Results

RESULTS

One hundred renal allograft recipients and twenty apparently normal control cases were studied in Urology and Nephrology Center, Mansoura, Egypt.

A total of 402 patient samples; urine (100/402); stool (100/402); sputum (100/402); skin scraps (2/402) and sera (100/402) were collected. 182 fungal isolates were recovered from 100 patients; (159/182) were included into 8 single species and (23/182) were grouped as mixed species. A total of 63 control samples; urine (20/63); stool (20/63); sputa (3/63) and sera (20/63) were collected. From 20 control cases, 12 fungal isolates were recovered; *Candida* and *Aspergillus spp.* could only be isolated.

Table (1) shows the results obtained from one hundred renal allograft recipients and twenty normal control cases. *Candida* was found to be the most prevalent fungal isolates (115/194) which was recovered from both the transplanted patients (23 from urine, 53 from stool and 30 from sputum) and the controls (2 from urine and 7 from stool). *Aspergillus niger* (11/194) also isolated from the cases (5 from stool and 3 from sputum) and the controls (2 from stool and one from sputum).

All the other fungal species were recovered only from transplanted cases with *Penicillium species* as the most prevalent (19/194) followed by *Mucor species* (13/194). Other fungi were isolated with less frequency as *Trichosporon species* (4/194), *Saccharomyces species* (4/194), *Rhizopus species* (3/194) and *Geotrichum species* (2/194).

The mixed isolates were recovered from 23 patients (23/194); 12 from stool and 11 from sputum. The mixed isolates from stool were; (3/12) *Saccharomyces* and *Trichosporon* species; (2/12) *Trichosporon* and *Aspergillus species;* (2/12) *Mucor* and *Aspergillus species*; (1/12) *Rhizopus and Aspergillus species;* (1/12) *Rhizopus* and *Mucor species;* (1/12) *Mucor* and *Penicillium* species; (1/12) *Geotrichum* and *Saccharomyces species* and (1/12) *Aspergillus and Penicillium species.* The mixed isolates from sputum were; (4/11) *Mucor & Penicillium spp*; (3/11) *Penicillium & Aspergillus spp*; (2/11) *Mucor & Aspergillus spp*; (1/11) *Rhizopus & Aspergillus spp* and (1/11) *Rhizopus & Penicillium spp.* No fungal isolates other than *Candida spp* were recovered from urine samples.

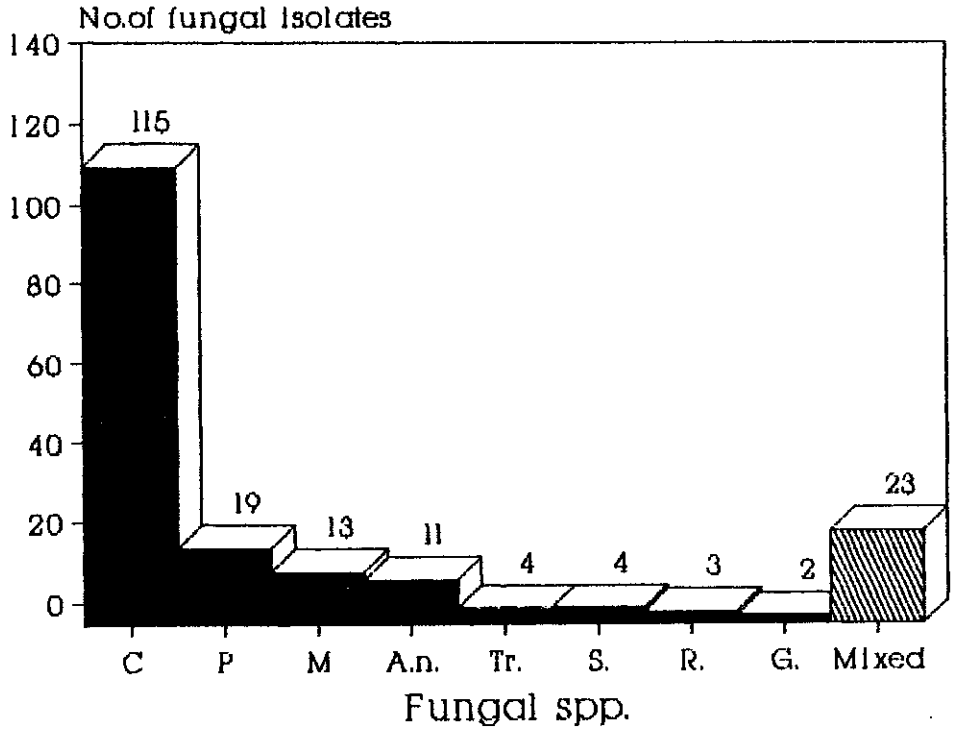
Table (1) SEX DISTRIBUTION IN CASES AND CONTROLS WITH POSITIVE CULTURES

Isolated Fungus Spp.	Total No. of isolates	Urine				Stool				Sputum			
		Cases		Control		Cases		Control		Cases		Control*	
		M	F	M	F	M	F	M	F	M	F	M	F
Candida	(115)	10	13	--	2	44	9	4	3	25	5	--	--
Asp. niger	(11)	--	--	--	--	4	1	1	1	2	1	1	--
Trichosporon	(4)	--	--	--	--	3	1	--	--	--	--	--	--
Saccharomyces	(4)	--	--	--	--	4	--	--	--	--	--	--	--
Geotrichum	(2)	--	--	--	--	1	1	--	--	--	--	--	--
Penicillium	(19)	--	--	--	--	6	3	--	--	8	2	--	--
Mucor	(13)	--	--	--	--	3	4	--	--	5	1	--	--
Rhizopus	(3)	--	--	--	--	1	1	--	--	--	1	--	--
Mixed	(23)	--	--	--	--	10	2	--	--	8	3	--	--
Total	(194)	10	13	--	2	76	22	5	4	48	13	1	--

