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Prevalence and Seasonal Variation of Fungal Diseases Among Inhabitants of Parts of Gaza-Palestine.**Abstract**

Although skin diseases are common, this is the first study addressing the prevalence of fungal diseases in areas of the Gaza Strip, one of the most overpopulated areas in the world, expected to have high prevalence of fungal diseases in Gaza Strip. In the present study data was obtained from the Ministry of health records and from patients attending the Dermatology Department in Al-Shifa Hospital-Gaza. Each patient participated in the study filled a questionnaire including age, sex, residence, type of fungal disease and site of infection. ANOVA was used to compare the means of different species diagnosed according to seasons for years 1998-2001. The present study showed that (32%) of individuals from both sexes suffered from fungal infection. The results showed that both head and skin were the most affected locations the body for infections (15.9%) and (10.5%) respectively. The most prevalent types of *Tinea* recorded was *Tinea capitis* (23.3%). There was a significant association between fungal disease and age ($p=0.001$). A significant seasonal variation was observed between the mean of fungal disease in winter vs summer ($p=0.02$) for the years 1998, 2000 and 2001. It was concluded that fungal diseases are still common in the Gaza Strip community and the prevalence between seasons was found to be higher in summer.

Key words: Dermatophytoses, Prevalence, Fungal, Infection, Gaza.**Introduction**

Gaza Strip is an elongated area of Palestine bordered by Egypt from the South, the green line from the North, Negev desert from the East and the Mediterranean Sea from the West. The total surface area of Gaza Strip is 300 Km², and it is an overpopulated area with an estimated population of 1,443,737 for the year 2004 (1). The average daily mean temperature range from 25 °C in summer to 13 °C in winter. Average daily maximum temperatures range from 29 °C to 17 °C and minimum temperatures from 21 °C to 9 °C in the summer and winter respectively. The average annual rainfall varies from 450mm/yr in the north to 200mm/yr in the south. Most of rainfall occurs during period, the period of October thru March. Superficial fungal infections of the skin, including dermatophytoses, are a public health problem in the world especially in economically underdeveloped and developing countries (2).

In Gaza fungal diseases are common and seem to be related to the habits of personal hygiene and crowdness. Despite, its prevalence, fungal infections has never been studied in Gaza. The present study is aimed to investigate the prevalence of fungal diseases and their seasonal variation among the inhabitants of the Gaza Strip.

Additionally, distribution of fungal diseases by age, area and habits was studied.

Subjects and Methods

Data were collected from patients attending the dermatology Department in AL-Shifa Hospital, the main hospital in the Gaza Strip and from the records of Ministry of health. The sample size was 1470 patients. All patients complained from the presence of fungal diseases in some locations of the body including: nails, hands, foot, groin, trunk, face, skin, tongue, beard and vagina. Their ages varied from months to 75 years old. They were examined by a dermatologist and advised of medication for each case. The fungal specimens were examined, classified and confirmed microscopically in 10% KOH. The second phase of this work included the studying of the seasonal variation of fungal diseases in Gaza Strip from 1998 to 2001.

Statistical analysis

Statistical package for social sciences Inc., Chicago, Illinois (SPSS/PC) was used for data analysis. Frequency, cross-tabulation and Chi-square were applied and p-values less than 0.05 were considered to be statistically significant. The study variables were entered, one way analysis of variance (ANOVA) procedure was used to test the hypothesis in which several means are equal. ANOVA is used to compare the means of

different species diagnosed according to seasons for years 1998-2001. In order to know which mean differs significantly we

Results

The results of the present study showed that the prevalence of fungal diseases was 235 per 100,000 persons living in the Gaza Strip. The number of the infected males and females were 490 (49%) and 510 (51%) respectively. The site of infection with fungal diseases in the body is illustrated in Table 1. A total of 233 (15.9%) cases were in the head, 57 (3.9%) cases in the nails, 57 (3.9%) cases in the hands, 145 (9.9%) cases

perform Turkey's Honesty significant difference (HSD).

in the foot, 114 (7.8%) cases in the groin, 137 (9.3%) cases in the trunk and neck, 154 (10.5%) cases in the skin, 47 (3.2%) cases, in the face, 22 (1.5%) cases in the tongue, 9 (0.6%) cases in the beard and 25 (1.7%) cases the vagina.

This study showed that the general prevalence of fungal diseases in Gaza was 68% (1000 out of 1470).

Table. 1 The distribution of infected persons according to location of infection.

