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Epidemiologic Investigation of an Outbreak of *Tinea capitis*: Experience from the South of Iran

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Abstract: The deputy of health affairs of Kerman province encountered a report of *Tinea capitis* outbreak in one of the southern towns of the province in winter 2006 of which stated 1294 cases of *Tinea capitis* among primary school children that 86% of them were boys. The epidemiological and environmental investigation was conducted through a case-control study. The outbreak investigation showed that the risk of infection was significantly higher among subjects with a lower socioeconomic status, poor personal hygiene and a positive personal history of *Tinea capitis*. Improvement of living condition, public attention to personal hygiene and active case finding would be effective in decreasing and preventing *Tinea capitis*.

Key words: Outbreak, risk assessment, environmental health, dermatophytes, fungal infection

INTRODUCTION

Tinea capitis is a common fungal infection caused by Dermatophytes which is endemic in many countries (Brilhante *et al.*, 2004; Razzaq Adel *et al.*, 2007). This highly contagious disease is a worldwide public health problem particularly in school children (Razzaq Adel *et al.*, 2007; Bassiri Jahromi and Khaksar, 2006) and it is rarely diagnosed in infancy and adulthood. Dermatophytes are a group of fungal infections, which are categorized to three major groups: Epidermophyton, Tricophyton and Microsporum. These tineas tended to use nail, hair and skin keratin as a nutritive material (Bassiri Jahromi and Khaksar, 2006; Millu and Hodgson, 1993). The epidemiologic pattern of this kind of disease differs from a country to another-even in a large country it differs from one region to another (Ilkit *et al.*, 2007).

Epidemiologic studies in controlling and eradicating the disease are of great importance (Clayton and Hay, 1994). In January, 2006 an epidemiologic outbreak of *Tinea capitis* occurred in a community in Southern Iran. We conducted epidemiological investigation to determine the risk factors of the disease to implement control and preventive measures.

MATERIALS AND METHODS

Setting

The epidemic was happened in Manoojan city-one of the warmest cities in the southern part of Kerman province (The greatest province throughout the country). The total population of the city is 61000. It is located 1400 km South-west of Tehran. The area of the district is 4086 km² and 98% of residents are farmers and shepherds. In November and December 2005 the reported cases from the city

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schools were not considerable so the directors of the district health center of the city not to take it serious, but in January, 2006 the number of case increased dramatically and at the end of season, 1294 cases based on laboratory test results and epidemiologic and clinical criteria were found positive of which 1118 cases were boys (86%). Ninety five percent of them were primary schools students aged less than or equal to 12 years.

Case Definition

Three levels of case definition with increasing specificity were used. Suspected cases were the ones which had clinical signs (such as: scalp purities, scalp scaling, patchy or discrete alopecia) according to the report of field health staff. The probable cases were the patients with positive potassium hydroxide (KOH) microscopy. The confirmed cases were the people with positive fungal culture.

Epidemiologic Investigation

In a case-control study, 400 primary school children were studied using age-and sex matched controls randomly selected from the same schools considering the high prevalence of cases in the primary schools. Cases consisted of 200 children diagnosed as *Tinea capitis* based on clinical signs and positive laboratory investigations (Hainer, 2003) and the remaining 200 subjects were defined as control group.

After the selection of cases and controls, the trained interviewers referred to their homes and after obtaining informed consent, the parents were questioned about type of residence (permanent or immigrant), family members, father occupation and income, existence of bathroom in their home, the number of taking a bath per week, adequate usage of soap and shampoo, occurrence of similar disease in the recent years or among the other members of the family, the presence of animals near home, the reference to barber shop (or haircutting at home). The frequency of the selected characteristics between cases and controls was compared by chi square test. The statistical analyses were conducted by SPSS V.15 Software.

RESULTS AND DISCUSSION

Trichophyton mentagrophytes was cultured from the specimens. The mean (\pm SD) age of the patients and controls were 9.6 (\pm 0.2) and 9.9 (\pm 1.8), respectively ($p>0.05$). In the patient group 89.0% were boys and in the control group 87.7% were boys ($p>0.05$). In Table 1, the relative frequency of each the studied variables is shown. The important risk factors of the disease were low income of the family, the absence of bathroom at home, inadequacy of bath taking in a week and history of disease in the recent years.

In the present study the role of different factors were verified in an outbreak of *Tinea capitis* in a city located in tropical region of Iran. Before discussing about the results the main limitation of the study should be mentioned. It was more logical to culture all specimens in the patient group though some authorities have shown that clinical diagnosis is accurate in more than 92% of laboratory confirmed cases so that they recommend empirical treatment of the patients solely based on clinical presentation (Hainer, 2003).

