Results

RESULTS

This study started in January 2003 and completed in September of the same of year (over a period of nine months). All patients included had risk factors predisposing to mycoses and they were selected from ICU of Benha University Hospital regardless their cause of admission.

Out of sixty patients 34 (56.7%) were male and 26 (43.3%) were female. The age of all patients ranges between 20-90 years with Means ± SD equal (55.9± 13.7). This is shown in (Table 8).

Table (8): Distribution of cases according to sex and age:

Sex				Age (year)			
Male		Female		Mean ± SD		Range	
34	56.7%	26	43.3%	55.9 ±	13.7	20	90

Out of 134 clinical isolates, 121 *Candida* species were isolated with prevalence of (90.3%) and 13 *Aspergillus* species with prevalence of (9.17%) . This is shown in (Table 9 and Fig. 21):

Table (9): Prevalence of *Candida* species and *Aspergillus* species:

Total No.	*Candida* species		*Aspergillus* species					
			A. niger		*A. flavus*		*A. fumigatus*	
134	121	90.3%	5	3.7%	4	3%	4	3%

3.70%   3%   3%

Candida species
A. niger
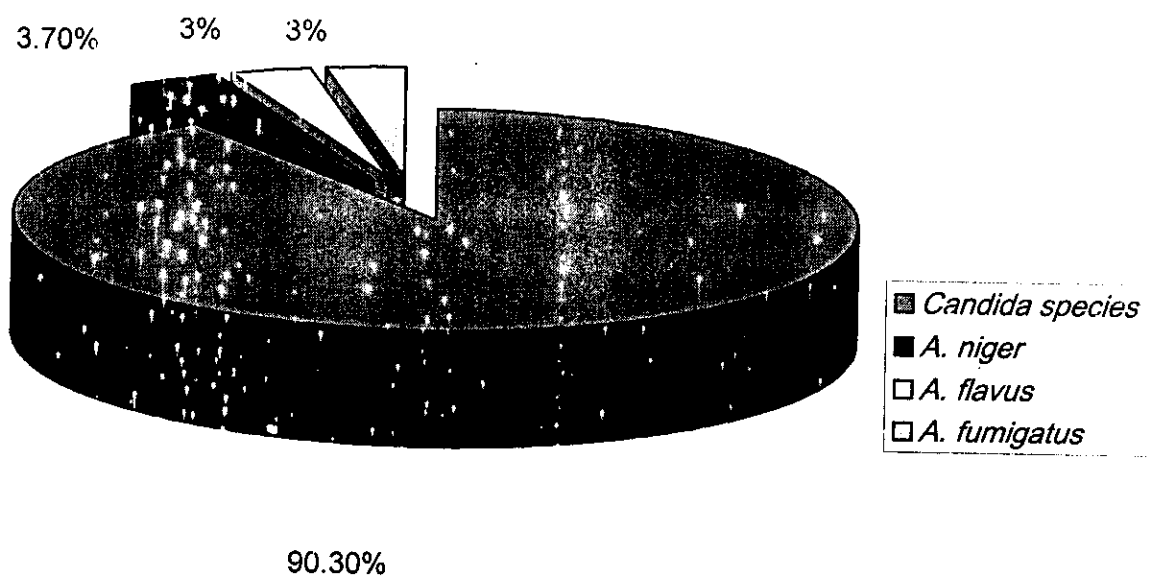A. flavus
A. fumigatus

90.30%

Fig. (21) Pervalence of *Candida* Species and *Aspergillus* species

The clinical samples were :

1) 57 oral swabs from which the prevalence of isolates were 54.3% (31 isolates) *C.albicans*, 24.5% (14 isolates) *C.tropicalis* 10.5% (6 isolates) *C.krusei*, 5.2% (3 isolates) *C.pseudotropicalis*, 1.7%(1 isolate) *C.para*psillosis, *A. flavus* and *A.fumigatus* respectively.