In situ infection	No. of patients	%
Head	233	15.9
Nail	57	3.9
Hand	57	3.9
Foot	145	9.9
Groin	114	7.8
Trunk and neck	137	9.3
Skin	154	10.5
Face	47	3.2
Tongue	22	1.5
Beard	9	0.6
Vagina	25	1.7
Total infected	1000	68.0
No-infected	470	32.0
Total	1470	100.0

A high prevalence of fungal infection was observed in head (15.9) while the least was in the beard (0.6).

Table 2 and Fig.1 The distribution of infected patients with all types of fungal diseases according to the area and population.

Area	No of people in each area	No. of positive fungal cases	Prevalence per 100,000
Al-remal	261	164	63
Al-nasser	160	81	51
Al-shagaeia	333	261	78
Al-tofah	177	130	73
Al-daraj	154	94	61
Al-zayton	167	111	66
Al-sha'af	104	78	75
Jabalia	114	81	71
Total	1,470	1,000	68

It was observed high prevalence of infected patients in Al-shagaeia (78) while the least one is in Al-nasser (51).

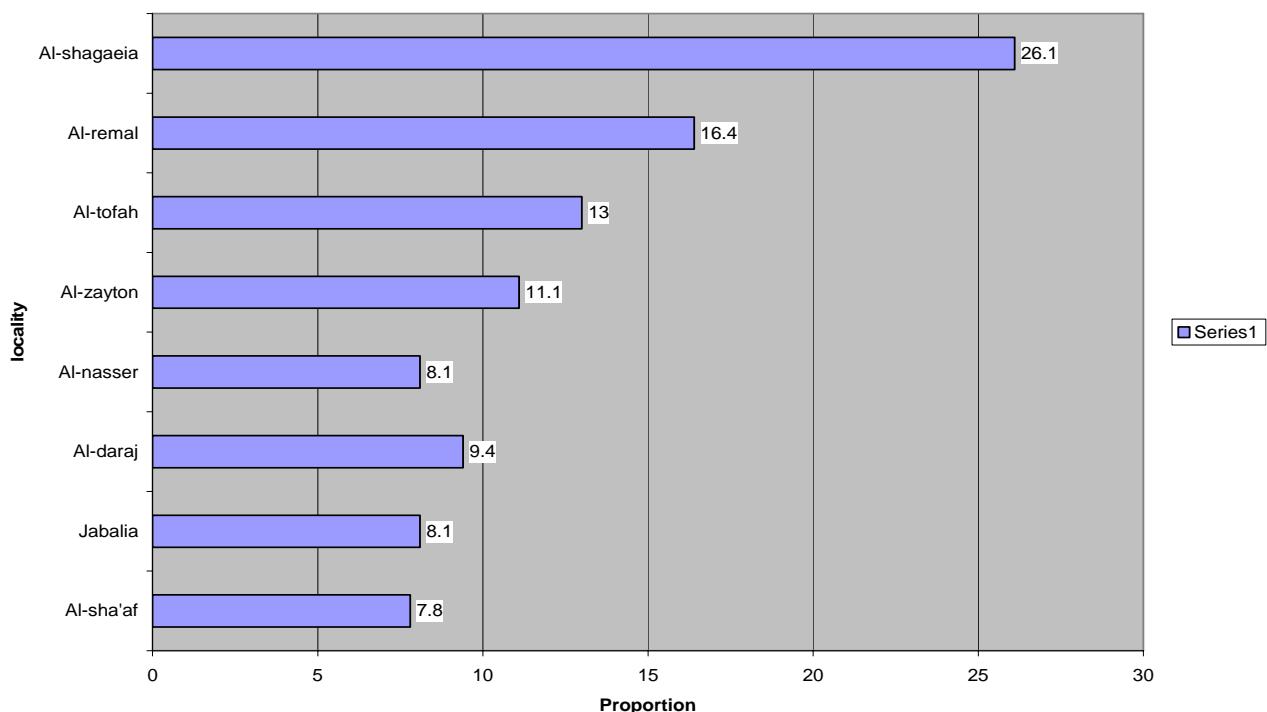


Fig.1 Distribution of infected patients by locality

It was found that the prevalence of fungal diseases was high in Al-Shagaeia area (26.1%) and low in Al-sha'af (7.8%).

