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Treatment of Pediculosis Capitis with Oral Ivermectin

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Abstract:
Pediculosis capitis is a common scalp infection, especially among school-aged children. It is caused by an infestation of Pediculus humanus var. capitis, a parasite from the Pediculidae family. This case study aims to describe the management of pediculosis capitis using oral Ivermectin. A case study was conducted on a 12-year-old girl with pediculosis capitis, presenting with itching, pain, and burning sensation on the scalp. Dermatological examination revealed the presence of eggs and adult lice. The patient was treated with oral Ivermectin for one week, and evaluation was done using the Scale and SALT Score. After one week of treatment with oral Ivermectin, the patient showed significant improvement. Symptoms of itching decreased, and no live lice were found during follow-up examination. Oral Ivermectin is effective in treating pediculosis capitis with good tolerance. This case study highlights the importance of accurate diagnosis and appropriate treatment in managing pediculosis capitis.

Keywords: *pediculosis capitis; head lice; ivermectin; case study; treatment.*

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INTRODUCTION

Pediculosis capitis is a scalp condition resulting from an infestation of *Pediculus humanus var. capitis*, a parasitic insect from the *Pediculidae* family. This species is an obligate ectoparasite, relying exclusively on human blood for its survival (Rassami & Soonwera, 2012; Riswanda & Arisandi, 2021; Wheat et al., 2019).

According to the World Health Organization (WHO), approximately 6 to 12 million individuals are affected by *pediculosis capitis* each year (Fanesya Putri Muslim et al., 2022). This significant prevalence remains a major concern, particularly in Indonesia, where the disease affects 71.3% of reported cases (Rahayu, 2016). *Pediculosis capitis* predominantly affects elementary school children, reflecting high global prevalence within this age group. In Indonesia, data from 2017 revealed that 106 out of 568 children (18.66%) were diagnosed with *pediculosis capitis* (Fanesya Putri Muslim et al., 2022).

Pediculosis capitis spreads through direct contact with an infected individual or indirectly via shared personal items such as towels, combs, hats, and headscarves(Fanesya Putri Muslim et al., 2022; Rahayu, 2016). Contributing factors include poor personal hygiene and limited awareness of preventive measures against head lice (Bailey & Prociv, 2000; Verma & Namdeo, 2015).

The condition primarily manifests as *pruritus* caused by the saliva of *Pediculus humanus var. capitis* during blood-feeding through the epidermis. The resulting itch prompts scratching, which can lead to *excoriation* and secondary bacterial infections due to repeated trauma. Beyond physical symptoms, infestation may also cause psychosocial issues, including diminished self-esteem due to societal stigma, as well as disrupted sleep and cognitive function, all of which interfere with daily life (Jahangiri, 2017; Speare et al., 2007).

A definitive diagnosis of *pediculosis capitis* is established by identifying adult *Pediculus humanus var. capitis*, nymphs, and eggs on the scalp and in the hair. The presence of eggs (*nits*) is especially diagnostic and serves as the most reliable marker of the condition.

Management of head lice can be pharmacological or non-pharmacological. Non-pharmacological methods include manual removal using lice combs (*serits*), while pharmacological treatment involves the application of liquid insecticides or other medications designed to eliminate lice (Vander Stichele et al., 2002).

The goal of treatment is to eradicate both lice and their eggs while addressing any secondary infections. Therapy selection depends on the efficacy, potential toxicity, and resistance patterns of available insecticides in a given geographic area (Rukke et al., 2011; Vander Stichele et al., 2002).

Pediculosis capitis remains a significant public health issue, particularly among school-aged children. Studies have emphasized its high prevalence and the associated psychosocial burden. Research by Rassami & Soonwera (2012) demonstrated the efficacy of topical permethrin, but also revealed growing resistance to this treatment, with a 30% failure rate attributed to genetic mutations in lice. Similarly, Vander Stichele et al. (2002) highlighted the limitations of non-pharmacological strategies like wet combing, which—despite reducing chemical exposure—had a lower efficacy (45% cure rate) compared to pharmacological options. These findings underscore a crucial gap: the need for alternative treatments that combine high efficacy, low resistance potential, and practicality, especially in resource-limited settings.

