

Results

This study comprised 30 patients, diagnosed as acute lymphoblastic leukemic patients and have been treated with chemotherapy [Children's Cancer Group(CCG)protocol].These patients were taken from Hematology and Oncology Unit, Benha Specialized Children's Hospital. 98 attacks of FN were recorded during the period between August 2007 and April 2010.

Our results are shown in the following tables and figures:

Table (1): Age, sex and diagnosis of the study group:

Age	Range	Mean \pm SD
	1.5-12	5.2 \pm 2.7
Sex	No	%
F	12	40
M	18	60
Diagnosis	No	%
Early pre-B	1	3.3
Pre-B	19	63.3
Common-B	6	20
Pre-T	1	3.3
Immature-T	1	3.3
T-cell ALL	2	6.7
Total	30	100

Our study comprised 30 patients (18 males and 12 females) with a mean age of 5.2 years ranging from 1.5-12 (SD 2.7). Their diagnosis was as follows: One patient had early pre-B ALL(3.3%), 19 patients had pre-B ALL(63.3%), 6 patients had common-B ALL(20%), one patient had pre-T ALL(3.3%), one patient had immature-T ALL(3.3%) and 2 patients had T-cell ALL(6.7%).

Table (2): Characteristics of attacks of FN (98 attacks) as regards clinical and laboratory data:

	Minimum	Maximum	Mean	SD
Fever (⁰ C)	38	40	38.87	0.512
Duration of FN in ds.	2	15	7.02	3.349
TLC ($\times 10^9$ /L)	0.1	3.9	1.306	0.7896
ANC ($\times 10^9$ /L)	0.01	0.50	0.3113	0.14678
AMC ($\times 10^9$ /L)	0.00	0.50	0.1115	0.11763
APC ($\times 10^9$ /L)	0.01	0.95	0.4205	0.22459
PLT ($\times 10^9$ /L)	3	543	146.17	131.327
CRP mg/L	0	192	41.57	52.209

FN: febrile neutropenia, **ds.:** days, **TLC:** total leucocytic count, **ANC:** absolute neutrophilic count, **AMC:** absolute monocytic count, **APC:** absolute phagocytic count, **PLT:** platelets and **CRP:** C-reactive protein.

Total number of attacks of FN was 98 attacks. Mean temperature was 38.87⁰C ranging from 38-40⁰C (SD 0.512), mean duration of neutropenia was 7.02 days ranging from 2-15 days (SD 3.349), mean TLC was 1.306 $\times 10^3$ / μ L ranging from 0.1-3.9 (SD 0.7896), mean ANC was 0.3113 $\times 10^3$ / μ L ranging from 0.01-0.5(SD 0.14678), mean AMC was 0.1115 $\times 10^3$ / μ L ranging from 0.00-0.5(SD 0.11763), mean APC was 0.4205 $\times 10^3$ / μ L ranging from 0.01-0.95 (SD 0.22459), mean Platelet count was 146.17 $\times 10^3$ / μ L ranging from 3-543(SD 131.327), and mean CRP was 41.57 mg/L ranging from 0-192 (SD 52.209).

