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Clinical Burden of Primarily Misdiagnosed *Tinea capitis*:  
A Comparative Statistical Analysis <Manuscript Title>

**Abstract**

**Background:** Tinea capitis has been recognized as the most commonly misdiagnosed scalp disease. Inappropriate medication and delayed intervention leads to a broad array of complications from prolongation of treatment to scarring of the scalp. The financial deficits and problems imparted on patients continue to be a clinical and social burden.

**Objective:** The clinical and financial aspects between the initially misdiagnosed group and the properly diagnosed group were analyzed, to provide the epidemiologic basis and to address improvements for misdiagnoses of tinea capitis.

**Methods:** A retrospective review of electronic and written chart was performed on all patients diagnosed of tinea capitis at Daegu Catholic University Medical Center (DCUMC) from January 2006 to June 2016. A total of 100 patients were included in the study and an initially misdiagnosed group and initially diagnosed group were evaluated.

**Results:** Significant differences between the groups were not observed in variables including age, sex and occupation. The highest diagnostic precision was observed in dermatologists (78.4%) by using standard microscopic (31.0%) and culture studies (13.0%). Misdiagnosis rate was highest in pediatrics (34.9%) and erroneous examination such as laboratory test (48.4%) and Gram stain (19.4%) were countered in the misdiagnosed group. Additional clinic visits, prescriptions and extra trips to clinics resulted financial disadvantage in the misdiagnosed group.

**Conclusion:** The misdiagnosed tinea capitis was found to arise from unawareness of the disease that leads to inappropriate approach and medication prescription. The duration, complications and financial loss were reported to be higher in misdiagnosed group based on the study

Key words: *Corynespora cassiicola*, Fungus, Keratitis, Plant pathogen

**INTRODUCTION**

Tinea capitis (TC) is defined as superficial fungal infection of the scalp and still presents with a high incidence, which poses a public health concern around the world1. Effective control was brought in industrialized countries after introduction of griseofulvin while other third world regions still remain endemic2. Initial stages of the infection is usually asymptomatic, however it can easily spread and present in various clinical forms. Ranging from asymptomatic carrier state to inflammatory favus, the differential diagnoses encompass seborrheic dermatitis, atopic dermatitis, psoriasis vulgaris, alopecia areata, furunculosis, and trichotillomania3.

MATERIALS AND METHODS

1. Data collection

A retrospective review of electronic and written chart was performed on all patients diagnosed of TC at Daegu Catholic University Medical Center (DCUMC) from January 2006 to June 2016. The following data retrieved from the medical record include admission note, progress note, diagnostic measures and treatment options before and during visits at DCUMC, laboratory results along with basic vital signs. The result of following test methods evaluated in the studies include potassium hydroxide preparation, fungal culture, Grams swab stain, blood culture, trichogram, woods lamp examination, and skin biopsy.

2. Statistical analysis

All data was gathered and was encoded in numerical values. Frequency and inclination were evaluated with descriptive and multiple response analyses. The variables in continual forms were eva- luated with two-sample *t*-test. The descriptive data are expressed in percentage and mean ± standard deviation. All analysis was performed using SPSS 19.0 version (SPSS, INC®., Chicago, USA) with a *p*-value of less than 0.05 as statistically significant value.

RESULTS

1. Demographic study

The selected subject groups compliant with the inclusion criteria were a total of 100 patients and 37 were diagnosed of TC on their first visits while remaining 63 were misdiagnosed as other disease entity. The correctly diagnosed group was referred as group 1 and the misdiagnosed group was referred as group 2. For the demographic study, sex, age, route of medical visit, region, occupation and past medical history were evaluated. Regarding the sex, both groups 1 and group 2 displayed similar com- positions where female was more dominant. The age ranged from 0 to 89 years with the mean age of 35.84 in group 1, and similarly the age ranged from 0 to 83 years with the mean age of 29.89 in group 2.

2. Comparative frequency analysis

Comparative frequencies of the following variables were measured: initial visited consultant type, symptoms, diagnostic methods, complications, treatment choices. Additionally, duration of treatment was also evaluated between two groups by using two sample *t*-test. Primarily correct diagnoses were mostly achieved by dermatologist, followed by pediatrician, internists, general practitioners, and lastly emergency medical doctor.

DISCUSSION

TC is the most common form of scalp disease misdiagnosed by clinicians and a highly inflammatory type may confound medical practitioners unfamiliar with the disease1-6. Treatment with antibiotics frequently occurs and may account for unnecessary costs and morbidity8. TC presents in a number of specific patterns including diffuse scale type, black dotted type, discrete areas of pustules with excoriation and lastly kerion, which is an isolated inflammatory lesion9. Each pattern must list a differential diagnosis encompassing seborrheic dermatitis, psoriasis vulgaris, alopecia, furun- culosis, and trichotillomania3. The level of host immunity and the type of fungal organism involved with the disease can lead to inflammatory type of tinea capititis which is highly confounding with symptoms that of bacterial infection10-12.

1. Demographic analysis

The demographic study revealed that TC was most commonly misdiagnosed in children. As the most common age group of TC occurs in children, definitive number also outnumbers rest of the population. The mean age and the percentage of the misdiagnosed group under 18 years of age was 5.82 and 63.29%, respectively. It was found that most of pediatric patients seek management initially from pediatricians and the highest misdiagnosed group of specialty was pediatrics with over 34.9% of all misdiagnosed cases.

2. Clinical manifestation and complications

The symptoms and lesions presented between two groups were comparable in terms of progression and complication of the disease. In group 1, pruritus was the highest complaint with 22.7% followed by scales, pustule and papules. The symptoms and lesions reported in group 1 are consistent with the primary lesions that are usually present in TC. On the contrary, although pruritus and primary lesions were also noticed in group 2, scarring alopecia was the most commonly presented lesion with higher rates of ulcers and seborrhea (Table 2). The result indicates that the misdiagnosed group was more susceptible to lesions that were consistent with complication. Concurrently, the misdiagnosed group showed a higher rate of complication. In group 1 only 41% (9 cases) were left with complications which included scars, hair loss, and dents on scalps. In group 2, 96% (61 cases) suffered complication and scar (41%) was the major complication followed by bacterial co-infection, and hair loss (Table 2). Bacterial co-infection may occur under large superficial crusts and present in forms of folliculitis16.

CONCLUSION

Currently, there are no carefully controlled studies regarding the epidemiologic analysis of misdiag- nosed TC and its evaluation of its clinical and social impact. The misdiagnosed TC usually arises from unawareness of the disease that leads to inappropriate diagnostic approach resulting in misleading medication prescription. The clinical duration and complications were reported to be higher and the financial loss was evident in the misdiagnosed group. Limited cases and retrospective study nature in a single center remain limitations to the study. However, based on the findings, the present study should provide a basis for further epidemiologic analysis and it is recommended to explore solutions for early diagnosis and solving patients' quality of lives with economic burden of TC.

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The authors declare that there are no acknowledgement.

**Conflict of interest**

In relation to this article, I declare that there is no conflict of interest.

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