This study aims to address that gap by evaluating oral ivermectin, a treatment proven effective for other parasitic infections but underexplored for *pediculosis capitis*. By focusing on ivermectin's safety, tolerability, and effectiveness in pediatric populations, this research seeks to offer a viable alternative to traditional therapies. The findings are expected to inform clinical practice through evidence-based recommendations for managing treatment-resistant cases and enhancing outcomes via a simplified, single-dose regimen.

Therefore, the objective of this study is to assess the efficacy and safety of oral ivermectin in treating *pediculosis capitis*, addressing limitations in prior research concerning resistance to topical treatments. Expected benefits include practical therapeutic recommendations, particularly for resource-constrained settings, and improved patient compliance through single-dose administration.

METHOD

This study utilized a case study method conducted at the Dermatology and Venereology Polyclinic, Adam Malik Hospital, on January 19, 2023. The subject was a 12-year-old female patient diagnosed with *pediculosis capitis*. Data collection was carried out through clinical interviews, physical examinations, and supplementary assessments, including dermoscopy and microscopic analysis. The severity of symptoms was measured using the Visual Analog Scale (*VAS*) and the Severity of Alopecia Tool (*SALT*) Score. The intervention administered was a single dose of oral ivermectin 6 mg and cetirizine 10 mg once daily to reduce itching.

RESULT AND DISCUSSION

The patient presented with complaints of itching, pain, and a burning sensation on the scalp, persisting for one week. Physical examination revealed excoriations, erythema, and the presence of nits and adult lice firmly attached to the hair. Dermoscopic examination confirmed the presence of live lice and nits. The initial assessment showed a VAS score of 8, indicating severe itching, while the SALT score revealed the presence of nine lice and one nit on the top of the head, five lice on the left side, and three lice on the right side. Microscopic examination further confirmed the existence of live lice and eggs, while dermoscopy highlighted tightly attached nits (Figures 1 and 2).

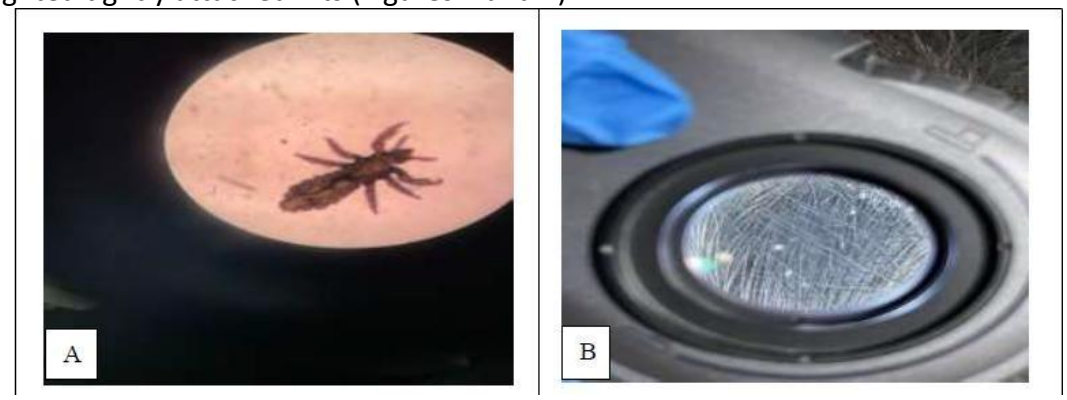

Figure 1. A) Microscopic examination of pediculosis capitis, B) Examination using a dermoscope
Source: Author's personal documents