Table3. The distribution of infection with different types of fungi

Type of fungus	No. of positive fungal cases	%
<i>Tinea capititis</i>	233	23.3
<i>T. corporis</i>	129	12.9
<i>T. versicolor</i>	145	14.5
<i>T. pedis</i>	129	12.9
<i>T. manuum</i>	23	2.3
<i>T. cruris</i>	84	8.4
<i>T. circinata</i>	82	8.2
<i>T. facial</i>	29	2.9
<i>T. unguium</i>	31	3.1
<i>T. barbae</i>	9	0.9
Candidiasis	82	8.2
onychomycosis	24	2.4
Total	1000	100.0

It was observed high prevalence of *Tinea capititis* (23.3) while the least one is *T. barbae* (0.9)

Table 4. The distribution of fungal diseases according age group.

	Month to year No. %	Age group of patients						p-value
		2-15 y No. %	16-30 y No. %	31-45 y No. %	46-60 y No. %	61-75 y No. %		
Infected	37 (51.4)	263 (64.9)	340 (59.6)	216 (91.5)	125 (83.9)	19 (50)		0.001
Not-infected	35 (48.6)	142 (35.1)	230 (40.4)	20 (8.5)	24 (16.1)	19 (50)		
	72	405	570	236	149	38		

($\chi^2=112.17$, Df=5, p=0.001)

It was observed high prevalence of fungal diseases in the age group 31-45 y (91.5%), while the least one in age group 61-75y (50%).

Table 5. The distribution of fungal infections according seasons in 1998.

Type of infection	Winter	Spring	Summer	Autumn
<i>Tinea capititis</i>	346	556	654	375
<i>Tinea corporis</i>	190	278	339	257
<i>T. versicolor</i>	297	502	752	416
<i>T. pedis</i>	196	335	558	555
<i>T. cruris</i>	156	245	486	309
<i>T. manuum</i>	148	177	437	271
<i>T. circinata</i>	177	288	412	239
<i>T. facial</i>	115	111	225	104
<i>T. unguium</i>	138	305	604	323
Onychomycosis	222	265	480	320
Candidiasis	529	1056	1873	1065
<i>T. barbae</i>	0	0	30	0
Mean	210*	343	571*	353

ANOVA, F=2.9, p=0.04

By using Tukey's HSD , the difference was observed between the mean of fungal diseases in winter vs summer (p=0.02).

Using ANOVA the prevalence of fungal diseases was shown to be dependent on seasons (f=2.9, p<0.05), since the prevalence

was the highest in summer while the lowest prevalence was in winter. Tukey's Honesty significance difference specified that the mean of prevalence of fungal diseases in summer was statistically higher than that of winter (p=0.027).

Table 6. The distribution of fungal infections according seasons in 1999.

Type of infection	Winter	Spring	Summer	Autumn
<i>Tinea capititis</i>	339	553	647	359
<i>Tinea corporis</i>	190	275	330	251
<i>T. Versicolor</i>	297	501	739	493
<i>T. pedis</i>	190	339	543	549
<i>T. cruris</i>	152	244	482	303
<i>T. manuum</i>	-	-	-	-
<i>T. circinata</i>	-	-	-	-
<i>T. facial</i>	-	-	-	-
<i>T. unguium</i>	-	-	-	-
Onychomycosis	508	1008	1687	1058
Candidiasis	222	267	470	317
<i>T. barbae</i>	-	-	-	-
Mean	271*	455	700*	476

ANOVA, F=2.3, p=>0.05

By using Tukey's HSD , No difference was observed between the mean of fungal diseases in winter vs. summer (p=>0.05).

Table 7. The distribution of fungal infections according seasons in 2000.

Type of infection	Winter	Spring	Summer	Autumn
<i>Tinea capitis</i>	330	510	638	350
<i>Tinea corporis</i>	188	288	344	261
<i>T. Versicolor</i>	300	510	737	503
<i>T. pedis</i>	196	353	554	541
<i>T. cruris</i>	157	248	483	277
<i>T. manuum</i>	141	171	429	269
<i>T. circinata</i>	171	280	403	227
<i>T. facial</i>	85	103	250	109
<i>T. unguium</i>	128	293	601	313
Onychomycosis	209	373	486	328
Candidiasis	485	982	1666	1051
<i>T. barbae</i>	0	0	0	0
Mean	217*	374	623*	384

ANOVA, F=3.9, p=0.01

By using Tukey's HSD , The difference was observed between the mean of fungal diseases in winter vs summer (p=<0.05).

Table 8. Distribution of fungal infections according seasons in 2001.

