

# Gray Patch Tinea Capitis in Two Siblings

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## ABSTRACT

Gray patch type of tinea capitis is one of clinical manifestations of dermatophytosis in scalp and hair that usually occurs in tropical areas such as Lombok, mainly taking place in 6-month-old to 12-year-old children and could cause hair loss. The risk factors are direct contact with microorganisms from animals, humans, and soil. In addition, indirect contact with fomite and inappropriate use of topical corticosteroid. We are reporting two cases, two siblings, a 7-year-old girl and 11-year-old boy with gray patch tinea capitis. The risk factors in these two patients were exposure to cats, sleeping in the same bed, and the use of betamethasone valerate cream. On Wood's lamp examination, a yellow-green fluorescent was found and on 20% potassium hydroxide (KOH) examination, an ectothrix spore was found. The systemic therapy given to both patients was ultramicrosize griseofulvin, vitamin D3, cetirizine, and topical therapy, which is terbinafine cream 1%. Identification of risk factors in this case is the main thing in determining effective and efficient management.

**Keywords:** gray patch tinea capitis, siblings, fomite, cats, topical corticosteroid

## 1. INTRODUCTION

Tinea capitis is a disease that is caused by dermatophyte infection in scalp and hair that usually found in 6-month-old to 12-year-old children [1]. This dermatophytosis could be found globally especially in tropical area, such as Lombok Island in Indonesia which is an area with tropical climate [2]. Tinea capitis is caused by dermatophyte invasion, mostly by *Trichophyton*, *Microsporum*, or *Epidermophyton* species. The epidemiology varied based on the geographical location. The prevalence of tinea capitis

varied within the range of 7,1% to 47,5% worldwide [1,6]. Research conducted by Gajula, *et al.*, in 2021 in India found that gray patch tinea capitis was the most common clinical picture at 36.9% and ages 5 to 10 years were the most common patients, which is 55.4% [3,5]. Dermatophytosis is a fungal infection with the highest prevalence in Indonesia, which is 52% [6]. This dermatophyte infection affect the hairy keratinized skin and follicle that could lead to pruritus, inflammation, scales, and even hair loss. The examination that could be done to establish a diagnosis are Wood lamp, 20%

potassium hydroxide (KOH) examination, and trichoscopy [1].

Transmission of tinea capitis infection can occur through direct contact or indirect contact. Direct contact can occur through microorganisms from humans to humans (anthrophilic microorganisms), animals to humans (zoophilic microorganisms), and soil to humans (geophilic microorganisms), while indirect contact can occur through fomites. Fomites are objects that can carry infection, for example, clothes, mattresses, sofas, or toiletries that are used together. Risk factors for tinea capitis are contact with pets, use of shared bathing tools, and exposure to other infected people [3]. Adesiji, *et al.*, also said that the likelihood of children being infected with tinea capitis is higher in children who have pets and use objects [4]. Inappropriate use of corticosteroids can lead to loss of morphology of clinical signs of tinea such as loss of inflammation, flattening of edges, and loss of surface scale. The area of the lesion using corticosteroids, especially in the area of the lesion can cause damage to the growth and strength of hair which makes easier colonization of dermatophytes [3,5].

We report a case of gray patch tinea capitis in two siblings with the identification of risk factors and their management.

## 2. CASE REPORT

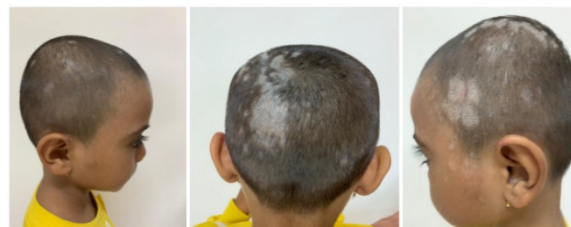
A 7-year-old girl and her 11-year-old brother from Bima, Islam, Mbojo ethnicity and both are elementary school students came for treatment at the Dermatology and Venereology Outpatient Clinic at the West Nusa Tenggara General Hospital (RSUDPNTB) together with their parents on June 29, 2021. Both patients came with the same complaint, which are itching on the scalp since one month ago along with by hair loss. Based on the information from the patient's mother, the girl felt the initial complaint which is itching on the scalp which was felt to be getting worse and with hair loss. Two weeks since the itching sensation felt, the hair began to fall out and dandruff was seen that had accumulated on the girl's scalp. Initially the hair loss and dandruff that accumulates only occurs in one location with the size of a coin, then it multiply and