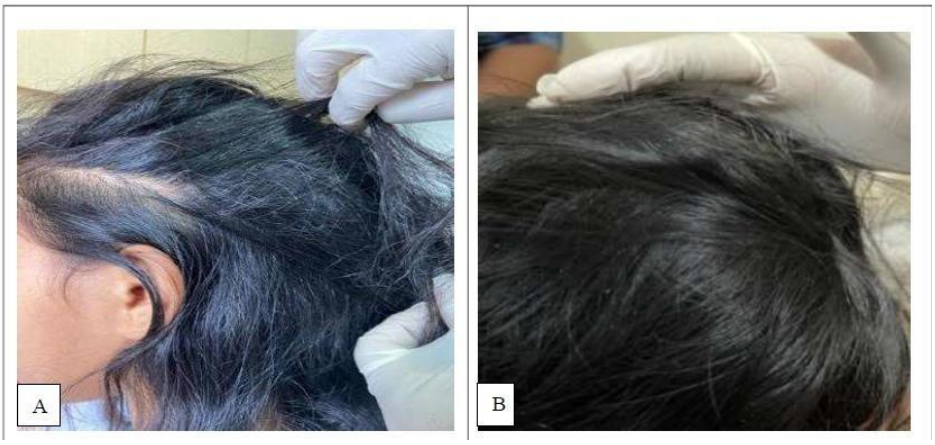

Figure 2. (A,B) Clinical manifestations of pediculosis capitis in patients

Source: Author's personal documents

The patient received a single dose of oral Ivermectin 6 mg and cetirizine 10 mg once daily. Additionally, the patient was instructed to wash all personal items in hot water (50°C) for 30 minutes or to seal them in plastic bags for 48 hours. At the one-week follow-up, the patient reported significant improvement, with the VAS score reduced to 3, indicating mild itching. The SALT score showed the absence of lice or nits on the top of the head, two dead lice on the left side, and no lice on the right side. No live lice were detected on dermoscopic and microscopic examination (Figure 3).

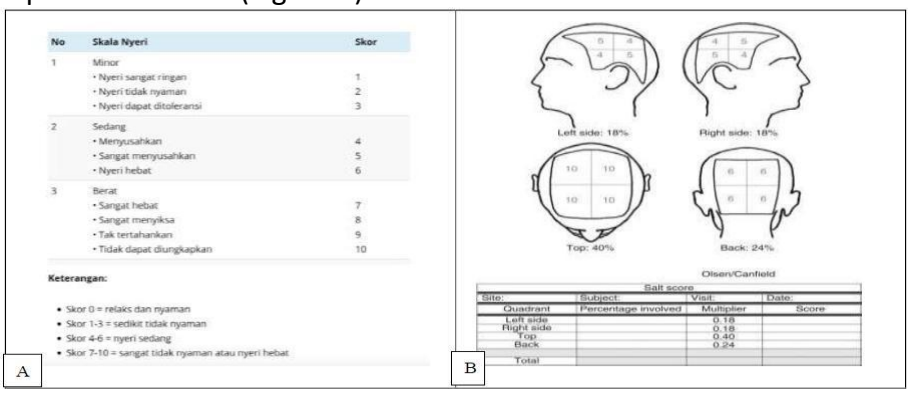

Figure 3. A) VAS B) SALT Score
Source: Author's personal documents

Further examination at the two-week follow-up (Figure 4) showed that the scalp was clear of live lice, and no new nits were observed. The VAS score was consistently at 1, indicating minimal itching, and the SALT score confirmed no recurrence of lice. The patient's compliance with treatment and environmental decontamination was also evaluated and found to be excellent. These findings demonstrate that oral Ivermectin is effective in treating pediculosis capitis with a good safety profile, as indicated by the significant reduction in VAS and SALT scores after treatment.