Type of infection	Winter	Spring	Summer	Autumn
<i>Tinea capitis</i>	50	99	62	22
<i>Tinea corporis</i>	14	31	61	23
<i>T. Versicolor</i>	5	39	70	31
<i>T. pedis</i>	9	33	53	34
<i>T. cruris</i>	3	28	39	14
<i>T. manuum</i>	1	5	14	4
<i>T. circinata</i>	5	22	38	18
<i>T. facial</i>	4	11	12	2
<i>T. unguium</i>	-	-	-	-
Onychomycosis	1	2	18	4
Candidiasis	5	9	40	26
<i>T. barbae</i>	1	1	2	7
Mean	9.7	25	37	17

ANOVA, F=3.5, p=0.02

By using Tukey's HSD , The difference was observed between the mean of fungal diseases in winter vs summer (p=<0.05).

Table 9. The type of fungal diseases distributed by year from 1998-2001 in Gaza city.

Type of infection	1998	1999	2000	2001
<i>Tinea capitis</i>	1934	1898	1828	233
<i>T. corporis</i>	1160	1046	1081	129
<i>T. versicolor</i>	1967	2030	2050	145
<i>T. pedis</i>	1644	1621	1644	129
<i>T. cruris</i>	1196	1181	1165	84
<i>T. manuum</i>	1033	-	1010	23
<i>T. circinata</i>	1116	-	1081	82
<i>T. facial</i>	585	-	547	29
<i>T. unguium</i>	1370	-	1335	-
Onychomycosis	1287	4261	1296	24
Candidiasis	4523	1276	4184	82
<i>T. barbae</i>	30	-	-	9
Total	17845	13313	17221	1000
Prevalence	(29%)	(17%)	(27%)	(27%)

The lowest Annual distribution of fungal diseases is in 1999.

Discussion

This study is the first epidemiological survey for fungal diseases in Gaza Strip where the prevalence and incidence of fungal diseases is available through the data and records of Palestinian Ministry of Health. All individuals that participated in the study were attended the dermatology department at Al-Shifa hospital presenting with different complaints. From the present study it is possible to draw a true picture to estimate prevalence and the specific types of fungal diseases in Gaza. The study showed that almost half of the studied individuals suffered from fungal diseases. Al-shagaeia area had the highest prevalence of fungal diseases among other localities of Gaza Strip

2001 a significant correlation between prevalence and seasonal variation (summer vs. winter) was found. Very high humidity in Gaza especially during the summer may explain the high prevalence of fungal diseases observing during this period.

It is important to indicate that the missing information concerning four different infections for the year 1999 can explain the lower prevalence of fungal diseases during this year.

Recommendations

Al-Shagaeia area may need such program to solve this problem and more medical campagains to help in reducing the prevalence of skin diseases.

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References.

1. Palestinian Central Bureau of Statistics (PCBS) (1997) Palestine in figures 2003, May 2004.
2. Kasai, T. (2001) Epidemiological investigation Committee for Human Mycoses in the Japanese Society for Medical Mycology. 1997 Epidemiological survey of dermatophytes in Japan. *Nippon Ishinkin Gakkai Zasshi*; 42:11-8.
3. Gonzalez, U.; Seaton, T.; Bergus, G.; Torres, J.M.; Jacobson, J. (2004) Systemic antifungal therapy for *Tinea capitis* in children. Cochrane library, Issue. 2. Chichester: Wiley.
4. Aly, R. (1994) Ecology and epidemiology of dermatophyte infections. *J Am Acad Dermatol.* 31:S21-5.
5. Akpolat, N.O; Akdeniz, S.; Elci, S.; Atmaca, S. and Ozekinci, T. (2005) *Tinea capitis* in Diyarbakir, Turkey. *Mycoses*, 48:8-10.
6. A. Rastegar Lari¹, L. Akhlaghi², M. Falahati² and R. Alaghehbandan³ (2005) Characteristics of dermatophytoses among children in an area south of Tehran, Iran. *Mycosis*. volume 48 Issue 1 (32-37)
7. Cheng, S. and Chong, L. (2002) A prospective epidemiological study on *Tinea pedis* and onychomycosis in Hong Kong. *Chin. Med. J (Engl)* 115(6):860-5.
8. R. Maruyama¹ M. Hiruma² K. Yamauchi³ S. Teraguchi³ and H. Yamaguchi⁴ (2003) An epidemiological and clinical study of untreated patients with *Tinea pedis* within a company in Japan. Volume 46 Issue 5-6 (208 -212)