spread quickly. At the same time, the boy complained with the same symptoms. The patient's mother said that the two patients often played with their cousin's four cats every day. These cats have been kept since one month ago. Both patients sleep together on the same bed. The medical history for both patients was Betamethasone Valerate cream given by the local health service facility, but it did not show any improvement so the patient was referred to the West Nusa Tenggara General Hospital.

Physical examination was done on both patients. Both showed good general condition, compos mentis, and vital signs were within normal limits. Girl's weight is 18 kg, height is 110 cm, with a Body Mass Index (BMI) of 14.87 kg/m<sup>2</sup>, while boy's weight is 23 kg, height is 136 cm, with a BMI of 12.43 kg/m<sup>2</sup>. Both are included in the normal category based on BMI.

Dermatological status in the girl is the presence of skin lesions on the scalp with hypo-pigmented patches, lenticular-plaque size, well-defined, partially discrete, partially confluent, multiple, regional, along with fine white scales and alopecia (Figure 1).

Next, the dermatological status in the boy showed



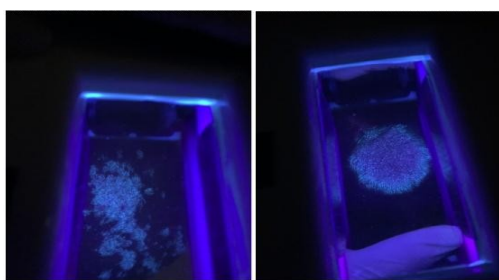
skin lesions on the scalp with hypopigmented patches, plaque size, well-defined borders, round, discrete, solitary, localized, with white and thick fine scales, and alopecia (Figure 2).

**Figure 1** (from left to right) The picture of the lesion on the scalp of the girl can be seen from the right, middle, and left side of the patient.

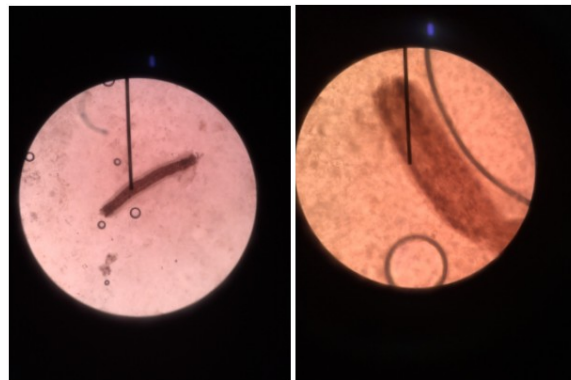


**Figure 2** (from left to right) The picture of the lesion on the scalp of the boy is seen from the side and above.

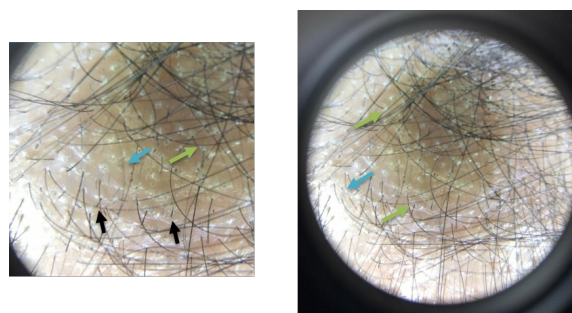
For the girl and boy, Wood's lamp and 20% KOH examination were done. The results of the Wood's Lamp examination were that there was yellow-green fluorescence in these two patients as shown in Figure 3. In addition, the results of the 20% KOH examination with samples from scrapings on scalp and hair lesions were ectothrix dermatophyte invasion patterns in both patients such as in Figure 4. In boys, trichoscopic examination was done and there were perifollicular scaling, comma hair, and broken hair as shown in Figure 5.