M = Male F = Female

* Only three sputum specimens were available from the control cases, one of them yielded *Aspergillus niger* and the other two specimens

Fig.1 Different Fungal Species Isolated From Different Samples



C = Candida
P = Penicillium
M = Mucor
A.n.= Aspergillus niger
Tr. = Trichosporon
S. = Saccharomyces
R. = Rhizopus
G. = Geotrichum

Table (2) shows the distribution of *Candida spp* in different body samples. 115 isolates were recovered, *Candida tropicalis* was the most frequent species (86/115) which was recovered from both the cases (19 from urine, 36 from stool and 23 from sputum) and the controls (2 from urine and 6 from stool). *Candida stellatoidia* (13/115) isolated only from the cases. *Candida pseudotropicalis* (8/115) isolated from both the cases (4 from stool and 3 from sputum) and the controls (1 from stool). *Candida stellatoidia* (13/115) and *Candida guilliermondii* (8/115) isolated only from the cases. No *Candida albicans* could be isolated from any sample.

In table (3), urine was found positive for *Candida species* in 23% of cases (23/100). Ten were males (mean age = 37.8 $\pm$ 9.3), most of them (8/10) were above the age of 30 years the males aged more than 30 years and 13 were females (mean age = 29.5 $\pm$ 6.5), most of the females (9/13)were located in the age group 21 to 30 years. The more prevalence of Candiduria in females was found statistically significant (P=0.02), otherwise it was not statistically associated with any particular age group (P=0.526).

Table (2) DISTRIBUTION OF CANDIDA SPECIES IN DIFFERENT SAMPLES.

Candida Spp.	Total No. of isolates	Urine		Stool		Sputum	
		Cases	Control	Cases	Control	Cases	Control
C.tropicalis	(86)	19	2	36	6	23	--
C.stellatoidia	(13)	2	--	7	--	4	--
C.pseudotropicalis	(8)	--	--	4	1	3	--
C.guilliermondii	(8)	2	--	6	--	--	--
C.albicans	--	--	--	--	--	--	--
Total	(115)	23	2	53	7	30	--

Fig.2 Different Candida Spp.

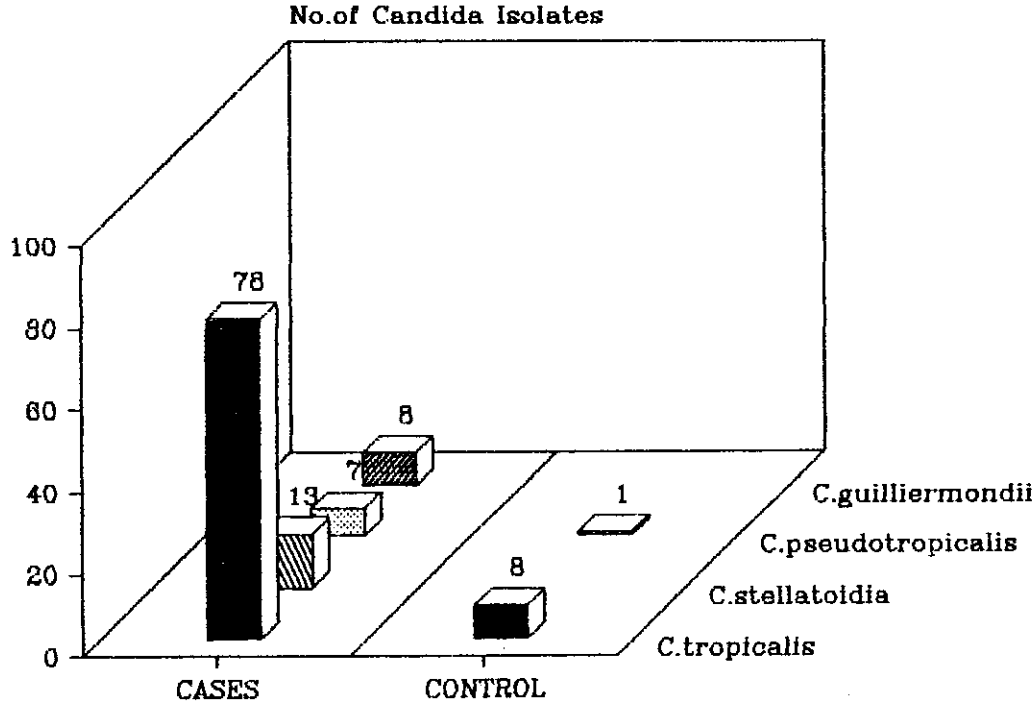
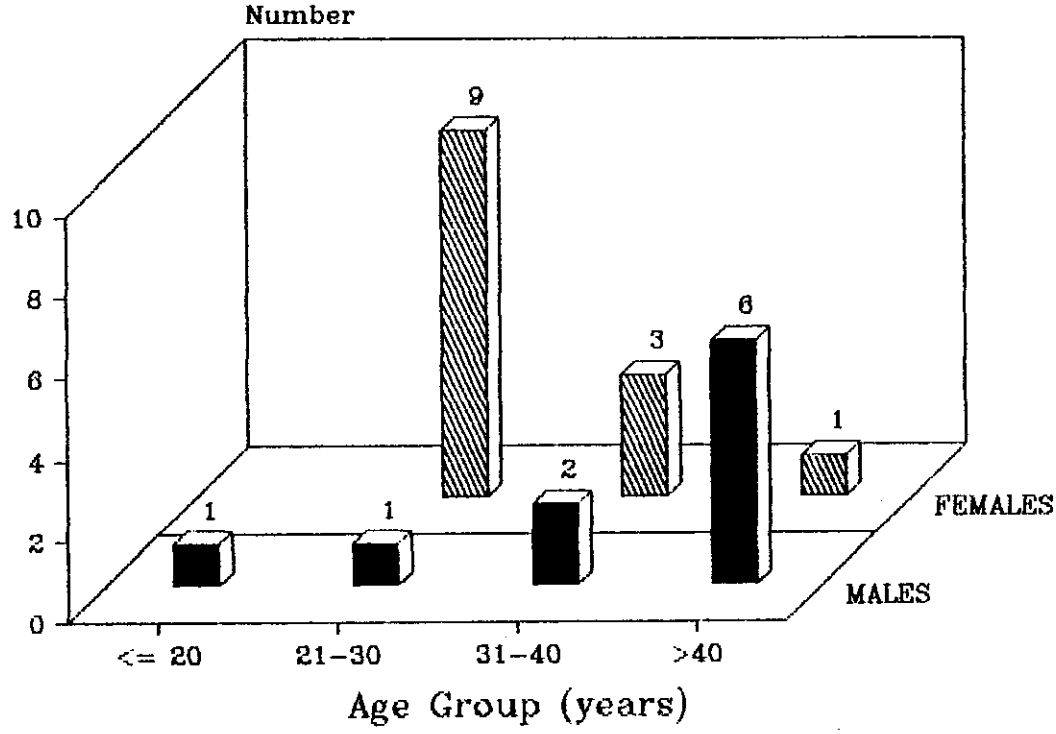