2) 40 Sputum samples from which the prevalence of isolates were 37.5% (15 isolates) *C.albicans,* 17.5% (7 isolates). *C. tropicalis*, 20% (8 isolates) C.krusei, 2.5% (1 isolate). *C. pseudo tropicalis* and *C. glabrata*, 5% (2 isolates) *C.stellatoidea*, 12.5% (5 isolates), *A. niger*, 7.5% (3 isolates) *A. flavus* and *A. fumigatus* respectively.

3) 32 rectal swabs from which the prevalence of isolates were 62.5 % (20 isolates) *C. albicans*, 6% (5 isolates) *C. tropicalis*, 9.3% (3 isolates) *C.krusei* and *C. pseudotropicalis*, 3.1% (1 isolates) *C. glabrata* respectively. This is shown in (Table 10).

Table (10): Prevalence of *Candida* species and *Aspergillus* species in different specimens:

Species	Oral swabs No= (57) Group I		Sputum No= (40) Group II		Rectal swabs No= (32) Group III		Test of significance		
	No	%	No	%	No	%	Z_1	Z_2	Z_3
C. albicans	31	54.3	15	37.5	20	62.5	1.092	0.5	1.511
C.tropicalis	14	24.5	7	17.5	5	15.6	0.270	0.321	0.062
C. krusei	6	10.5	8	20	3	9.3	0.356	0.040	0.346
C.pseudotropicalis	3	5.2	1	2.5	3	9.3	0.133	0.193	0.296
C. glabrata	0	0.0	1	2.5	1	3.1	-	-	0.011
C. stellatoidea	0	0.0	2	5	0	0.0	-	-	-
C. parapsillosis	1	1.7	0	0.0	0	0.0	-	-	-
A. niger	0	0.0	5	12.5	0	0.0	-	-	-
A.flavus	1	1.7	3	7.5	0	0.0	0.197	-	-
A.fumigatus	1	1.7	3	7.5	0	0.0	0.197	-	-

Z_1 = I versus II Z_2 = I versus III Z_3 = II versus III

Z < 1.96 insignificant

Z ≥ 1.96 significant

The prevalence of *C.albicans* isolates 54.5% (66strains) was higher than *C*.non ablicans 45.5% (56 strains). As regards *C*.non albicans, *C.tropicalis* represent 21.5% (26 strains), *C.krusei*14% (17 strains), *C.pseudotropicalis* 5.9% (7 strains), *C.glabrata*, 1.6% (2 strains), *C.stellatoidea*1.6% (2 strains) and C. *parapsillosis 0.8* % (1 strain). This is shown in (Table 11and Fig. 22).

Table (11): Distribution of *Candida* strains:

Candida species	Total No. (121)	%
C. albicans	66	54.5
C. tropicalis.	26	21.5
C. krusei	17	14.0
C. Pseudotropicalis	7	5.9
C. glabrata	2	1.6
C. stellatoidea	2	1.6
C. parapsiliosis	1	0.8

Fig.(22) :Distribution of *Candida* strains

In order of frequency, the most common predisposing conditions to fungal infection are long term antibiotic therapy in diabetic patients 36.7% (22 cases), long term antibiotic only 31.7% (19cases), antibiotic therapy with organ failure 10% (6 cases), antibiotic with steroid therapy 8.3% (5 cases), antibiotic and steroid therapy in organ failure 6.6%(4 cases), lymphoma 3.3% (2 cases), antibiotic and steroid therapy in diabetic patients 1.6% (1 case) and antibiotic in diabetic patients with organ 1.6% (1case). This is shown in (Table 12):

Table (12): Relation of predisposing conditions to infections with different fungi:

Predisposing conditions	No. of cases 60		C. albicans isolates		C. non albicans isolates		A. niger		A. flavus		A. fumigatus	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Long term antibiotic with diabetes[1]	22	36.7	18	81.8	11	50	2	9	1	4.5	2	9
Long term antibiotic only[2]	19	31.7	11	57.8	13	50	-	-	1	5.2	1	5.2
Long term antibiotic with organ failure[3]	6	10	3	50	5	50	-	-	-	-	-	-
Long term antibiotic with steriod therapy[4]	5	8.4	5	100	2	40	1	20	-	-	1	20
Long term antibiotic and steriod therapy with organ failure[5]	4	6.5	2	50	2	50	-	-	2	50	1	-
Malignancy (lymphona)	2	3.4	-	-	2	100	-	-	-	-	-	-
Long term antibiotic and steriod therapy with diabetes[6]	1	1.6	1	100	-	-	1	100	-	-	-	-
Long term antibiotic and organ failure in diabetes[7]	1	1.6	1	100	-	-	1	100	-	-	-	-

1- 2 Patients had mixed infection

2- 7 patients had mixed infection.