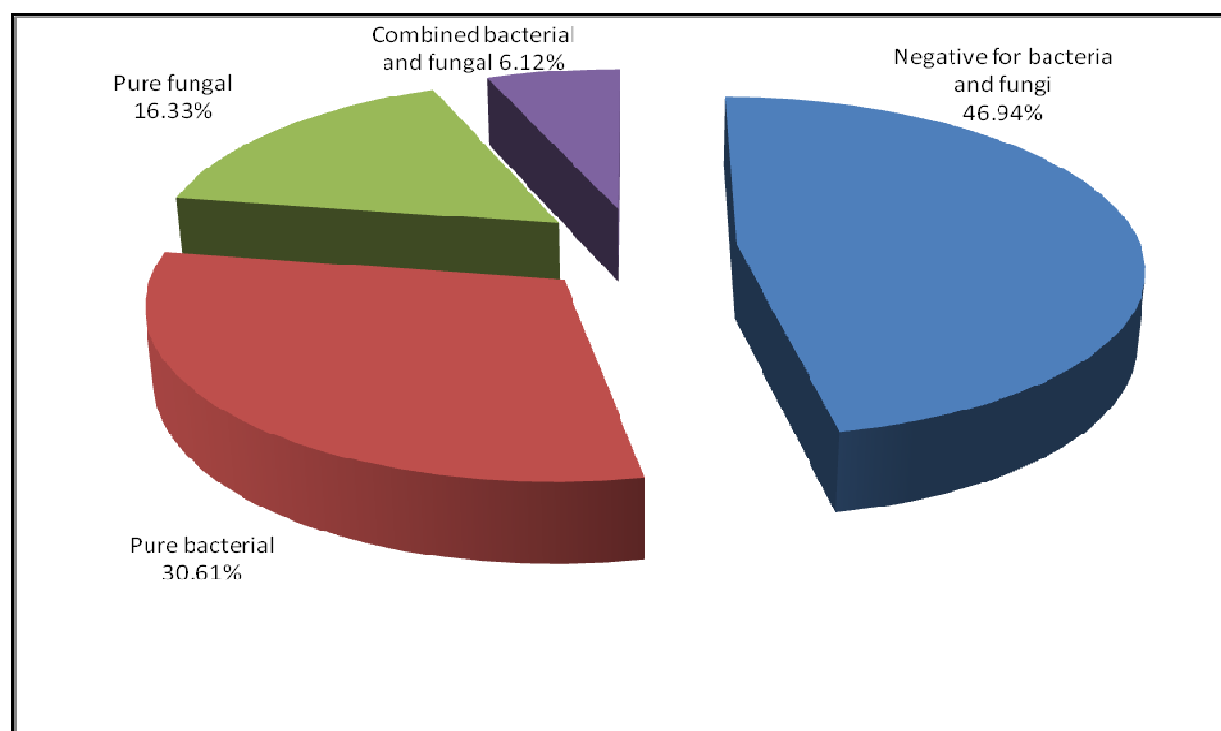


Figure (1)

(Percentage of infection among the studied group)

Total number of attacks of FN was 98. Among these attacks, there was 52 attacks (53.1%) associated with infection and 46 attacks (46.9%) not associated with bacterial or fungal infection. The percentage of bacterial infection only was 30.61% (n=30), fungal infection only 16.33% (n=16) and combined bacterial and fungal infections 6.12% (n=6) of total attacks .