Table (3) AGE AND SEX DISTRIBUTION OF 23 CASES WITH CANDIDURIA

Age group	Total No. of cases in each age gp.		Urinary Candida	
			Male	Female
< = 20	(7)	(14. 2%)	1	-
21 - 30	(36)	(27 .7%)	1	9
31 - 40	(36)	(13.85%)	2	3
> 40	(21)	(33. 3%)	6	1
Total	(100)		10	13

Fig.3 Age and Sex Distribution in Patients With Candida in Urine



In table (4), Candida versus other fungi isolated from stool and sputum were illustrated. In regard to stool, Candida was recovered in 53% of the cases (53/100), the highest prevalence (19/53) was located in both the age groups 21-30 and 31-40. The fungal species other than Candica were accounted for 45% of the cases (45/100); the highest prevalence (17/45) was located in age group 31-40. No fungal isolates were detected in the remaining two cases (2/100). No statistically significant association was found between age and presence of fungi in stool (p=0.982).

In regard to sputum,Candida was recovered in 30% of the cases (30/100), the highest prevalence (13/30) was located in age group 31-40. The fungal species other than Candida accounted for 31% (31/100), the highest prevalence (14/30) was located in age group 21-30. The rest of cases were fungus free (39/100). No statistically significant association was found between age and the presence of fungi in sputum (P=0.428).

Table (4) AGE DISTRIBUTION IN CASES WITH INTESTINAL AND RESPIRATORY FUNGAL ISOLATES (Candida Vs. Others).

Age group	Total No. of cases in each age gp.	Intestinal				Respiratory			
		Candida		Others		Candida		Others	
< = 20	(7)	3	(42.8%)	3	(42.8%)	--	(0%)	3	(42.8%)
21 - 30	(36)	19	(52.7%)	16	(44.4%)	6	(16.6%)	14	(38.8%)
31 - 40	(36)	19	(52.7%)	17	(47.2%)	13	(36.1%)	11	(30.5%)
> 40	(21)	12	(57.1%)	9	(42.8%)	11	(52.3%)	3	(14.2%)
Total	(100)	53		45		30		31	

Kidney function was classified according to serum creatinine level into 3 groups; 55 patients were found with good kidney function (<1.5 mg/dl), 38 patients with moderate function (1.5 - 2.5 mg/dl) and 7 patients with poor function (>2.5 mg/dl).

Urine was found positive for Candida in 15/55 of the patients with good function (4 males, 11 females), 7/38 of the patients with moderate function (5 males, 2 females) and only one male (1/7) with poor kidney function was found positive for candiduria.

No statistically significant association was found between kidney function and urinary candida (p=0.335) as shown in Table (5).

In Table (6), Stool was found positive for Candida in 31 patients (31/55) with good kidney function, 20 patients (20/38) with moderate function and two patients (2/7) only with poor kidney function. Stool was positive for fungi other than Candida in 22 patients (22/55) with good function, 18 patients (18/38) with moderate function and 5 patients (5/7) were with poor kidney function. No statistically significant association was found between kidney function and fungi detected in stool (p=0.319).

Sputum was positive for Candida in 13 patients (13/55) with good function, 14 patients (14/38) with moderate function and 3 patients (3/7) with poor kidney function.

Sputum was positive for fungi other than Candida in 17 patients (17/55) with good function, 10 patients (10/38) with moderate function and 4 patients (4/7) with poor kidney function. No statistically significant association was found between kidney function and fungi detected in sputum ($p=0.512$).

Table (5) RELATION OF KIDNEY FUNCTION AND URINARY CANDIDA.

Kid.F.*	No. of cases examined		Urinary Candida	
			Male	Female
Good	(55)	(27.2%)	4	11
Moderate	(38)	(18.4%)	5	2
Poor	(7)	(14.2%)	1	-
Total	(100)		10	13

* Kidney function evaluated by serum creatinine level, where

Good F. = (<1.5 mg/dl).

Moderate F.= (1.5-2.5 mg/dl)

Poor F. = (>2.5 mg/dl).

Table (6) RELATION OF KIDNEY FUNCTION TO CASES WITH INTESTINAL AND RESPIRATORY FUNGAL ISOLATES (Candida vs. Others).

Kid. F.	No. of cases examined	Intestinal				Respiratory			
		Candida		Others		Candida		Others	
Good	(55)	31	(56.3%)	22	(40%)	13	(23.6%)	17	(30.9%)
Moderate	(38)	20	(52.6%)	18	(47.3%)	14	(36.8%)	10	(26.3%)
Poor	(7)	2	(28.5%)	5	(71.4%)	3	(42.8%)	4	(57.1%)
Total	(100)	53		45		30		31	

The period after kidney transplantation was classified into 3 groups; 12 months (41 patients); 13 to 36 months (34 patients) and after 36 months (25 patients) post operatively.

