothed head lice comb. Permethrin lotion was then applied to their hair and parents were asked to wash it after 12 hours and then to comb through again using the same comb. Both groups returned on the 7th day, any lice found were taped to the child's case report form for analysis. On day 14 all children were seen again, any head lice found on their hair were taped to the child's case report form for analysis.

OUTCOME MEASURES

The main outcome measure was the absence of live lice in Group A on the last (14th) day of the trial period, but few in the group B.

STATISTICAL ANALYSIS:

Intention to treat analysis was conducted using Mann Whitney U-tests for continuous data.

RESULTS:

Out of 400 children, Group A had 200 children, 50 (25%) had no head lice, 120 (60%) had active pediculosis and 30 (15%) had an inactive infestation, Group B had similar results. Proportion of children with pediculosis was similar in all age groups ('junior', 'middle' and 'senior' groups); junior group 1- 4 years, middle group 5- 9 years and senior group 10- 12 years (showed in Table 1). Gender was significant risk factors female children were 3 times more likely to have active infection than males. While the effect of gender remained significant ($P = 0.047$). Head lice were more common in girls than boys, with active infestations prevalent in 26.9% of girls and 13.6% of boys respectively, and inactive infestations prevalent in 18.4% of girls and 5.9% of boys respectively. Analysis of the prevalence of infestation (active and inactive) across groups of ages stratified by gender revealed for girls and boys significant clustering effects of infestation in group of ages ($p=0.003$ & $p=0.035$, respectively).

There were no dropouts or losses to follow-up and all children completed the trial. No significant differences in children's characteristics were found between the Group A and Group B at baseline. Both groups contained similar proportions of sex and hair length.

Out of 400 children examined, 33.7% had evidence of infestation with head lice either as nits alone (inactive infestation), or lice or viable, unhatched eggs (active infestation). Active infestation was detected in 21.0% of the total, or 63.8% of children showing evidence of current or past infestation with head lice. The prevalence of inactive infestation was 12.7%. The prevalence of infestation by grade ranged widely for example, in juniors, the prevalence of infestation ranged from 13.3% to 52.4% ($p=0.041$) and, for middle and seniors, from 0% to 72.2% ($p = 0.001$), suggesting an age effect. Tests of the null hypothesis of uniform distribution across groups were statistically significant for the prevalence of overall infestation (active and inactive) and of active infestation ($p<0.001$), supporting the alternative hypothesis of clustering within groups.

On day 1, 200 children in the Group A were infested with a median of eight louse at any stage in

development; a median of eight nymphs and one adult. This compared with medians of seven nymphs, one adult and 10 louse at any developmental stage in the Group B, this difference was not statistically significant.

At day 7 there were significant differences in the numbers of nymphs ($P=0.045$) and adults ($P=0.017$) between the two groups (Table 2), the Group A having a median of three nymphs, 0 adults and three head lice at any stage of development. This compared with medians of 12, 2 and 15, respectively, in the Group B. This pattern was also observed at day 14 (for nymphs $P=0.031$ and for adults $P=0.023$), here, the Group A had a median of 0 nymphs, 0 adults and no head lice at any stage of development, this compared with medians of two, one and five, respectively, in the Group B.

Table-1: Age Distribution of Children in Groups

| Age Groups | Age | Total No. of Boys | Total No. of Girls |
|--------------|-------------|-------------------|--------------------|
| Junior Group | 1 - 4 Years | 66 | 66 |
| Middle Group | 5 - 9 Years | 66 | 66 |
| Senior Group | 10-12 Years | 68 | 68 |

Table-2: Comparison of Bug Busting with 1% Permethrin

| Infestation | Group A | Group B |
|------------------------------|-----------------------------------|-------------------------------------|
| Active Infestation | 60% | 60% |
| Inactive Infestation | 15% | 15% |
| Median Clearance on 7th Day | Nymph=3 Adult=0 Head lice=3 | Nymph=12 Adult=2 Head lice=15 |
| Median Clearance on 14th Day | Nymph=0 Adult=0 Head lice=0 | Nymph=2 Adult=1 Head lice=5 |

DISCUSSION:

This study was designed to test the effectiveness of the methods of managing head lice infestation. Participants were a random sample of the local population of children found to have head lice.

In other studies Roberts⁹, found that malathion was twice as effective as manual reduction, however: 50% of the participants overall did not comply with treatment and, of these, 86% deviated by extending or shortening recommended treatment intervals by 13 days.

The difference with our study is that manual reduction of head lice was carried out as recommended every 3rd day for a 2-week period. This will not allow the immature louse to mature and go on to reproduce.

The cumulative head lice count increased on day 7 in the Group B, indicating that only adult lice were being eradicated by permethrin lotion. The cumulative head lice count in Group A had decreased significantly by day 7, indicating that the combing method was successful in eradicating both adult lice and emerging nymphs. At day 7, of the total number of lice detected in each intervention group, a similar percentage of lice were detected in both groups (47% in the Group A and 45% in the Group B).

By day 14 the percentage had fallen to 6% in the Group A but had remained at 22% for the Group B. This further indicates that the manual reduction method was successful in eradicating lice at all stages of their life cycle. The majority of the children were recruited between January to May 2013 and then again between September and November 2013, and January to May 2014. This reflects school term times and the increased incidence of head lice infestation, possibly due to close contact with other children, three times more girls than boys participated in the trial, reflecting the higher prevalence of head lice in girls as indicated by other workers¹⁰.

Other studies have supported our findings, demonstrating that the proportion of girls with an active infection is higher than the proportion of boys, which is thought to be due to gender-related behavioral differences. Close contact between heads for boys tends to occur briefly in rough and tumble play, while for girls close head contact is often more intimate and prolonged¹¹.

Our trial met all three of the inclusion criteria for randomized controlled trials indicated in the Cochrane Review. These are as follows: firstly, participants should have live lice or lice and eggs present; secondly, participants should not have used any other pediculocide in the month preceding enrolment; and finally, lice and eggs should not be removed by combing following treatment with a pediculocide, except during detection combing¹².

The results of this study suggest that manual reduction of head lice is an effective alternative to the permethrin lotion in managing head lice infestation. The technique has the advantage of being non-toxic, cheap and effective, through explanation and co-ordination of best practice strategies at the school, local authority and national levels, as well as with individual families, it is possible to work towards the goal of head lice eradication¹³.

CONCLUSION:

The effect of manual reduction of head lice on patients was significantly better than that of 1% permethrin lotion. The results showed significant reduction in the number of nymphs and adult lice in manual reduction method as compare to lotion group. No adverse effects were seen by the methods in the both groups.

Thus, manual reduction of head lice is a safe and effective alternate treatment method for the head lice.

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