**Figure 3** (from left to right) Wood's lamp examination in both patients showed a yellow-green fluorescence.



**Figure 4** (from left to right) Examination of 20% KOH under a microscope in both patients revealed the presence of ectothrix spores.



**Figure 5** (from left to right) Trichoscopic examination showed perifollicular scaling (green arrow), comma hair (blue arrow), broken hair (black arrow).

The differential diagnosis in these two patients was gray patch type tinea capitis, alopecia areata, and seborrheic dermatitis. Based on the history, physical examination, Wood's lamp and 20% KOH examinations in these two patients, a diagnosis of gray patch tinea capitis can be established.

The therapy given to the girl was griseofulvin ultramicrosize 180 mg/day for 10 days, vitamin D once daily at a dose of 400 IU, cetirizine syrup 1 teaspoon once a day, terbinafine 1% cream applied 2 – 3 times per day. The boy also received similar therapy, but griseofulvin ultramicrosize was given in a dose of 230 mg/day for 10 days.

Both parents were given education, such as stopping the Betamethasone Valerate ointment treatment, taking the prescribed oral and topical medication as recommended, checking pets to veterinarian, and cleaning and separating the patient's bed.

### 3. DISCUSSION

Tinea capitis, or commonly called scalp ringworm, is a dermatophyte infection of the scalp that most often occurs in children aged 6 months to 12 years. Tinea capitis gray patch type is a form of clinical appearance of tinea capitis that is non-inflammatory [7]. Risk factors that can cause tinea capitis are direct contact with animals, for example, domestic animals such as cats or dogs. In addition, indirect contact through fomites such as mattresses, sofas, toiletries that are used together can also be a transmission of dermatophyte infections. In addition, the use of topical steroids can suppress the cutaneous inflammatory response that the skin makes to limit fungal infections. Simultaneously, there is local suppression of the T-cell-mediated immune response by dermatophytes, which ultimately increases the risk of chronicity and recurrence. The use of topical steroids can also increase the penetration of fungi into the dermis as shown by histopathological examination which causes failure of treatment [8]. In our case, we found two siblings with a diagnosis of gray patch type tinea capitis with risk factors including exposure to pets (cats), fomites in the form of using the same mattress, and the use of topical corticosteroids. The clinical features of tinea capitis of the gray patch type are pruritus, loss of hair roots, hair becomes not shiny, alopecia, lesions are often round, minimal inflammation, and there are fine gray scales [9,10,11].

One of the examinations for gray patch tinea capitis is Wood's lamp examination. In tinea capitis, a yellow-green fluorescence can be seen due to the presence of pteridine in hair infected with ectothrix dermatophyte pathogens such as *M. canis*, *M. audouinii*, *M. distortum* and *M. ferrugineum*, whereas

endothrix dermatophyte pathogens such as *T. tonsurans* do not show any fluorescence [12,13]. Other examinations that can be done are examination using a microscope by taking samples from scalp and hair lesions which are then dripped with 20% KOH solution on the hair samples. This was done because the elements of dermatophytes contain chitin and glycoproteins in their cell walls that are resistant to KOH solution [14]. This examination can show the pattern of dermatophyte invasion in gray patch type tinea capitis with an endothrix pattern (possible cause is *Trichophyton sp.*) that shows multiple in the hair shaft and an ectothrix pattern (possibly *Microsporum sp.*) indicating the presence of dermatophyte spores outside the hair shaft [15,16]. In this case, ectothrix pattern was found on both patient's hair samples.