3- 2 patients had mixed infection.

4- 4 patients had mixed infection.

5- 2 patients had mixed infection.

6- One patient had mixed infection.

7- One patient had mixed infection.

As regards different patients groups *C. albicans* was isoalted in 76.9%, *C.tropicalis* in 38.4% *C.krusei* in 26.9%, *C.pseudotropicalis* in 15.3% and *C.stellatoidea* in 3.8% of patients with cerebral strocke (12 patients had mixed infection.)

C.albicans was isolated in 66.6%, *C. tropicalis* in 11.1% as *C.krusei* and *C.pseudotropicalis*, *A. niger* was isolated in 33.3% and both *A.flavus* and *A.fumigatus* were isolated in 11.1% of patients with respiratory failure and C.O.P.D (Chronic Obstructive Pulmonary Diseases) (5 patients had mixed infection)

C. albicans was isolated in 40% as *C.tropicalis* and *C.krusei,* while *C.pseudotropicalis* was isolated in 20% as *C.stellatoidea* and *C.parapsillosis,* of patients with renal failure (3 patients had mixed infection).

C. albicans was isolated in 100%, *C.tropicalis* in 33.3% as *C.pseudotropicalis* and *A.flavus*, *A.fumigatus* in 11.1% of patients with hepatic coma (all patients had mixed infection.).

C. albicans and *C. tropicalis* were isolated in 50% while *C. krusei,* *A niger* and *A.flavus* isolated in 25% of patients with coma for diffrential diagnosis. (2 patients had mixed infection).

C. albicans was isolated in 80% and *C. tropicalis* in 20% of patients with intestinal obstruction and oesphageal fistula.

C.tropicalis was isolated in 66.6%, while both *C.krusei* and *C.glabrata* were isolated in 33.3% of patients with malignant disease (one patients had mixed infection).

C. tropicalis was isolated in 100% of patients with head injury.

C.albicans was isolated in 100%, *C.tropicalis* and *A. niger* in 50% of patients with postoperative infection (2 patients had mixed infection).

C. albicans, C. tropicalis and *A.flavus* were isolated in 100% of patients with drowning (one patients had mixed infection). This is shown in (Table 13):

Table (13): Prevalence of fungi in different patient groups:

Patients group	No. of Cases		C. albicans		C.tropicalis		C.krusei		C.pseudo tropicalis		C.glabrata		C.stellatoidea		C.parapsillosis		A.niger		A.flavus		A.fumigatus	
	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%	No	%
Cerebral strocke[1]	26	43	20	76.9	10	38.4	7	26.7	4	15.3	-	-	1	3.8	-	-	-	-	-	-	-	-
Resp.F & C.O.P.D[2]	9	15	6	66.6	1	11.1	1	11.1	1	11.1	-	-	-	-	-	-	3	33.3	-	-	1	11.1
Renal failure[3]	5	8.3	2	40	2	40	2	40	1	20	-	-	1	20	1	20	-	-	-	-	-	-
Hepatic coma & failure[4]	3	5	3	100	1	33.3	-	-	1	33.3	-	-	-	-	-	-	-	-	1	33.3	-	-
Coma for D.D.[5]	4	66	2	50	2	50	1	25	-	-	-	-	-	-	-	-	1	25	-	-	-	-
Intestinal obstruction	5	8.3	4	80	1	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Malignancy[6]	3	5	-	-	2	66.6	1	25	-	-	1	33.3	-	-	-	-	-	-	-	-	-	-
Head injury	1	1.6	-	-	1	100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Postoperative infection[7]	2	3.3	2	100	1	50	-	-	-	-	-	-	-	-	-	-	1	50	-	-	-	-
Drowning[8]	1	1.6	1	100	1	100	-	-	-	-	-	-	-	-	-	-	-	-	1	100	-	-