Within 12 months after kidney transplantation, urine was found positive for Candida in (5/41) patients (3 males & 2 females), after 13 to 36 months, (11/34) patients were found positive for Candida (3 males & 8 females) and after 36 months post operatively, urine was positive for Candida in (7/25) patients (4 males & 3 females). The relation between post transplantation period and presence of Candida in urine was found statistically insignificant ($p=0.416$) Table (7).

In table (8), stool was found positive for Candida in (25/41) patients within a period of 12 months after kidney transplantation, (17/34) patients in the period from 13-36 months, and (11/25) patients after 36 months post operatively. Fungi other than Candida were found in (15/41) patients within a period of 12 months after kidney transplantation, (16/34) patients after 13 to 36 months and (14/25) patients after 36 months. No statistically significant association between post transplantation period and fungi detected in stool was found ($p=0.324$).

Sputum was found positive for Candida in (9/41) patients within a period of 12 months after kidney transplantation,

(14/34) patients were positive for Candida in the period from 13-36 months and after 36 months, (7/25) patients were positive for Candida.

Fungi other than Candida were found in (9/41) patients within the first 12 months postoperatively, (11/34) patients in the period from 13 to 36 months and (11/25) patients after 36 months. No statistically significant association between post transplantation period and fungi detected in sputum ($p=0.539$).

Tabe (7) RELATION OF POST TRANSPLANTATION PERIOD AND URINARY CANDIDA

Period/month	No. of cases examined		Urinary Candida	
			Male	Female
< = 12	(41)	(12.1%)	3	2
13 - 36	(34)	(32.3%)	3	8
> 36	(25)	(28%)	4	3
Total	(100)		10	13

Table (8) RELATION OF POST TRANSPLANTATION PERIOD TO CASES WITH INTESTINAL AND RESPIRATORY FUNGAL ISOLATES (Candida vs. Others).

Period/month	No. of cases examined	Intestinal				Respiratory			
		Candida		Others		Candida		Others	
< = 12	(41)	25	(60.9%)	15	(36.5%)	9	(21.9%)	9	(21.9%)
13 - 36	(34)	17	(50%)	16	(47%)	14	(41.1%)	11	(32.3%)
> 36	(25)	11	(44%)	14	(56%)	7	(28%)	11	(44%)
Total	(100)	53		45		30		31	

Regarding the immunosuppressive drugs, the patients were classified into 3 groups; group I was found constituted of 49 patients received conventional therapy (prednisolone and azathioprine), out of these patients;8 revealed Candida in urine (16.3%), group II constituted of 14 patients received cyclosporin A therapy (prednisolone and cyclosporin A), out of these patients; 3 revealed Candida in urine (21.4%) and group III constituted of 37 patients received triple therapy (prednisolone, azathioprine and cyclosporin A), out of these patients; 12 revealed Candida in urine (32.4%). The relation between type of immunosuppression and urinary Candida was statistically insignificant (p=0.211), Table (9).

In table (10), stool was found positive for Candida in (30/49) patients who received conventional therapy (61.2%), (8/14) patients who were under cyclosporin A therapy (57.1%) and (15/37) patients who were under triple therapy (40.5%). Fungi other than Candida in stool were isolated from (19/49) patients under conventional therapy (38.7%), (6/14) patients under cyclosporin A therapy (42.8%) and (20/37) of patients under triple therapy (54%).

No statistically significant association between type of immunosuppression and presence of fungi in stool (p=0.242).

Sputum was positive for Candida in (13/49) of patients under conventional therapy (26.5%), (3/14) of patients under cyclosporin A therapy (21.4%) and (14/37) patients under triple therapy (37.8%). Fungi other than Candida in sputum isolated from (13/49) patients under conventional therapy (26.5%), (4/14) patients under cyclosporin A therapy (28.5%) and (14/37) patients under triple therapy (37.8%).

No statistically significant association between type of immunosuppression and fungi detected in sputum ($p=0.938$).

Table (9) RELATION OF IMMUNOSUPPRESSIVE REGIMENS AND URINARY CANDIDA

Immunosupp.*	No. of cases examined		Urinary Candida
Conventional	(49)	(16.3%)	8
Cyclosporin A	(14)	(21.4%)	3
Triple	(37)	(32.4%)	12
Total	(100)		23

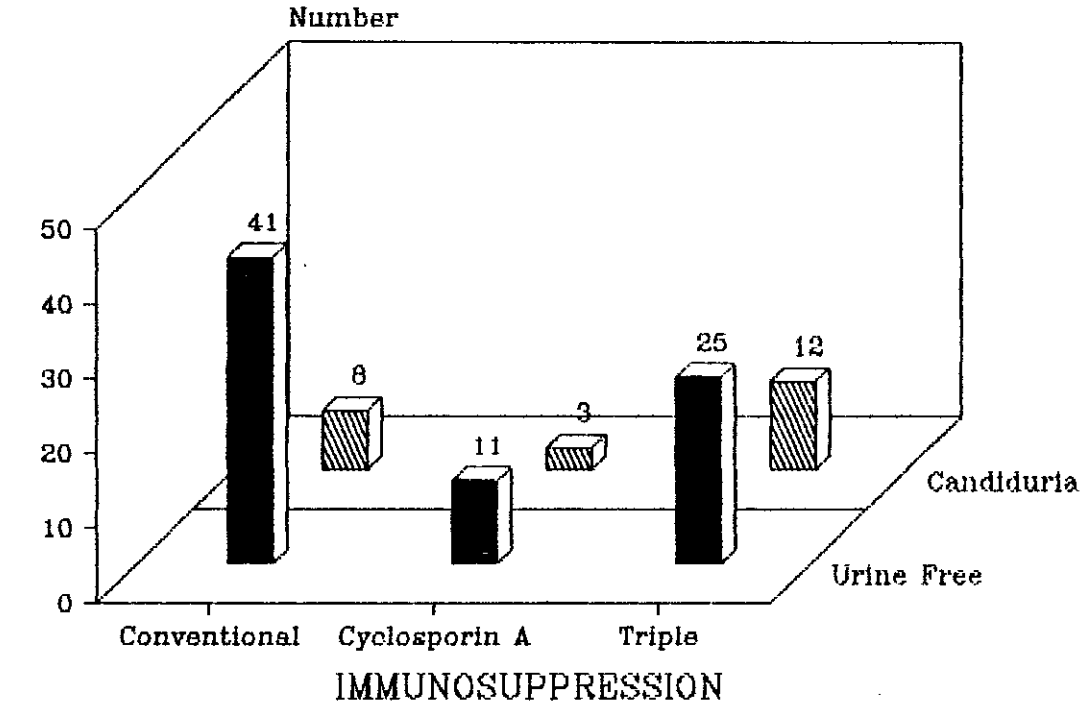
* Immunosuppression regimens include:

Conventional therapy = Prednisolone + Azathioprine

Cyclosporin A therapy = Prednisolone + Cyclosporin A

Triple therapy = Prednisolone + Azathioprine + Cyclosporin A.

Fig.4 Urinary Candida in Relation to Type of Immunosuppression



Total = 100 cases

Table (10) RELATION OF IMMUNOSUPPRESSION TO CASES WITH INTESTINAL AND RESPIRATORY FUNGAL ISOLATES (Candida vs. Others).

Immunosupp.	No. of cases examined	Intestinal		Respiratory	
		Candida	Others	Candida	Others
Conventional	(49)	30 (61.2%)	19 (38.7%)	13 (26.5%)	13 (26.5%)
Cyclosporin A	(14)	8 (57.1%)	6 (42.8%)	3 (21.4%)	4 (28.5%)
Triple	(37)	15 (40.5%)	20 (54%)	14 (37.8%)	14 (37.8%)
Total	(100)	53	45	30	31

Table (11) shows the serum titers of one hundred patients and twenty normal controls for Candida antibodies as revealed by indirect immunofluorescent antibody technique (IFA). Out of 100 patients; 2 cases (2%) showed reaction with a titer less than 1/20; 60 cases (60%) showed reaction to a titer of 1/20 ; 34 cases (34%) showed positive reaction with a titer of 1/40 and 4 cases (4%) showed candida antibodies with a serum titer of 1/80.

Out of 20 normal controls; 17 cases (85%) showed a titer less than 1/20 and 3 cases (15%) were with a titer of 1/20.

Table (12) showed the results of indirect immunofluorescent antibody test for Candida antibodies in relation to the corresponding culture results. Out of 23 patients with positive urine cultures, 10 gave a serum titer of 1/20; 9 were with a titer of 1/40; 4 cases were positive for a serum titer of 1/80.

Out of 77 patients with negative urine cultures; 2 showed a reaction with a titer less than 1/20; 51 with a titer of 1/20 and 24 with a titer of 1/40.

Out of 53 patients with positive stool cultures; 33 cases gave reactions with a serum titer of 1/20; 16 cases with a titer of 1/40 and 4 cases with a titer of 1/80 and no positive stool cultures were with a titer less than 1/20.

Out of 57 patients with negative stool cultures; 2 showed a reaction with a titer less than 1 /20; 28 with a titer of 1/20 and 17 with a titer of 1/40.

Regarding thirty patients with positive sputum cultures; one case was found with a titer less than 1/20; 17 cases with a titer of 1/20; 9 cases with a titer of 1/40 and 3 cases with a titer of 1/80.

Out of 70 patients with negative sputum cultures, we found that 2 cases with a titer less than 1/20; 43 cases with a titer of 1/20; 24 cases with a titer of 1/40 and one case was positive with a titer of 1/80.

Table (11) SERUM TITERS OF CANDIDA ANTIBODIES BY INDIRECT IMMUNOFLOURESCENT TECHNIQUE

Number of Serum	Serum Titers					Total
	<1/20	1/20	1/40	1/80	1/160	
Cases	2	60	34	4	--	100
%	2%	60%	34%	4%	--	
Control	17	3	--	--	--	20
%	85%	15%	--	--	--	

Fig.5 Serum Titers of Candida Antibodies by Indirect Immunoflourescent Technique.