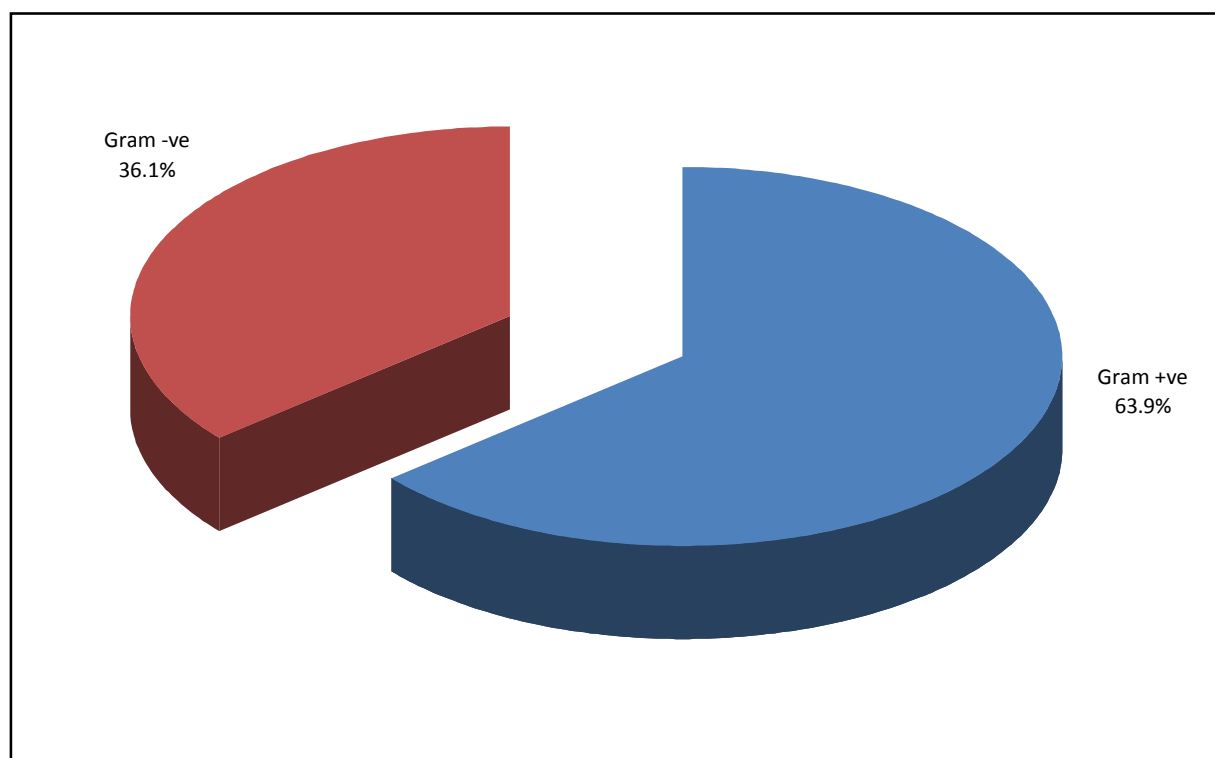


Figure (2)

(Results of bacterial blood culture)

Gram-positive organisms constituted 63.9% (n=23) and Gram-negative organisms constituted 36.1% (n=13) of febrile neutropenic attacks that had positive bacterial blood culture.

