A STUDY ON TINEA CAPITIS

Thesis

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M.D. Degree in
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Presented By

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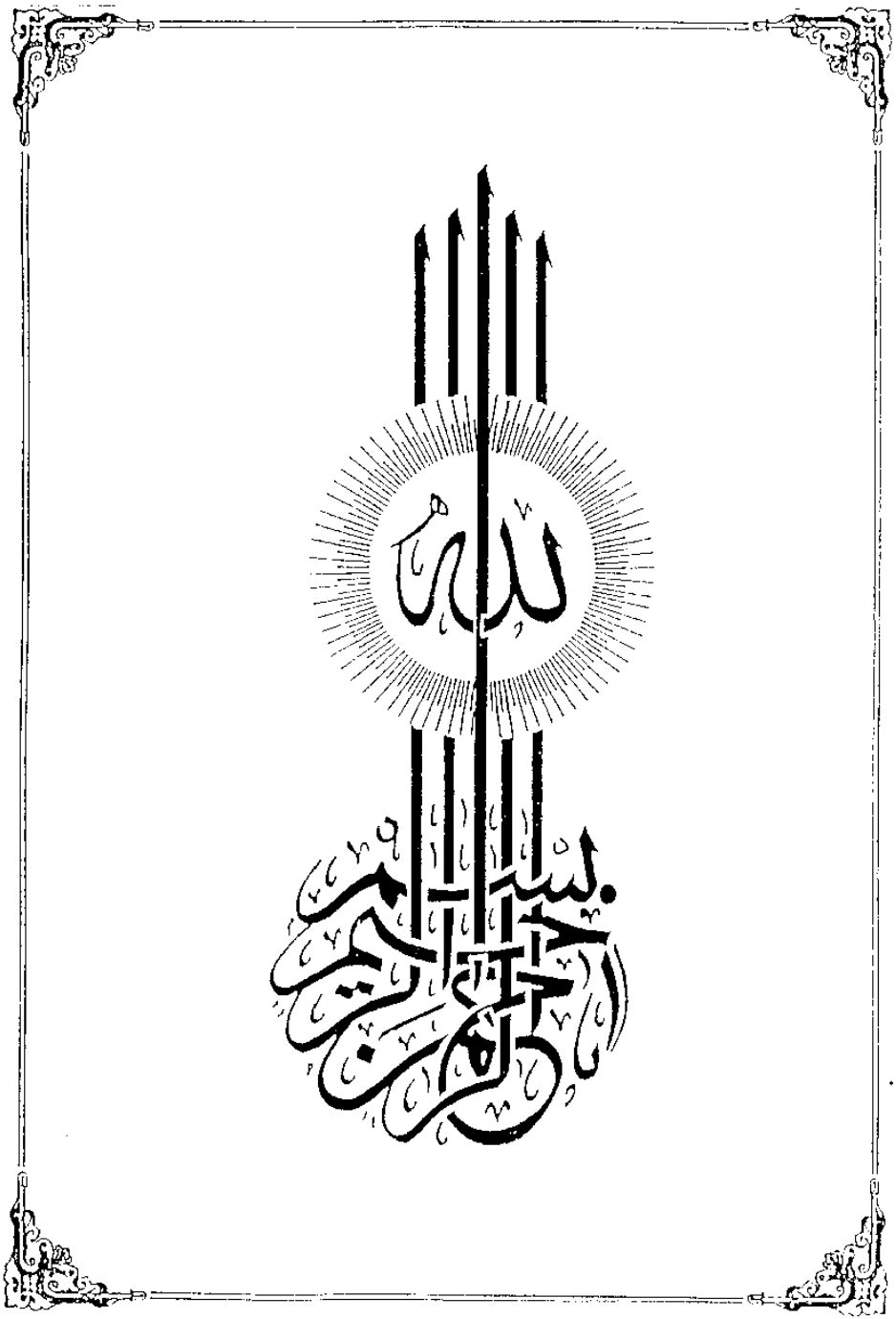
بسم الله الرحمن الرحيم

"دعواهم فيها سبحانك اللهم وتحيتهم فيها سلام وآخر دعواهم أن

الحمد لله رب العالمين"

صدق الله العظيم

"يونس / آية ١٠"



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Introduction and Aim of the work

INTRODUCTION AND AIM OF THE WORK

Ringworm of the scalp is a fungus infection caused by several species of Dermatophyte genera, *Microsporum* and *Trichophyton.* The condition is often chronic and slowly progressive. Children are more susceptible to this infection than adults. Males are affected more than females (Kumar and Lakshmi, 1990 and Fenton, 1991). Scalp infection may be scaly, black dot, kerion, or favus form. The predominant dermatophytes causing tinea capitis are *Microsporum audouinii, M.canis, M.ferrugineum, Trichophyton violaceum, T.tonsurans,* and *T.schoenleinii.* Occasional causes of scalp ringworm include *T.mentagraphytes, T.rubrum, T.verrucosum, T.gourvilli, T.saudanase, M.gypseum, M.nanum, and M.distortrum* (Emmons et al., 1977).