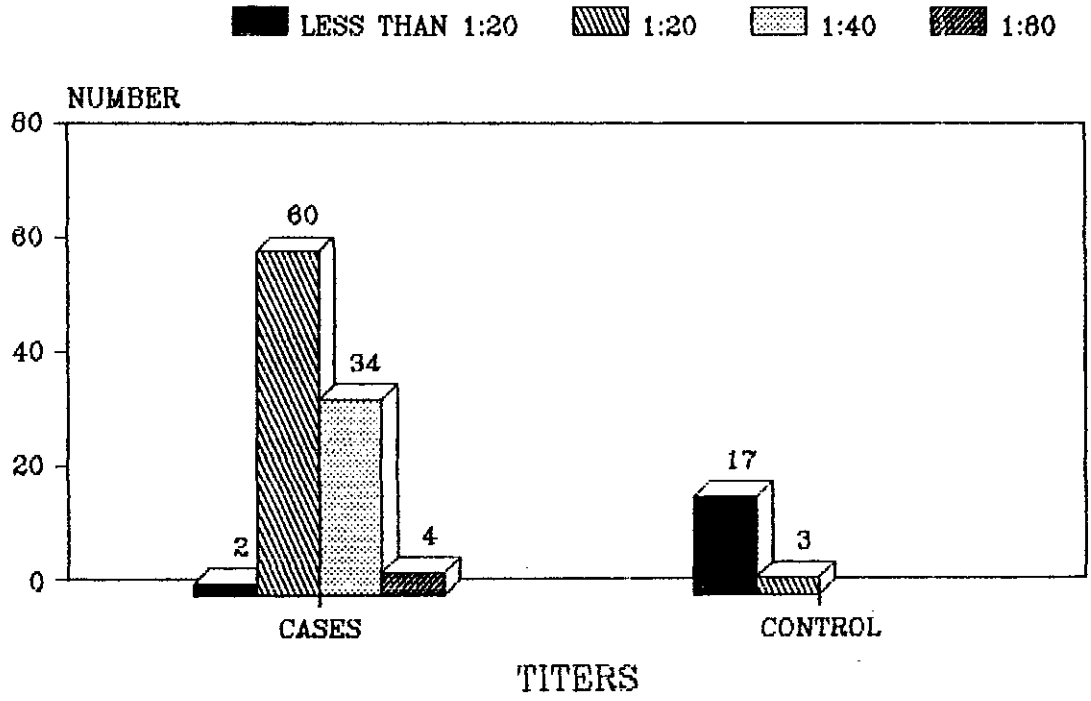


Table (12) CANDIDA ANTIBODY TITERS BY INDIRECT IMMUNOFLOURESCENT TECHNIQUE IN RELATION TO CULTURE RESULTS.

Specimen	Dilution of Serum	Positive culture					Negative Culture.				
		<1/20	1/20	1/40	1/80	Total	<1/20	1/20	1/40	1/80	Total
Urine		--	10(43.4%)	9(39.1%)	4(17.3%)	23	2 (2.5%)	51(66.2%)	24(31.1%)	--	77
Stool		--	33(62.2%)	16(30.1%)	4(7.5%)	53	2 (4.2%)	28(59.5%)	17(36.1%)	--	47
Sputum		1(3.3%)	17(56.6%)	9(30%)	3(10%)	30	2(2.8%)	43(61.4%)	24(34.2%)	1(1.4%)	70

Table (13) shows the serum titers of one hundred patients and twenty normal controls for Aspergillus antibodies by IFA.

Out of 100 patients; 13 cases (13%) showed a reaction with a titer less than 1/20; 60 cases (60%) showed a titer of 1/20; 21 case (21%) showed positive reaction with a titer of 1/40; 5 cases (5%) with a titer of 1/80 and 1 case (1%) showed a high titer of 1/160.

Out of 20 normal controls, 19 cases (95%) were with a titer less than 1/20 and 1 case (5%) with a titer of 1/20.

Table (14) shows the results of indirect immunoflourescent antibody test for Aspergillus antibodies in relation to the corresponding culture results.

Out of 100 negative urine cultures; 13 cases were with a titer of less than 1/20; 61 cases with titer of 1/20; 20 cases showed positive reaction with a titer of 1/40; 5 cases with a titer of 1/80 and 1 case with a titer of 1/160.

No urine cultures were positive for Aspergillus spp.

Out of 11 positive stool cultures; 6 cases showed a reaction with a titer of 1/20; 1 case with a titer of 1/40 and 4 cases with a titer of 1/80.

No positive stool cultures were with both a titer of 1/160 and less than 1/20. Out of 89 negative stool cultures; 15 cases were with a serum titer of less than 1/20; 54 cases with a titer of 1/20; 18 cases with a titer of 1/40; one

Out of 9 positive sputum cultures; 4 cases were with a serum titer of 1 to 20; 3 cases with a titer 1 to 40 and 2 cases with a titer 1 to 80 and no positive sputum cultures were with both a titer 1 to 160 and less than 1 to 20. Out of 91 negative sputum cultures; 15 cases were with a reaction of a titer less than 1 to 20; 56 cases with a titer 1 to 20; 16 cases with a titer 1 to 40; 3 cases with a titer 1 to 80 and one case with a titer 1 to 160.

Table (13) SERUM TITERS OF ASPERGILLUS ANTIBODIES BY INDIRECT IMMUNUNOFLOURESCENT TECHNIQUE.

Number of Serum	Serum Titers					Total
	<1/20	1/20	1/40	1/80	1/160	
Cases	13	60	21	5	1	100
%	13%	60%	21%	5%	1%	
Control	19	1	--	--	--	20
%	95%	5%	--	--	--	