T. mentagrophytes as a *Zoophilic dermatophyte* was the cause of the epidemic. In a study conducted on 290 sporadic patients in Tehran, *T. violaceum* and *T. mentagrophytes* were diagnosed as the most and the least prevalent etiological agent agents, respectively (Bassiri Jahromi and Khaksar, 2006). One of the major differences of our study with the above mentioned study is related to the living conditions in the two areas. The epidemiologic pattern of *Tinea capitis* is closely related to social

Table 1: Comparison of background variables in the healthy (n = 200) and patient group (n = 200)*

Characteristic	Patient group	Control group	Total	p-value
Age				
Mean	9.6	9.9	--	0.09
SD	2	1.8		
Family size				
Mean	7.1	6.8	--	0.38
SD	2.2	2.4		
Sex				
Girl	22 (11)	27 (13.5)	49 (12.3)	
Boy	178 (89)	173 (86.5)	351 (87.7)	0.44
Residence				
Immigrants (tribes)	17 (8.5)	15 (7.5)	32 (8.0)	
Permanent	183 (91.5)	185 (92.5)	368 (92.0)	0.71
Father's occupation				
Agriculture and animal husbandry	108 (57.8)	110 (57.9)	218 (57.8)	
Unemployed	44 (23.5)	34 (17.9)	78 (20.7)	0.25
Others	35 (18.7)	110 (57.9)	81 (21.5)	
Income				
Low	84 (43.1)	57 (31.5)	141 (37.5)	
Mid	104 (53.3)	112 (61.9)	216 (57.4)	0.04
High	7 (3.6)	12 (6.6)	19 (5.1)	
Bathroom in house				
Yes	125 (62.8)	152 (76)	277 (69.4)	
No	74 (37.2)	48 (24)	122 (30.6)	0.004
Frequency of bath usage/week				
<1	13 (19.1)	2 (1.3)	15 (5.1)	
1	89 (62.2)	81 (54.0)	170 (58.0)	0.001
>1	41 (28.7)	67 (44.7)	108 (36.9)	
The ability of buying soap and shampoo				
Yes	187 (94.4)	190 (97.4)	377 (95.9)	0.013
No	11 (5.6)	5 (2.6)	16 (4.1)	
History of Tinea capitis households in recent year				
Yes	29 (14.6)	33 (16.5)	62 (15.6)	0.61
No	169 (85.4)	167 (83.5)	336 (84.4)	
History of Tinea capitis in the subject in recent year				
Yes	9 (4.5)	1 (0.5)	10 (2.5)	0.01
No	189 (95.5)	196 (99.5)	385 (97.5)	
Presence of domestic animal in home vicinity				
Yes	160 (80)	155 (77.5)	315 (78.7)	0.54
No	40 (20)	45 (22.5)	85 (21.3)	
Referring to barbershop				
Yes	37 (18.8)	24 (12.1)	61 (15.4)	0.06
No	160 (81.2)	175 (87.9)	335 (84.6)	

*Values in parentheses shows percentage

and geographical settings (Clayton and Hay, 1994). The most prevalent etiologic agent in the United States has been shown to be *T. tonsurans* (Pomeranz *et al.*, 1999) and it was of the second most prevalent agent in a study conducted in Spain (Rubio-Calvo *et al.*, 2001).

It should be noteworthy that in the recent years in most of the developed countries a shift from Anthropophilic to Zoophilic fungal infections has been documented (Rubio-Calvo *et al.*, 2001).

Generally, Anthropophilic fungi are transmitted from human to human and the probability of asymptomatic carriage is relatively high, while Zoophilic fungi such as *T. mentagrophytes* are less likely lead to asymptomatic carriage (Ilkit *et al.*, 2007).

In total, 86% of cases occurred during the outbreak were male which is compatible with other studies (Bassiri Jahromi and Khaksar, 2006; Rubio-Calvo *et al.*, 2001). The higher susceptibility of boys to *Tinea capitis* in comparison to girls may be due to the later onset of puberty in boys (Sberna *et al.*, 1993). The reason why the disease has primarily occurred in school children is that the fungistatic action of fatty acids of adult sebum has a potential role in inhibition of fungal growth (Bassiri Jahromi and Khaksar, 2006; Rubio-Calvo *et al.*, 2001).

The probability of *Tinea capitis* was higher among those with a lower socioeconomic status, those who took bath less than once per week and those with no bathroom in their home (Table 1). The role of sanitation and personal hygiene in the development and spreading of outbreaks of *Tinea capitis* has been well documented in other studies (Leeming and Elliot, 1995; Svejgaard, 1995). During 1950s most of the *Tinea capitis* epidemics in Europe were seen in conditions of overcrowding, poor hygiene and poverty (Svejgaard, 1995).

Recent history of similar disease was reported in 4.5% of cases and 0.5% of controls ($p < 0.05$) (Table 1). Although the fungal cause of the outbreak was zoophilic the possible role of asymptomatic cases should not be neglected (Ilkit *et al.*, 2007; Pomeranz *et al.*, 1999). So to control the outbreak active case finding should be considered especially among children (Ilkit *et al.*, 2007).

Owing to zoophilic nature of the *T. mentagrophytes* it was expected that presence of animal pets or domestic animals in the child's environment would be more prevalent in the case group rather than control (Vidotto *et al.*, 1991). The results showed no significant difference in this regard which may be due to clustering effect and selection of both cases and controls from the same schools (Table 1).

In the patient group the percentage of the people who referred regularly to the public barbers was 19% and it was lower than control group (12%) which was marginally significant ($p = 0.06$) (Table 1). So it can be concluded that poor hygienic adherence of public barbers and comb sharing may be related factors to the propagation of epidemic (Bassiri Jahromi and Khaksar, 2006; Pomeranz *et al.*, 1999).

CONCLUSION

In conclusion, the findings of this investigation demonstrate the public health importance of increasing efforts to promote the living condition and housing for the residents. Improvement of environmental health, public attention to personal hygiene and active case finding would be effective in decreasing and preventing *Tinea capitis*.

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