1- 12 cases had mixed infection
2- 5 cases had mixed infection
3- 3 cases had mixed infection
4- All cases had mixed infection
5- 2 cases had mixed infection
6- One cases had mixed infection
7- 2 cases had mixed infection
8- One cases had mixed infection

According to differentiation table of *Ainscough and Kibbler,* *(1998)*, green colonies on Chromagar medium were identified as *C.albicans* 54.5% (66 strains) they were germ tube positive, Fig. (23), dark blue gray colonies surrounded by purple halo were identified as *C.tropicalis* 21.4% (26 strains), they were germ tube negative, Fig. (24), · rough spreading colonies with pale pink centers and white edges as *C.krusei,* 14% (17 strains), dark pink colonies as *C.glabrata* 1.6% (2 strains), Fig. (25). While white pale pink colonies were undifferentiated species 8.2% (10 strains). This is shown in (Table 14).

Table (14): Results of Chromagar as compared with that of germ tube test in differentiation of *Candida albicans* from *Candida* non albicans:

| Range of colony colours on Chromagar	Suggested yeast species	Positive isolates		Germ tube test
		No	**%**	
Green	*C.albicans*	66	54.5	Positive
Dark blue- gray, surroumded by purple halo (paler edge)	*C. tropicalis*	26	21.4	Negative
Pale, pink purple (large rough, spreading colonies with pale edges	*C. krusei*	17	14	Negative
Dark pink	*C. glabrata*	2	1.6	Negative
White pale pink	Undifferentiated	10	8.2	Negative
Total		**121**	**100.0**	
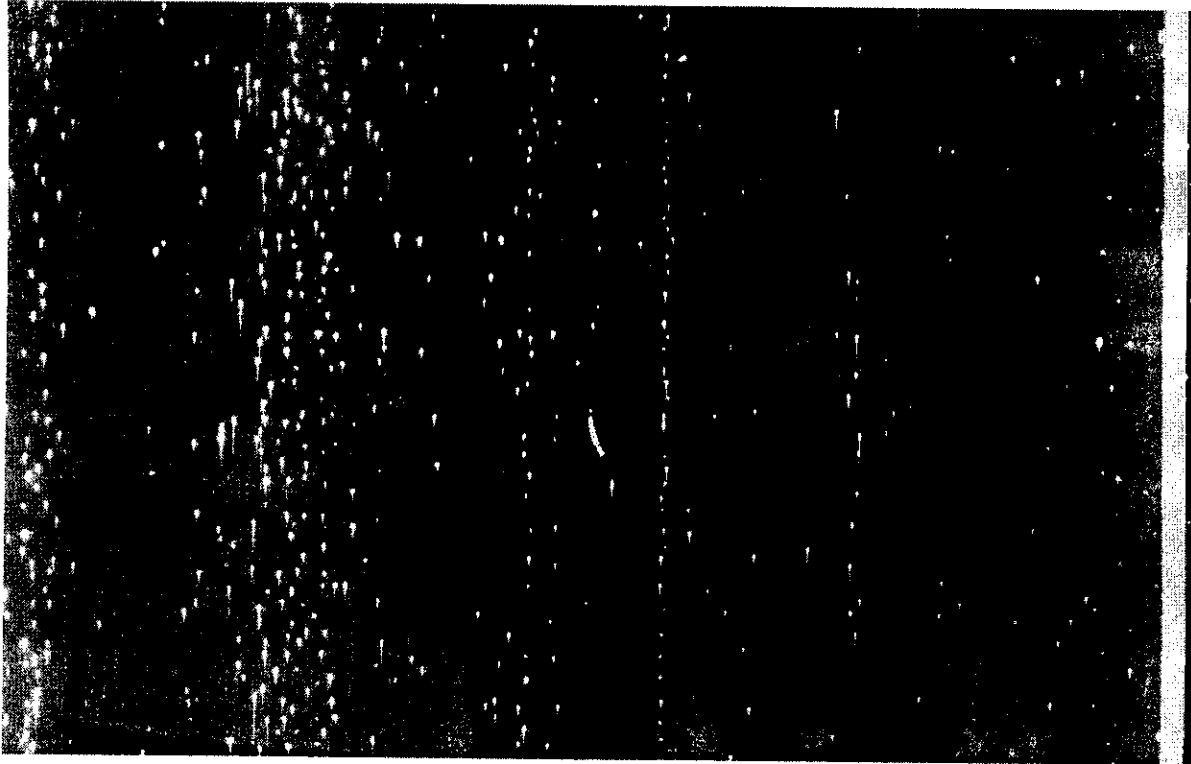
Fig. (23) Candida albicans on Chromagar *Candida*
medium, Colonies show the specific green colour.