Fig.6 Serum Titers of Aspergillus Antibodies by IFA

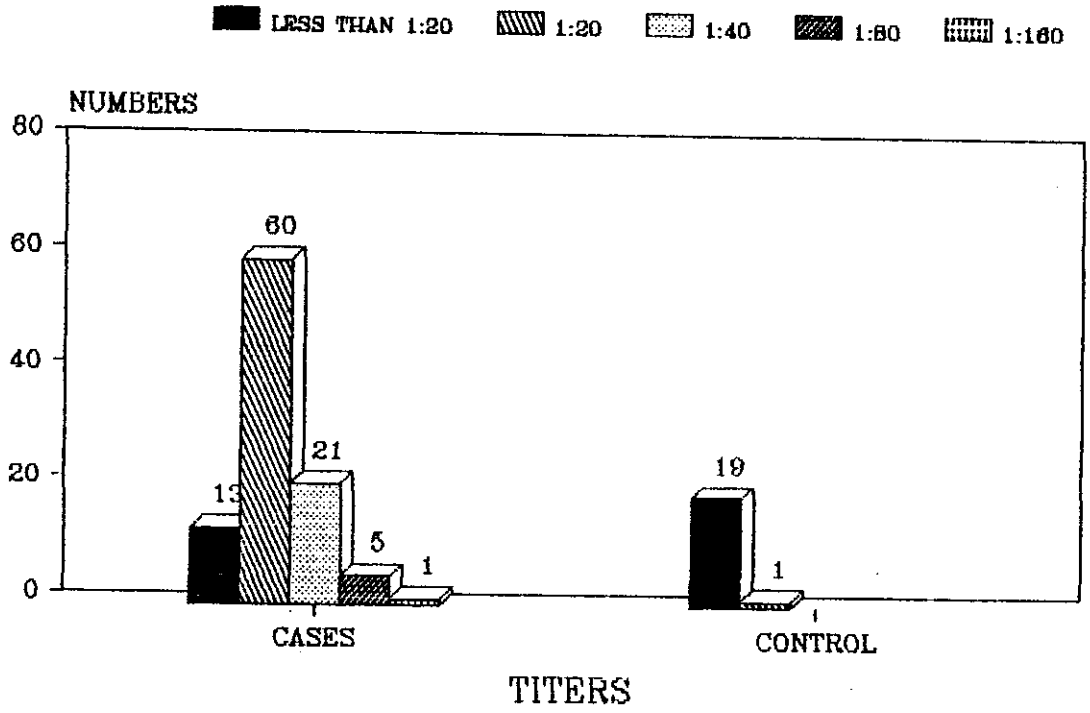


Table (14) ASPERGILLUS ANTIBODY TITERS BY INDIRECT IMMUNOFLOURESCENT TECHNIQUE IN RELATION TO CULTURE RESULTS.

Specimen	Dilution of Serum	Positive culture					Negative Culture					
		<1/20	1/20	1/40	1/80	Total	<1/20	1/20	1/40	1/80	1/160	Total
Urine		--	--	--	--	--	13(13%)	61(61%)	20(20%)	5(5%)	1(1%)	100
Stool		--	6(54.5%)	1(9%)	4(36.3%)	11	15(16.3%)	54(60.6%)	18(20.2%)	1(1.1%)	1(1.1%)	89
Sputum		--	4(44.4%)	3(33.3%)	2(22.2%)	9	15(16.4%)	56(61.5%)	16(17.5%)	3(3.2%)	1(1%)	91

Discussion

DISCUSSION

This study was conducted in Urology and Nephrology Center, Mansoura, Egypt on one hundred renal allograft recipients and twenty normal control cases in an attempt to evaluate the prevalence of different fungal infections and its relation to graft function, type of immunosuppression and the period after renal transplantation.

In renal transplants, infection is a major source of morbidity and mortality (Gallis et al., 1975; Peterson and Andersen, 1986), with staphylococci and Gram negative bacilli as the most prevalent bacterial causes (Anderson et al., 1973). Viruses and protozoa (Pneumocystis carinii) are also involved (Howard et al., 1978).

Fungi could cause disease and death in transplant recipients (Rifkind et al., 1967; Burton et al., 1972; Gallis et al., 1975 and Schroter et al., 1977).

Urinary tract infection and mucosal surface infection was suggested to be the reservoir of deep infection as fungal pneumonia or meningitis (Schroter et al., 1977). Also the indiscrimination use of antibiotics was involved in predisposing of such fungal infection (Howard et al., 1978).

Most reported fungal infection in renal transplant recipients have been of the opportunistic variety. Rifkind et

al. (1967) were the first to review systemic fungal infection in 23/51 transplant patients. Also, Gallis et al. (1975) found deep fungal infections developed in 22/171 patients following renal transplantation and Howard et al. (1978) found 21/356 renal transplanted patients had fungal infections.

In this study, urine was found positive for candida in (23/100) of the transplanted patients , stool (53/100) and sputum (30/100). For fungi other than candida, stool (45/100) and sputum (31/100) of the transplanted patients.

Rifkind et al. (1967) found systemic fungal infection in 23 of 51 autopsy reports; only one case was recognized before death. Concurrent bacterial, viral or parasitic infections were present in 87 % of the cases. Such combined infections are still the rule in transplant patients who die with fungal infections. They reported that certain factors which appeared significantly contribute to the overall mortality rate in these patients. These factors were increased age, the male sex and the use of unrelated donor. But analysis of these risk factors in association with fungal infections among the autopsy cases (23/51) revealed that sex of the patient was the only factor of significance. The excess of male subjects among the autopsy cases may suggest an effect of the sex hormones on the susceptibility to fungal infections but this was denied by anothers to be the

case in their renal transplant recipients, raising the question whether endocrine rather than ecologic factors might not determine the higher incidence among males of the systemic fungal infections mentioned.

Gallis et al. (1975) agreed with Rifkind's data about the propensity of male patients for developing fungal infection. In their series, the incidence of infection in male paients was considerably greater than that in female patients, but the difference was not statisticaly significant.

In the current study, urine was found positive for Candida in 23% of the cases (23/100). The incidence was found statistically higher in females than males (13 females, 10 males P=0.02). This was not the case for stool and sputum cultures where males were higher but no significance was detected.

The difference observed in sex predilection of Candiduria in this study when compared to others is difficult to explain. The collection of mid stream sample may not be fully performed by patients and vaginal Candida may contaminate the urine. Also, variation in age, ethnic characteristics or conditions of the study may underly this difference. Although the controversy of such predilection is not settled, the time of follow up and type of material

understudy whether autopsy or fresh body excreta could play part in this debate. An attractive though unsubstantiated possibility to explain sex differential, relates urinary colonization to the toilet habits prevalent in a given population. In our community, these habits could encourage periurethral soiling and hence ascending infection which is preferentially established in females because of the shorter urethra, as well as the other factors proposed to explain simple E. Coli infection in women which may be applicable also on fungus infection (Wise, 1989).

Effect of age, however, could have been more important since most of our patients were young in age. With aging, the risk of urinary fungal colonization is particularly higher in males, perhaps because of the urinary stasis associated with senile enlargement of the prostate (Schonebeck, 1986).

Since Rifkind's initial report, a high incidence of fungal infection has been noticed by kidney transplant groups (Burton et al., 1972; Gallis et al., 1975 and Howard et al.,1978).