Trichoscopy is another examination that can help to establish the diagnosis of gray patch tinea capitis. This examination can be performed quickly, is non-invasive, and is a sensitive tool for diagnosing tinea capitis. In the non-inflammatory type of tinea capitis, trichoscopic examination can show follicular scaling and keratosis [11,16,17]. Short and broken hair, comma hair, corkscrew hair, zigzag hair, morse code hair, perifollicular scaling, and interfollicular scaling are trichoscopic results that can be found in gray patch tinea capitis, but the characteristic of gray patch tinea capitis is perifollicular scaling [7,18,19].

The management of gray patch tinea capitis is systemic and topical therapy. Griseofulvin was given to both patients as an oral treatment because it is the first-line therapy for tinea capitis with the dermatophyte species *Microsporum sp.* [20]. According to a meta-analysis study conducted by Gupta *et al.*, griseofulvin is the most effective treatment for tinea capitis caused by *Microsporum sp.* compared to that caused by *Trichophyton sp.* The dose of griseofulvin microsize is 20 – 25 mg/kgBW/day for 8 weeks and the dose of griseofulvin ultramicrosize is 10 – 15 mg/kgBW/day and is given for 6 to 8 weeks. Griseofulvin works by interacting with microtubules to affect the formation of the mitotic spindle which will eventually inhibit mitosis in dermatophytes so that it can act as a fungistatic agent. Elimination of griseofulvin occurs rapidly from the body

so it must be consumed in the long term to show its efficacy [21].

Cetirizine is given to children as an antihistamine to reduce itching caused by dermatophyte infections and has minimal side effects. The dose of cetirizine in children aged 1 – 2 years is 2.5 mg/day, ages 2 – 6 years is given 2 x 2.5 mg, at ages 6 – 12 years 2 x 5 mg and ages 12 – 18 years is given 1 x 10 mg with a maximum dose of 10 mg/day [22]. In gray patch tinea capitis, keratinocytes in the epidermis release inflammatory cytokines in response to dermatophyte antigens which will cause an active inflammatory response in the skin, resulting in pruritus. With a strong anti-inflammatory effect, cetirizine is an antagonist to histamine secretion which in turn inhibits the production of eosinophils [23].

According to the recommendations from the American Academy of Pediatrics, the recommended daily intake of vitamin D for children aged 1 – 18 years is 400 – 600 IU per day [24]. Vitamin D3 plays a role in influencing the innate immune system to prevent infection and influencing the adaptive immune system to modulate autoimmunity. In addition, vitamin D could modulate the growth and differentiation of keratinocyte through binding with vitamin D receptor (VDR). The VDR expression is needed to initiate anagen phase in follicle growth cycle in normal hair [25,26]. Therefore, we gave vitamin D to both patients. Both patients were given topical therapy in the form of terbinafine 1% cream which was applied 2 – 3 times per day. Terbinafine is fungicidal against dermatophytes because it can damage the cell membranes of dermatophytes and destroy enzymes in dermatophytes that are useful for self-replicating. Topical treatment is useful in addition to systemic therapy to reduce the carriage rate of the infecting species. In a study conducted by Jerasutus, *et al.*, it was said that the use of terbinafine in children showed effective results [27].

#### 4. CONCLUSION

Two siblings, a 7-year-old girl and her 11-year-old boy, were diagnosed with gray patch tinea capitis. Identified risk factors include exposure to pets, shared mattresses, and inappropriate use of oral corticosteroids. By identifying risk factors, management will be more effective and efficient.

#### ETHICAL APPROVAL

The study is in compliance with the Declaration of Helinski.

#### CONSENT

The authors have confirmed during submission that patient consent has been signed and collected in accordance with the journal's patient consent policy.