Fig. (24) Candida tropicalis on Chromagar *Candida* medium. Colonies show the dark blue gray colour.
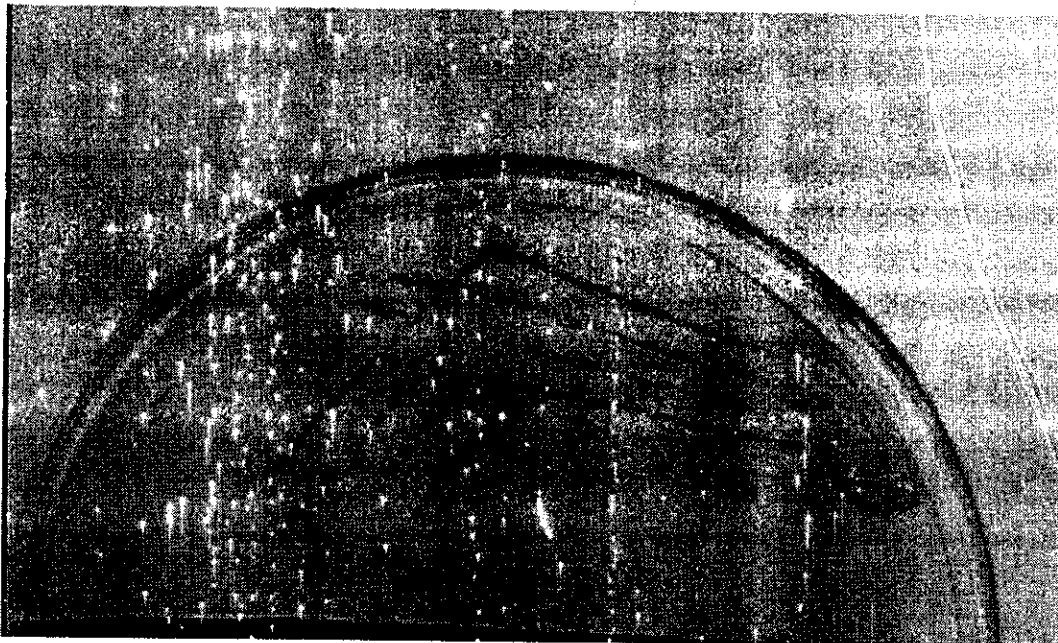

Fig. (25) Candida glabrata on Chromagar *Candida* medium, Colonies show the dark pink colour.

66 isolates (54.5%) *C.albicans,* 26 isolates (21.4%) *C.tropicalis,* 17 isolates (14%) *C.krusei* and 2 (1.6%) *C. glabrata* isolates were identified by both conventional sugar assimilation and Chromagar techniques. While 10 isolates (8.2%) were identified by conventional sugar assimilation alone, Fig. (26), and differentiated into *C. pseudotropicalis.* 7 (5.7%), *C.stellatiodea* 2 (1.6%) and *C.parapsillosis* 1(0.8%). This is shown in (Table 15).