Almost all agreed that the risk factors in trasplant patients include the use of large doses of corticosteroids, multiple or recent rejection episodes, older age and poor kidney function. Gallis et al. (1975) found no relationship

between renal function and fungal infection, while Howard and his colleagues (1978) suggested that patients with poor renal function were more susceptible to fungal infections which followed their initial bacterial or viral infections.

In this study, the kidney function was found to have no statistically significant relationship between presence of fungi in body excreta and kidney function, where kidney function was classified according to serum creatinine into three groups; 55 patients with good kidney function, 38 patients with moderate function and 7 patients with poor function. In cases of Candiduria, there was no statistically significant association between kidney function and presence of Candida in urine (P=0.335). Also, no statistically significnat association was found between kidney function and the detected fungi both in stool (P=0.319) and sputum (P=0.512).

As regards the post transplantation period and its relation to presence of fungi in the different body excreta ,in this study, we classified the transplanted patients according to the period after kidney transplantation into 3 groups; 12 months (41 patients), 13 to 36 months (34 patients) and after 36 months (25 patients) post operatively. We found that no relationship between post transplantation period and presence of fungi in the body excreta.

Fungal infection may occur as a primary infection or as a result of reactivation of previous fungal infection by immunosuppressive medications (Brooks and Remington, 1984).

In 1967, Rifkind and his colleagues noted that no significant relation between frequency of fungal infection and length of time that their transplanted patients received high dose steroids. While Bach et al. (1973) noticed that the severity of infection has a linear relationship with rejection episodes considering the high doses of immunosuppressive drugs used in cases of renal transplants.

Howard et al. (1978) noticed that patients with recent courses of high dose steroid therapy were more susceptible to fungal infections which followed their initial bacterial or viral infections. Also, Ramsey et al. (1980) noticed that only 5 out of 54 patients treated with immunosuppressive drugs to have invasive pulmonary fungal infection and in similar study, Ho and his colleagues (1984) found that one out of 81 patients treated with immunosuppressive drugs had fungal infection.

In 1989, Kahan stated that the serious opportunistic infections were more common with azathioprine than they are today in the cyclosporin A era. However, low dose azathioprine is associated with less infectious morbidity with viruses, fungi and Gram negative bacterial infections.

Also, there is a reduced incidence of bacterial and fungal infections in cyclosporin A treated patients compared with recipients immunosuppressed with azathioprine-prednisolone

As regards the immunosuppressive drugs, our results revealed that the data obtained from the patients immunosuppressed by cyclosporin A were more liable for urinary Candidal infection (21.4%) than the patients immunosuppressed by conventional therapy (16.3%) as cyclosporin A therapy selectively inhibits and alters the cellular immunity. Also, the immunosuppressed patients by triple therapy were more liable for urinary candidal infection (32.4%) than those patients immunosuppressed eiter by conventional (16.3%) or by cycloporin A (21.4%) therapy.

We could attribute the controversy about the relationship between the type of the immunosuppression and the subsequent acquisition of the different types of fungi in both stool and sputum to different duration of regimens appeared in different institutions and to the varying concentrations of each drug in a given regimen in cases of avoiding a specific drug high dose toxicity as for cyclosporin A.

The definite diagnosis of mycotic infections is based on the successful recovery and identification of the aetiologic agent from the clinical specimen. However, there are

instances in which cultural proof can not be obtained and other laboratory information must be utilized (Kaufman and Reiss, 1986).

Fungal serologic tests play an important role in the diagnosis of mycotic infection, although they often provide only tentative evidence of infection. These tests are helpful to supplement cultural or histological evidence of aetiology (Koneman and Roberts, 1984).

As with other serologic tests, false negative results may occur when blood is drown from a patient who is immunosuppressed by medications and whose antibody production is diminished. Many of the antigens used for testing are crude extracts of the fungi and contain many common components that cross-react with other fungi to give false positive results (Koneman et al., 1978).

Many serologic tests have been devised to detect antibody. These have been lacking in sensitivity or specificity and are not generally useful for diagnosis of invasive candidiasis in patients who are immunocompromised (Gold, 1984).

The serodiagnosis of invasive aspergillosis remains controversial. Some investigators have not found it helpful at all (Young and Bennett, 1971). Whereas others, using a variety of techniques have beleived that seroconversion

may be recognized early enough to institute therapy in at least some patients (Schaefer and Armstrong, 1976).

Regarding the detection of antibodies for *Candida* and *Aspergillus species* in the sera of the transplanted patients as a trial for screening and prevalence of fungal antibodies in comparing to the culture results, we found the results of serological study for Candida and Aspergillus antibodies as seen in Tables (11) and (13) that most of the control cases (85% and 95% respectively) gave a reaction for immuno-flourescence with a titer less than 1/20 which was not the case of studied patients (2% and 13% respectively) which may be due to the action of immunosuppressive drugs taken by these patients. On the other hand, a considerable percentage (38% and 27% respectively) of the patients represented by a titer 1/40 and higher than titer 1/40 while these had corresponding abscence of any titer in the control cases.

As regards the Candida antibody titer in relation to culture results (table 12), there was no big difference in 1/20 and 1/40 antibody titer groups for the patients representing both the positively cultured and negatively cultured patients, this may be due to fact that the normally presence of *Candida species* as commensals in the large intestine whereas 1/80 titer seemed to have more diagnostic value when comparing both the positive in culture and negative in culture patients and these results were constantly observed for patients revealing *Candida species* either in urine, stool or sputum.

As regards *Aspergillus* antibody titer in relation to culture results (Table 14), the titer of 1/80 seemed to have more diagnostic value when comparing both the positively cultured and negatively cultured patients and these results were observed for patients revealing *Aspergillus species* either in stool or sputum.

As regards the titer of 1/160 associated with the negaative culture for Aspergillus which was detected in one patient, the possible explanation for this high titer may be due to previous Aspergillus infection with residual high titer of antibodies and recently recovered without detection and isolation of fungus in his excreta.