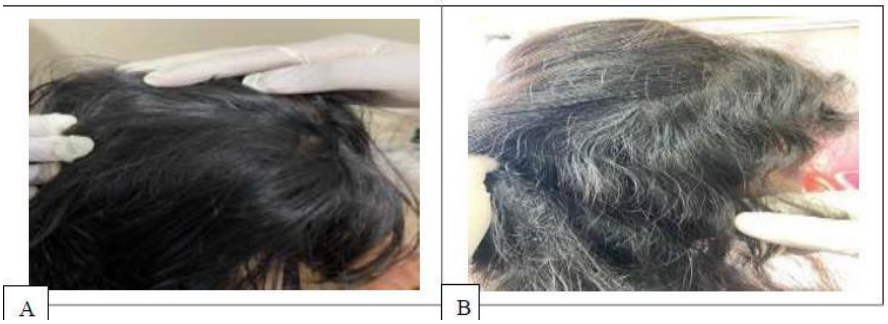

Figure 4. (A,B) At the one-week follow-up, the VAS score was 3, indicating a reduction in itching to a level that was manageable. The SALT score showed no lice or nits on the top of the head, two dead lice on the left side, and no lice on the right side. The patient continued to receive cetirizine 10 mg once daily to address residual itching.
Source: Author's personal documents

A 12-year-old girl presented with a primary complaint of lice infestation, characterized by itching and scalp pain persisting for one week. This presentation aligns with existing

literature, which indicates that pediculosis capitis primarily affects the scalp, with nits most located in the occipital and retroarticular regions. Pruritus is a common symptom, and the average incubation period before symptom onset ranges from 4 to 6 weeks. The condition is more prevalent among girls due to their longer hair and frequent use of hair accessories. Additionally, inadequate hygiene, such as infrequent hair washing, contributes to the development of pediculosis capitis. While the condition affects individuals across all racial and socioeconomic backgrounds, those from lower socioeconomic groups are disproportionately affected. Transmission occurs either directly through hair-to-hair contact or indirectly via shared items such as hats, pillows, mattresses, and combs (Fanesya Putri Muslim et al., 2022).

Dermatological examination revealed excoriation and erythema in the parietal region, with brown nits tightly attached to the hair shafts and live adult lice present on the patient's scalp. Adult Pediculus humanus var. capitis typically appear brownish-yellow to grayish-white but may appear dark black if they are engorged with blood.10-11 In individuals with darker hair, the lice may appear darker. Nits, or eggs, are generally brownish-yellow or white, but may turn dark black if the embryo inside has died (Rukke et al., 2011; Vander Stichele et al., 2002).

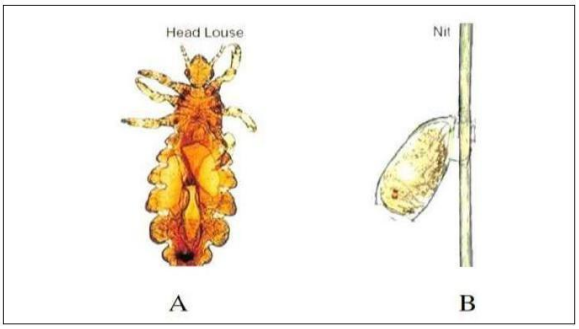

Figure 5. Adult Pediculus humanus var. capitis (A) and Pediculus humanus var. capitis eggs (B) (Riswanda & Arisandi, 2021)

Pediculosis capitis presents with several clinical manifestations including macular erythema, scalp excoriations, papular lesions, and the presence of nits adhered to hair shafts. Scratching the scalp can exacerbate the condition, leading to erosion, further excoriation, and potential secondary bacterial infections characterized by purulent discharge and crust formation. In severe cases, the accumulation of pus and crusts may result in hair clumping (Jahangiri, 2017; Speare et al., 2007).

The definitive diagnosis of pediculosis capitis is confirmed by the identification of Pediculus humanus var. capitis adults, nymphs, and eggs in the scalp and hair. Nits are particularly prominent and serve as the most reliable diagnostic indicator (Rukke et al., 2011; Vander Stichele et al., 2002).

Management in the reported case involved a single dose of ivermectin (6 mg), with a follow-up evaluation after one week. This treatment regimen aligns with existing literature, which supports the efficacy of a single ivermectin dose of 200 µg/kg or 400 µg/kg administered over 9-10 days for the treatment of head lice (Perdoski, 2021).