The dermatophytes causing tinea capitis vary from one country to another. In Egypt, although *T.violaceum* is the most common causative agent of tinea capitis, *T.schoenleinii, M.canis, T.verrucosum, T.rubrum,* and *M.audouinii* were isolated (Abdel-Fattah et al., 1967; El Mofty et al., 1968 and Amer et al., 1977).

Resistance to tinea capitis may involve non immunological as well as immunological mechanisms (humoral and cellular). The

natural resistance to tinea capitis caused by *M.audouinii* exists after puberty due to increase in fungistatic and fungicidal long-chain saturated fatty acid. In addition, a substance known as Serum Inhibitory Factor (SIF), which is not antibody but a dialyzable heat labile component of fresh sera, appears to limit the growth of dermatophytes to stratum corneum (Rath et al., 1959).

The major immunologic mechanism against dermatophyte infection is type IV delayed hypersensitivity response which is detected by intradermal test, Trichophytin (Blake and George, 1987).

The humoral limb of the immune system has a minor role in the development of acquired resistance to dermatophyte infections. Dermatophyte infections produce precipitating and complement fixing, as well as haemagglutinating antibodies (Pepy's et al., 1959).

Aim of the work

Aim of this work was to:

- Determine the predominant species of dermatophytes causing tinea capitis in Egypt.
- Study the immunological reactions in patients suffering from dermatophytosis, taking cases of tinea capitis as examples of dermatophyte infections.

Review of Literature

DERMATOPHYTOSIS

Dermatophytosis are infections of keratinized tissues, that is, the epidermis, hair, and nails, caused by a group of specialized fungi, the dermatophytes. The dermatophytes produce infections with mild to severe symptoms depending on the immunological response of the host. In general, dermatophytes do not invade subcutaneous or deep tissues (Chung and Bennett, 1992).

Historical review:

The history of human medical mycology started with the discovery and incrimination of etiologic agents of dermatophytosis. Remak (1837) noted peculiar microscopic structure of rods and buds in the diseased skin of patients suffering from tinea favosa. Remak (1842) inoculated the crusty elements of favus on his left arm and recognized that the causative agent of favus was infectious.

Three years later, Remak isolated the agent of favus and described the microscopic characteristics of the fungal structures. Remak (1845) classified the fungus in the genus *Achorion,* and named it *A.schonelinii*.

Gruby made a series of important studies on dermatophytosis between 1841 and 1844. He described the clinical manifestations and in vivo characteristics of *T.schoenleinii*. He also

recognized ectothrix and endothrix hair invasion and gave the name *Microsporum audouinii* to the agent of ringworm of childhood.

Malmsten (1848) erected the genus *Trichophyton* and described fungal spores in hair from patient suffering from tinea capitis and named the causative fungus *Trichophyton tonsurans*.

Sabouraud began his systematic studies of dermatophytosis in 1892. His extensive work culminated in the publication of classic book (Les Teines) in 1910. This work included taxonomy, morphology, and laboratory method for dermatophytes and treatment of dermatophytosis. He classified dermatophytes in four genera, *Achorion, Epidermophyton, Microsporum* and *Trichophyton* on the basis of clinical aspects of disease combined with cultural and microscopic characteristics of the fungi. He developed culture media that contained crude peptone and either crude maltose or honey.

Block et al. (1925) reported "trichophytin" activity of crude polysaccharide containing extracts.

Emmons (1934) redefined the dermatophytes according to botanical rules depending on morphological rather than on clinical basis. He modified Sabouraud's classification by placing the member of *Achorion* in genus *Trichophyton* and only three genera

namely: *Microsporum, Trichophyton* and *Epidermatophton* were included. He classified the dermatophytes according to the shape of macroconidia and this was accepted and remained the principle of classification system used today.

Nutritional requirements and physiologic characteristics of dermatophytes were studied by Benham (1953).