Table (15): Comparison between Chromagar and sugar assimilation in identification of *Candida* species:

Candida species	Chromagar		Sugar assimilation	
C. albicans	66	54.5%	66	54.5%
C. tropicalis	26	21.4%	26	21.4%
C. krusei	17	14%	17	14%
C. pseudotropicalis	Undifferentiated		7	5.7%
C. glabrata	2	1.6%	2	1.6%
C. stellatoidea	Undifferentiated		2	1.6%
C. parapsillosis	Undifferentiated		1	0.8%
Total			121	100%
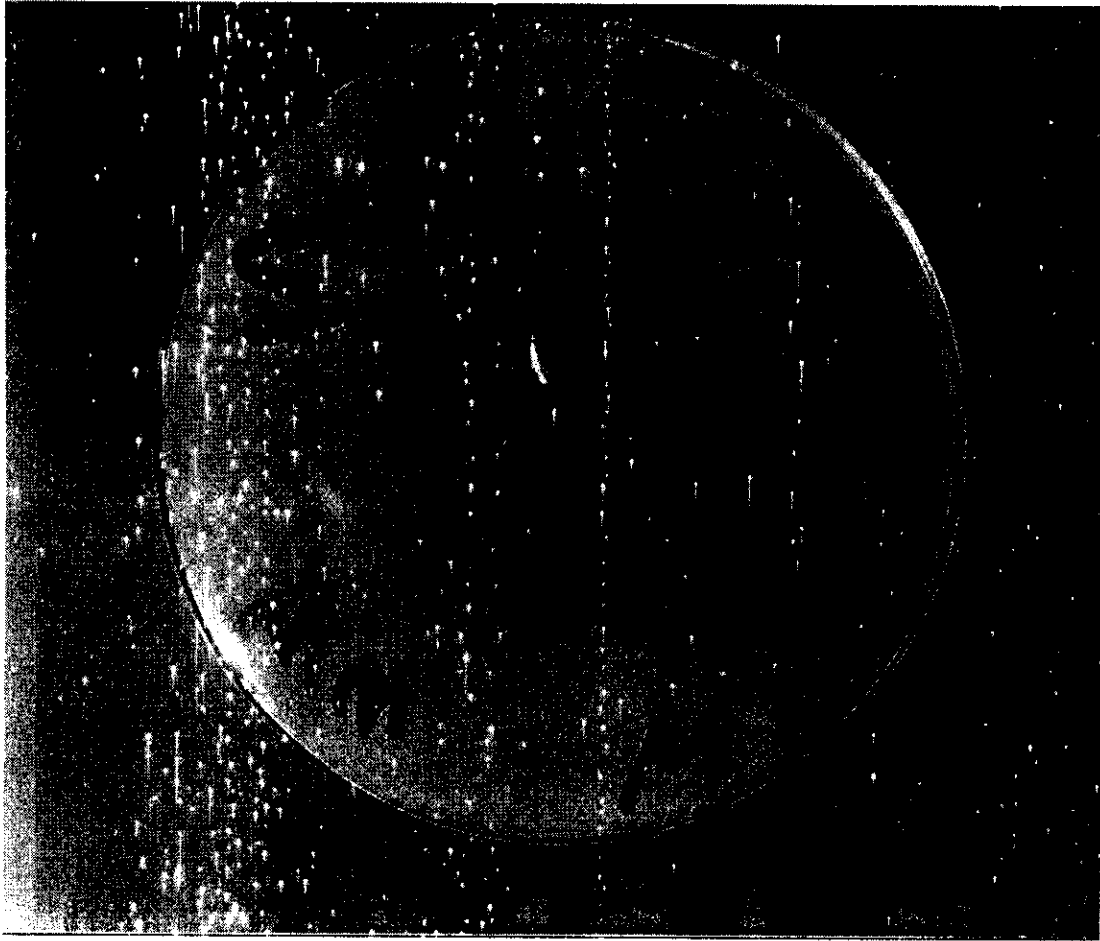
Fig. (26) Sugar assimilation pattern of *Candida albicans*.
It shows assimilation of glucose, maltose, mannite and
sucrose, but not lactose
G=glucose,
L=lactose
M= maltose
Mn=mannite
S=sucrose

Chromagar sensitivity for detection of *C.albicans* and non albicans were 100% and 81.8% respectively, while its specificity was 100% for both species. This is shown in (Table 16).

Table (16): Sensitivity and specificity of Chromagar in detection of *Candida* species using sugar assimilation as a gold standard:

Chromagar	*Candida albicans*	*Candida* non albicans
Sensitivity	100%	81.8 %
Specificity	100%	100%