#### REFERENCES

- [1] Venitarani, S. A., Handayani, S., & Ervianti, E. (2019). Profile of patients with tinea capitis. *Dermatology Reports*, 11(s1).
- [2] Pravitasari, D. N., Hidayatullah, T. A., Nuzula, F., & Damayanti, R. P. (2019). Profil Dermatofitosis Superfisialis Periode Januari – Desember 2017 Di Rumah Sakit Islam Aisiyah Malang. *SaintikaMedika*, 15(1), 25-32.
- [3] Al About Am, Crane JS, Tinea Capitis. [Updated 2020 Aug 10]. In: StatPearls [Internet]. Treasure Island (FL): Statpearls Publishing; 2021 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK536909/>
- [4] Adesiji, Y. O., Omolade, F. B., Aderibigbe, I. A., Ogungbe, O., Adefioye, O. A., Adedokun, S. A., Adekanle, M. A., & Ojede, R. (2019). Prevalence of Tinea Capitis among Children in Osogbo, Nigeria, and the Associated Risk Factors. *Diseases (Basel, Switzerland)*, 7(1), 13. <https://doi.org/10.3390/diseases7010013>

- [5] Gajula N, Vumma N, Rohit V, Kalikota A. A clinico-epidemiological study of tinea capitis in children attending a Tertiary Care Hospital in Karimnagar. *Indian J Paediatr Dermatol* 2019;20:332-7
- [6] Moriarty, B.; Hay, R.; Morris-Jones, R. (2012). The diagnosis and management of tinea. *BMJ*, 345(jul10 1), e4380–e4380. doi:10.1136/bmj.e4380
- [7] Hay R. J. (2017). Tinea Capitis: Current Status. *Mycopathologia*, 182(1-2), 87-93. <https://doi.org/10.1007/s11046-016-0058-8>
- [8] Kumar, P., Pandhi, D., Bhattacharya, S. N., & Das, S. (2020). Trichoscopy as a Diagnostic Tool for Tinea Capitis: A Prospective, Observational Study. *International journal of trichology*, 12(2), 68–74. [https://doi.org/10.4103/ijt.ijt\\_30\\_20](https://doi.org/10.4103/ijt.ijt_30_20)
- [9] Vineetha, M., Sheeja, S., Celine, M. I., Sadeep, M. S., Palackal, S., Shanimole, P. E., & Das, S. S. (2018). Profile of Dermatophytosis in a Tertiary Care Center. *Indian journal of dermatology*, 63(6), 490–495. [https://doi.org/10.4103/ijid.IJD\\_177\\_18](https://doi.org/10.4103/ijid.IJD_177_18)
- [10] Bongomin, F., Olum, R., Nsenga, L., & Baluku, J. B. (2020). Burden of tinea capitis among children in Africa: protocol for a systematic review and meta-analysis of observational studies, 1990-2020. *BMJ open*, 10(9), e041230. <https://doi.org/10.1136/bmjopen-2020-041230>
- [11] Alkeswani, A., Cantrell, W., & Elewski, B. (2019). Treatment of Tinea Capitis. *Skin Appendage Disorders*, 5(4), 201–210. <https://doi.org/10.1159/000495909>
- [12] Leung AKC, Hon KL, Leong KF, Barankin B, Lam JM. Tinea Capitis: An Updated Review. *Recent Pat Inflamm Allergy Drug Discov*. 2020;14(1):58-68. doi: 10.2174/1872213X14666200106145624. PMID: 31906842.
- [13] Bhat, Y. J., Zeerak, S., Kanth, F., Yaseen, A., Hassan, I., & Hakak, R. (2017). Clinicoepidemiological and Mycological Study of Tinea Capitis in the Pediatric Population of Kashmir Valley: A Study from a Tertiary Care Centre. *Indian dermatology online journal*, 8(2), 100–103. <https://doi.org/10.4103/2229-5178.202279>
- [14] Kang, S., Amagai, M., Bruckner, A., Enk, A., Margolis, D., McMichael, A., Orringer, J. (2019). *Fitzpatrick's Dermatology*. McGraw Hill Education. 9th edition.
- [15] Afshar, P., Larijani, L. V., & Rouhanizadeh, H. (2018). A comparison of conventional rapid methods in diagnosis of superficial and cutaneous mycoses based on KOH, Chicago sky blue 6B and calcofluor white stains. *Iranian journal of microbiology*, 10(6), 433–440.
- [16] Peixoto, R., Meneses, O., da Silva, F. O., Donati, A., & Veasey, J. V. (2019). Tinea Capitis: Correlation of Clinical Aspects, Findings on Direct Mycological Examination, and Agents Isolated from Fungal Culture. *International journal of trichology*, 11(6), 232–235. [https://doi.org/10.4103/ijt.ijt\\_88\\_19](https://doi.org/10.4103/ijt.ijt_88_19)
- [17] Wałkiel-Burnat, A., Rakowska, A., Sikora, M. et al. Trichoscopy of Tinea Capitis: A Systematic Review. *Dermatol Ther (Heidelb)* 10, 43–52 (2020). <https://doi.org/10.1007/s13555-019-00350-1>
- [18] Mayser, P., Nenoff, P., Reinell, D., Abeck, D., Brasch, J., Daeschlein, G., ... & Zidane, M. (2020). S1 guidelines: Tinea capitis. *JDDG: Journal der Deutschen Dermatologischen Gesellschaft*, 18(2), 161-179.
- [19] Mohta, A., Singh, A., Nyati, A., Agrawal, A., Nahar, D., Lal, M., Gupta, D., & Jain, S. K. (2020). Evaluation of Impact of Tinea Capitis on Quality of Life in Pediatric Patients Using Children's Dermatology Life Quality Index and Its Correlation with Disease Duration. *International journal of trichology*, 12(5), 213–219. [https://doi.org/10.4103/ijt.ijt\\_58\\_20](https://doi.org/10.4103/ijt.ijt_58_20)