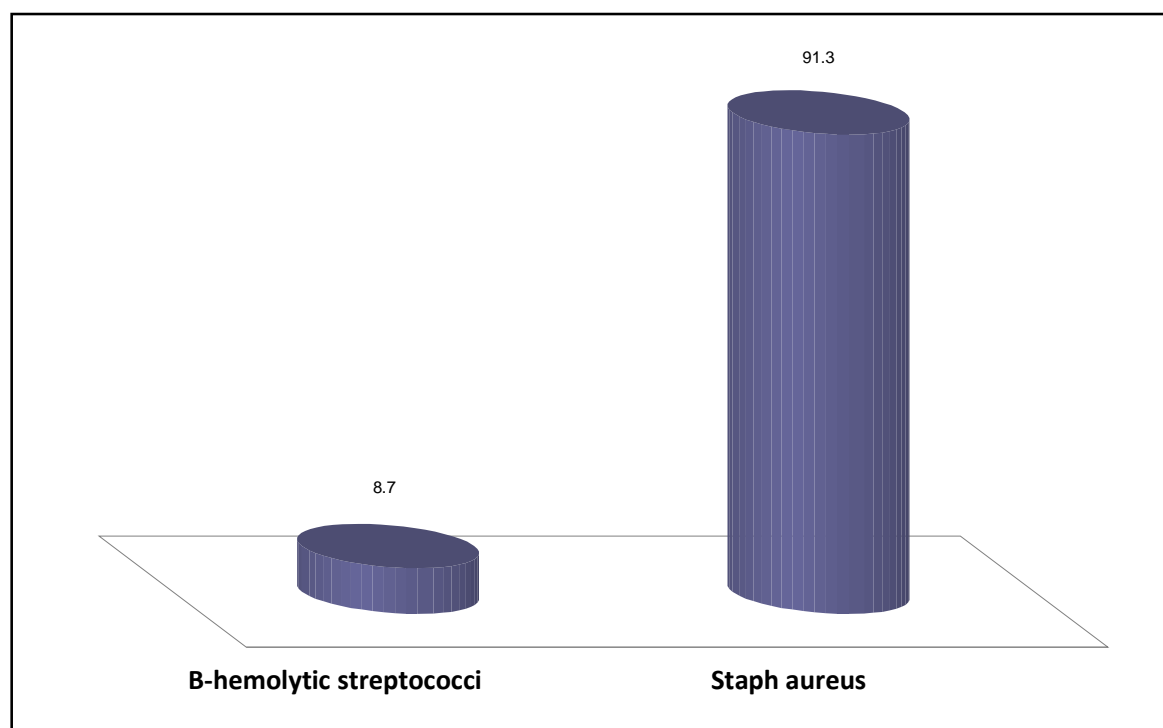


Figure (3)

(Gram-positive organisms)

Staph aureus constituted 91.3% (n=21) and beta-hemolytic streptococci constituted 8.7% (n=2) of Gram-positive organisms (n=23).

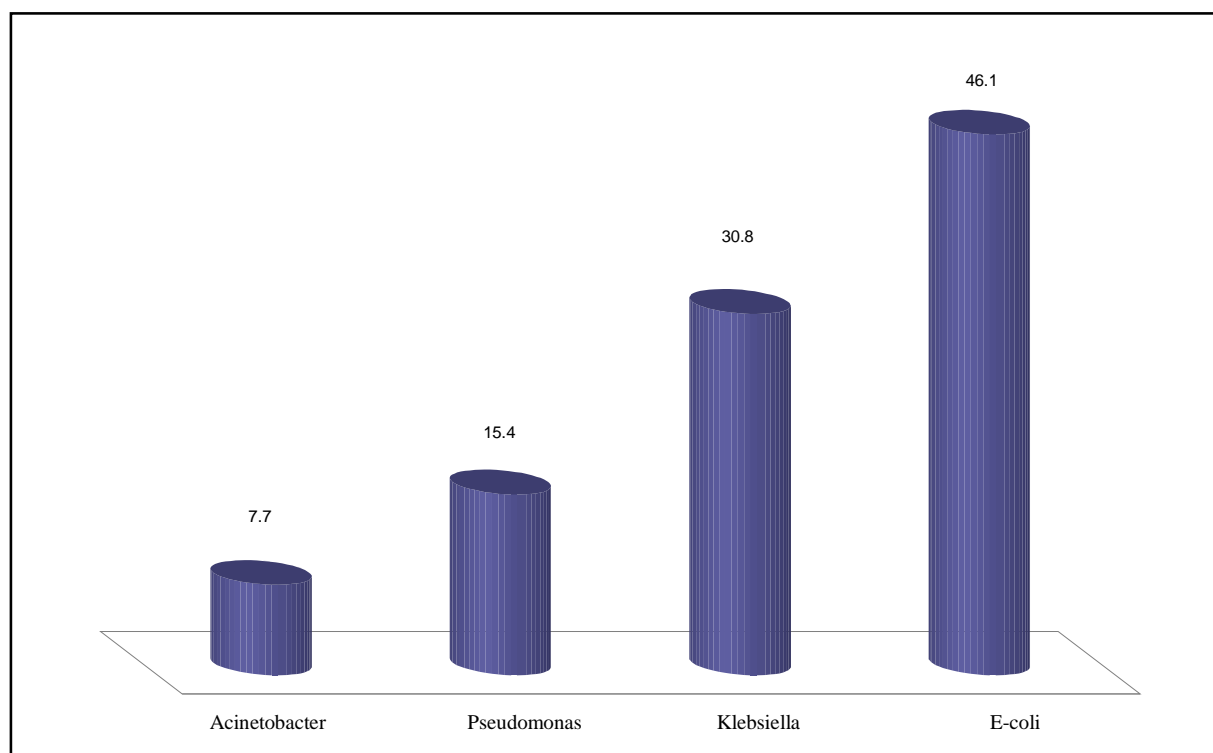


Figure (4)

(Gram-negative organisms)

E-coli constituted 46.1% (n=6), klebsiella 30.8% (n=4), pseudomonas 15.4% (n=2) and acinetobacter constituted 7.7% (n=1) of Gram-negative organisms.