Ivermectin is a synthetic derivative belonging to the macrocyclic lactone class of antiparasitic agents, widely known as avermectins. Although it bears structural similarities to macrolide antibiotics, ivermectin lacks antibacterial activity. Its mechanism of action involves selective binding to specific neurotransmitter receptors at the peripheral motor synapses of

parasites, leading to an endectocidal effect. This results in paralysis of nematodes, arthropods, and insects by inhibiting nerve impulse conduction at the interneuronal synapses in nematodes and at the neuromuscular junctions in arthropods and insects (Oung, 2018). The drug is rapidly absorbed when administered orally on an empty stomach, metabolized in the liver, and excreted predominantly in feces (98%) with a minor amount in urine (1%). Common side effects of ivermectin include headache, nausea, vomiting, and abdominal discomfort. Patients treated with ivermectin generally show a positive response without recurrence of the condition (Muwanguzi et al., 2021).

The pharmacological management of pediculosis capitis primarily involves topical treatments, each with specific mechanisms of action and recommended usage protocols. Permethrin, a synthetic pyrethroid that closely mimics natural pyrethrin, functions by disrupting sodium ion transport in neuronal tissues, leading to the paralysis of lice. It is suitable for use in children aged two months and older, with the Centers for Disease Control and Prevention (CDC) recommending a 1% permethrin lotion as the first-line treatment. While it effectively eradicates adult lice, it does not affect the eggs (nits), necessitating a second application on the seventh day to target newly hatched lice before they can reproduce (Perdoski, 2021). Another topical option, pyrethrins, are natural compounds derived from chrysanthemum flowers. These compounds are effective against live lice but do not eliminate eggs, making a second application necessary 9–10 days after the initial treatment. Pyrethrins are safe for use in individuals aged two years and older.

Benzyl alcohol lotion 5% is another FDA-approved treatment for head lice. This aromatic alcohol is effective against lice but is non-oviscidal, meaning it does not affect eggs. A second application is essential seven days after the initial use, and it is deemed safe for individuals aged six months and older (Perdoski, 2021). Ivermectin 0.5% lotion is also FDA-approved for children aged six months and older. Although it does not kill lice eggs, it prevents the survival of nymphs, effectively interrupting the lice life cycle (Perdoski, 2021). Another option, malathion lotion 0.5%, an organophosphate compound, exhibits partial ovicidal properties, allowing it to kill some lice eggs. If live lice persist after 7–9 days, a second application is advised. Malathion is recommended for individuals aged six years and older (Perdoski, 2021).

Spinosad 0.9% suspension, which has been FDA-approved since 2011, offers a highly effective solution for eliminating both lice and their eggs, often negating the need for reapplication. It is safe for individuals aged six months and older (Perdoski, 2021). Lindane, an organochloride compound also known as gamexane, was once widely used but is now recommended only in specific cases due to its neurotoxic potential. The American Academy of Pediatrics (AAP) has withdrawn its recommendation for lindane because of risks associated with overuse or accidental ingestion. It is contraindicated for neonates, children, individuals with HIV infection, seizure disorders, pregnant or breastfeeding women, and elderly individuals weighing less than 50 kg. Lindane is available in a 1% shampoo and a 0.5% lotion formulation, and reapplication is generally not required (Perdoski, 2021).

Oral treatments for pediculosis capitis include ivermectin, albendazole, and levamisole. Ivermectin tablets, although not approved by the FDA for the treatment of head lice, have been found effective when administered at a dosage of 200 μg/kg or 400 μg/kg, repeated over a 9–10-day period. However, this treatment is not recommended for children weighing less than 15 kg or for pregnant women (Perdoski, 2021). Another oral option is albendazole, typically given at a dose of 400 mg, administered as a single dose or repeated

after three days, with additional re-administration on days 7-10 to ensure effectiveness (Perdoski, 2021). Levamisole, another alternative, is administered at a dose of 3.5 mg/kg for 10 days. In children, the dosage is adjusted based on body weight, with those weighing 10-19 kg receiving 50 mg per day and those weighing 20-39 kg receiving 100 mg per day (Perdoski, 2021).