- [20] Olarinoye, G. M., Katibi, O. S., Ilesanmi, O. N., Fayemiwo, S. A., Ogunbiyi, A. O., & George, A. O. (2020). Trichoscopic features of tinea capitis among primary school children in north central Nigeria. *International Journal of Dermatology*, 59(11), 1346-1352.
- [21] Olson JM, Troxell T. Griseofulvin. [Updated 2020 Aug 29]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK537323/>
- [22] Gupta, A. K., Bamimore, M. A., Renaud, H. J., Shear, N. H., & Piguet, V. (2020). A network meta-analysis on the efficacy and safety of monotherapies for tinea capitis, and an assessment of evidence quality. *Pediatric Dermatology*, 37(6), 1014-1022.
- [23] Setyawati N., Pusvitasari, L., Rusyati, L., Gotama, D., "Antihistamine in Pediatrics Dermatology", *International Journal of Science and Research(IJSR)*, [https://www.ijsr.net/search\\_index\\_results\\_paperid.php?id=SR201025170201](https://www.ijsr.net/search_index_results_paperid.php?id=SR201025170201) , Volume 9 Issue 10, October 2020, 1602 - 1607
- [24] Naqvi A, Gerriets V. Cetirizine. [Updated 2021 Mar 25]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK549776/>
- [25] Dalle Carbonare, L., Valenti, M. T., Del Forno, F., Caneva, E., & Pietrobelli, A. (2017). Vitamin D: Daily vs. Monthly Use in Children and Elderly-What Is Going On?. *Nutrients*, 9(7), 652. <https://doi.org/10.3390/nu9070652>
- [26] Almohanna, H. M., Ahmed, A. A., Tsatalis, J. P., & Tosti, A. (2019). The role of vitamins and minerals in hair loss: a review. *Dermatology and therapy*, 9(1), 51-70.
- [27] Jerasutus S, Vejjabhinanta V, Prapapan O. Treatment of tinea capitis with topical 1% encapsulated terbinafine hydrochloride gel: A pilot study. *Pediatr Dermatol*. 2020 Nov;37(6):1090-1093. doi: 10.1111/pde.14377. Epub 2020 Sep 20. PMID: 32951299.s