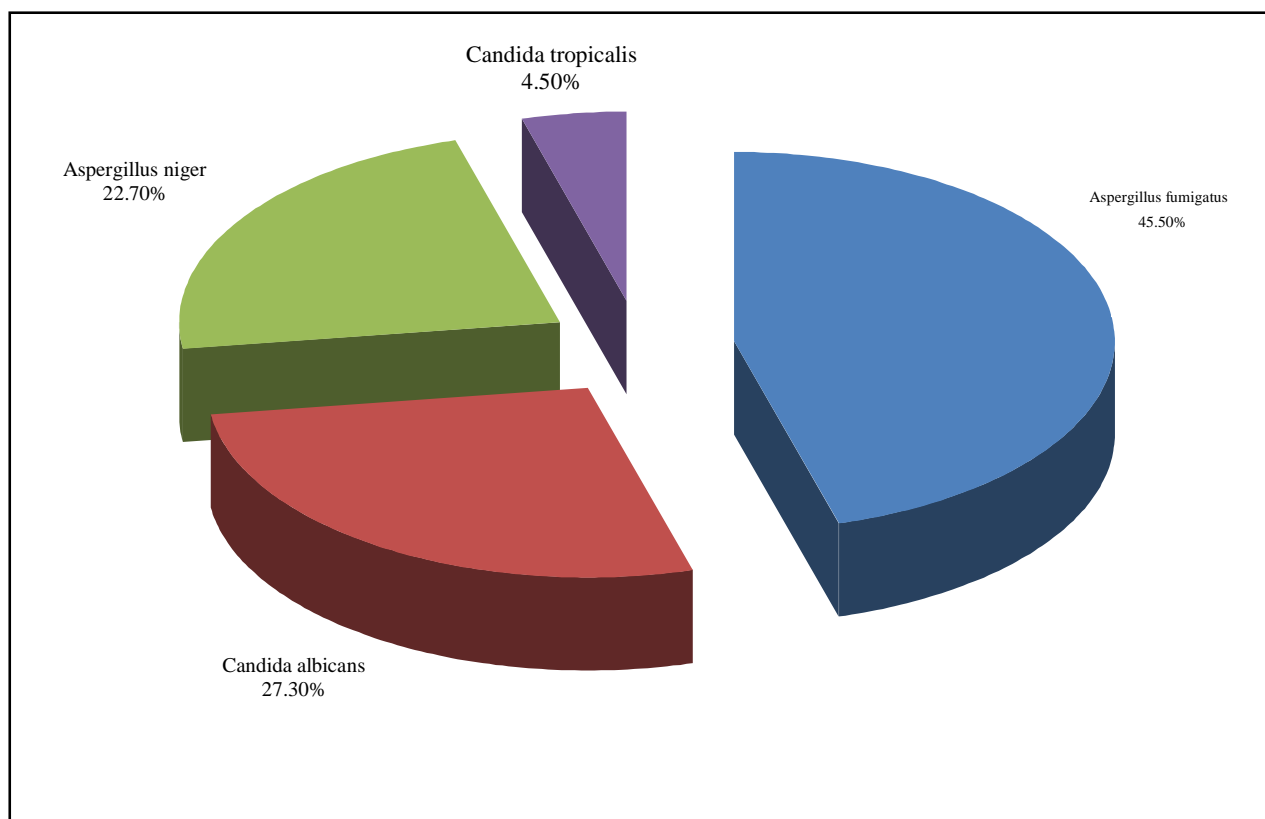


Figure (5)

(Results of fungal blood culture)

Aspergillus fumigatus spp. constituted 45.5% (n=10), *aspergillus niger* spp. 22.7% (n=5), *candida albicans* 27.3% (n=6) and *candida tropicalis* constituted 4.5% (n=1) of febrile neutropenic attacks that had positive fungal blood culture.