Conant et al. (1954) modified the morphological classification by adding certain cultural characteristics using single name of similar dermatophyte.

George (1957) reexamined the work of Emmons and supplemented them with studies on nutritional and physiologic characteristics of dermatophytes.

Dawson and Gentles (1959) used the hair-bait method to culture *Trichophyton ajelloi* and discovered that the fungus produced ascomycetous telemorphs belonging to *Arthroderma*.

From the epidemiological point of view, Ajello (1962) classified dermatophytes into three groups: anthropophilic, zoophilic and geophilic species. Anthropophilic species; in which human are the natural host for the dermatophytes and can be transmitted from human to animals and include, *M.audouinii, T.rubrum, T.mentagrophytes var interdigitale, T.schoenleinii, T.tonsurans, T.violaceum,* and *E.floccosum*. Zoophilic species; in

this group animals act as natural hosts for dermatophytes from which infection is mostly transmitted to man and represented by *M.canis, M.nanum, T.verrucosum,* and *T.mentagrophytes var mentagrophytes.* Geophilic sepecies; in which the soil is the natural habitant for dermatophytes and then infection of man and animal takes place and represented by such organisms as *M. gypseum, M.fulvum,* and *T.terrestre.*

Tapline and coworkers (1969) developed the dermatophyte test medium (DTM) to isolate and distinguish dermatophytes from fungal and bacterial contaminants in cutaneous lesions. Dermatophytes turn DTM red because their metabolic products raise the pH of the medium while most bacteria and other fungi do not.

A recent development in the study of the dermatophytes has been the observation that many of them have a sexual phase of reproduction. While this findings have obvious genetic implication, there have been few studies in this regard of the more than 20 species in which sexual reproduction has been observed, all have been classified in either of two genera, *Nannizzia* or *Arthroderma* (Blake and George 1987).

The relationship between *T.interdigitale (T.mentagrophytes var interdigitale)* and the other member of *T.mentagrophytes*

complex was studied by restriction enzyme analysis of mitochondrial DNA (mt DNA). The mt DNA of 22 isolates of *T.interdigitale* from Japanese patients with dermatophytosis was extracted, digested with the restriction enzymes HaeIII, Msp I, or Hind III and the restriction profiles obtained compared with those of *Arthroderma semii*, *Arthroderma benhamiae,* and *Arthroderma vanbreuseghemii.* The restriction profiles obtained from *T.interdigitale* were identical to those of *A.vanbreuseghemii.* Thus, these two species are considered to be closely related (Mochizuki et al.,1990).

Etiology of Tinea Capitis

The etiologic agents of dermatophytosis of the scalp are classified into two anamorphic genera *Microsporum,* and *Trichophyton,* depending on their macroconidial characteristics. Dermatophytes can be divided into three groups, anthropophilic, zoophilic and geophilic depending on their natural habitat. The important known causes of scalp ringworm, their geographical distribution, in case of zoophilic species, the animals from which human infections are usually contracted are listed in table (1) (Fenton 1991).

Table 1: Fungi causing scalp ringworm (Fenton, 1991).

Type	Distribution and Host
Anthropophilic	
• *Microsporum audouinii*	Word wide.
• *M.ferrugineum*	China, Japan, parts of Russia, Central and East Africa.
• *Trichophyton rubrum*	Wide spread endemic.
• *T. schoenleinii*	Wide spread, common in Middle East and North Africa.
• *T. tonsurans*	Wide spread, common in the U.S.A.
• *T. violaceum*	Africa, Central and South Europe, Middle East.
• *T. gourivilii*	West Africa.
• *T. megninii*	South Europe and Africa.
• *T. soudanense*	Central Africa.
• *T. yaoundei*	Africa.
Zoophilic	
• *M. canis*	World wide (Cats and dogs).
• *M. equinum*	World wide (Horses).
• *M. nanum*	World wide (Pigs).
• *M. persicolor*	West Europe (Field-vole).
• *T. mentagrophytes*	World wide (Many species of reservoirs in rodents).
• *T. verrucosum*	Wide spread (Cattle).
• *T. equinum*	Wide spread (Horses).
• *T. erinacei*	Europe and NewZealand (Hedgehogs).
• *T. quinckeanum*	Wide spread (Mice, may be transmitted to man by cats and dogs).
• *T. simii*	India (Monkeys).
Geophilic	
M. gypseum	Wide spread (Soil, man can be infected by contact with soil or infected animal).