In addition to these pharmacological treatments, various anecdotal methods have been employed for the management of pediculosis. These include the use of occlusive agents such as petrolatum, mayonnaise, vegetable oil, dimethicone, mineral oil, olive oil, and hair pomade, which function by suffocating lice, thereby preventing them from breathing and aiding in the detachment of lice and eggs from the hair. Essential oils, including ylang-ylang oil, Andiroba oil, Quassia vinegar, and lavender oil, have also been explored as alternative remedies, although their effectiveness and safety have not been validated by the FDA (Perdoski, 2021).

Differential diagnoses for pediculosis capitis in clinical practice may include conditions such as piedra and pseudonits. Piedra is a fungal infection characterized by nodular thickening on the hair shaft's surface, which is firmly adhered and resistant to removal. The affected hair may appear dull and may produce a metallic sound when combed. Diagnosis of piedra is confirmed through clinical examination, direct microscopy using 10-20% KOH, which reveals fungal hyphae, and culture techniques that yield filamentous colonies within 2-4 days (Barker et al., 2012). Pseudonits, in contrast, are keratin cysts that present as white, movable objects along the hair shafts. These can be further classified into two types: parakeratosis, which is associated with conditions like seborrheic dermatitis, psoriasis, or excessive traction, and peripilar pseudonits, which are more commonly observed in young women, although their exact pathogenesis remains unclea (Barker et al., 2012).

The primary objective of treating pediculosis capitis is to eliminate lice and eggs while managing any secondary infections that may arise. The selection of an appropriate treatment is influenced by various factors, including the efficacy of the therapeutic agent, its potential toxicity, and the prevalence of insecticide-resistant lice strains in the specific geographic region (Dodd, 2001). In the case of this patient, a shampoo was previously used—though the specific product could not be identified—without achieving significant improvement. Instead, the itching became more severe. This treatment failure was primarily attributed to several factors, including the patient's continued use of shared combs and pillows, infrequent hair washing due to negligence, and generally poor hair hygiene practices.

According to Chhaiya et al., (2012), several factors can contribute to the failure of treatment for pediculosis capitis. These include the use of an incorrect formula type that may not be effective against lice, the presence of residual ovicidal activity that allows eggs to survive treatment, and genetic resistance in Pediculus humanus var. capitis to certain insecticidal agents. Such resistance can significantly reduce the effectiveness of treatment, making it necessary to restrict access to these agents to prescription-only medications, ensuring accurate dosing, and maintaining adherence to prescribed treatment schedules. Non-compliance with the treatment regimen further complicates management, as patients may not consistently follow the recommended procedures. Finally, re-infestation remains a critical challenge, particularly when the patient comes into contact with other individuals who are also infested (Chhaiya et al., 2012).

To prevent the recurrence of pediculosis capitis, it is crucial to educate patients on the importance of examining all family members and close contacts for signs of infestation and

administering simultaneous treatment if any are found to be infested. This approach helps break the cycle of re-infestation. The recommended disinfection method involves soaking bedding and personal hair care items, such as combs and hairbrushes, in hot water. Additionally, sheets, pillowcases, headgear, clothing, and towels used by the patient within 2 days prior to treatment should be washed in hot water (50°C) for at least 30 minutes (Oung, 2018).

The prognosis for the patient is quo ad vitam bonam, quo ad fungtionam bonam, quo ad sanationam bonam, provided that the source of infection is addressed and treatment is properly administered.

CONCLUSION

Based on the results of this study, effective treatment of *pediculosis capitis* must consider factors such as the type of formulation used, the genetic resistance of lice to insecticides, and patient compliance with the prescribed treatment regimen. The failure of therapy in the patient was primarily due to the use of an unidentified shampoo, poor hair hygiene practices, and the sharing of personal items such as combs. Contributing factors to treatment failure include the use of an inappropriate formulation, lack of residual *ovicidal* activity, genetic resistance in *Pediculus humanus var. capitis*, non-compliance with treatment protocols, and re-infection through contact with other infected individuals.

As a prospect for further development, these findings can serve as a foundation for designing more effective educational programs and interventions focused on personal hygiene and the correct use of treatments to manage *pediculosis capitis*. Future research may explore the development of therapies that overcome genetic resistance in lice and the implementation of comprehensive strategies to prevent re-infection within communities.

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