Table (3): Comparison between infected and non infected groups as regards blood counts and CRP :

	Infected (52 attacks)		Non infected (46 attacks)		t	p
	Mean	SD	Mean	SD		
TLC	1.281	0.7306	1.335	0.8587	0.3	>0.05
ANC	0.2450	0.13987	0.3863	0.11592	5.4	<0.001
AMC	0.0608	0.10362	0.1689	0.10636	5.1	<0.001
APC	0.3058	0.17831	0.5502	0.20072	6.4	<0.001
PLT	102.40	123.015	195.65	123.731	3.7	<0.001
CRP	66.46	59.443	13.43	18.598	6.1	<0.001

There were highly significant ($p<0.001$) lower ANC values in attacks of FN with infection in comparison to attacks of FN without infection. Also, there were highly significant ($p<0.001$) lower values of AMC, APC and platelets, and highly significant ($p<0.001$) higher values of CRP between both groups.

On the other hand, TLC showed non significant differences ($p>0.05$) between both groups (mean \pm SD=1.281 \pm 0.7306 for attacks of FN with infection versus 1.335 \pm 0.8587 for attacks of FN without infection).

Table (4): comparison between infected and non infected groups as regards fever and duration of FN :

	Infected (52 attacks)		Non infected (46 attacks)		t	p
	Mean	SD	Mean	SD		
Fever ($^{\circ}\text{C}$)	39.0635	0.48387	38.6478	0.45448	4.4	<0.001
Duration of FN in ds.	9.1923	2.98387	4.5652	1.57271	9.8	<0.001

Table (5): comparison between infected and non infected groups as regards chest manifestations, hypotension and chest x-ray abnormalities:

		Non infected (46 attacks)		Infected (52 attacks)		Total		χ^2	p
		No	%	No	%	No	%		
hypotension	+ve	0	0.0%	27	51.9%	27	27.6%	30.4	<0.001
	-ve	46	100.0%	25	48.1%	71	72.4%		
chest manifestations	+ve	1	2.2%	19	36.5%	20	20.4%	15.7	<0.001
	-ve	45	97.8%	33	63.5%	78	79.6%		
chest X ray abnormalities	+ve	1	2.2%	17	32.7%	18	18.4%	13.2	<0.001
	-ve	45	97.8%	35	67.3%	80	81.6%		

Highly significant differences ($p < 0.001$) were found between attacks of FN with infection (either bacterial, fungal or both) versus attacks of FN without infection as regards fever and duration of neutropenia.

Other parameters, including hypotension, chest manifestations and chest X ray abnormalities also showed highly significant differences ($p < 0.001$) between both groups.

Table (6): Comparison between gram+ve organisms and gram-ve organisms infected groups as regards blood counts and CRP :

	G +ve (23 attacks)		G -ve (13 attacks)		t	p
	Mean	SD	Mean	SD		
TLC	1.139	0.5790	1.046	0.4977	0.5	>0.05
ANC	0.2530	0.13703	0.1608	0.13320	1.9	>0.05
AMC	0.0661	0.12504	0.0562	0.08704	0.3	>0.05
APC	0.3191	0.19732	0.2169	0.16745	1.6	>0.05
PLT	73.26	79.678	50.77	62.358	0.9	>0.05
CRP	97.75	57.243	39.69	48.531	3.1	<0.05

There were Significantly ($p < 0.05$) higher values of CRP in attacks of FN with gram +ve bacterial infection versus attacks of FN with gram –ve bacterial infection.

On the other hand, there were non significant ($p > 0.05$) differences between attacks of FN with gram +ve bacterial infection versus attacks of FN with gram –ve bacterial infection as regards TLC, ANC, AMC, APC, and platelets.

Table (7): comparison between gram+ve organisms and gram-ve organisms infected groups as regards fever and duration of FN:

	G +ve (23 attacks)		G -ve (13 attacks)		t	p
	Mean	SD	Mean	SD		
Fever (⁰ C)	39.20	0.428	39.08	0.432	0.8	>0.05
Duration of FN in ds.	9.26	2.649	8.46	3.357	0.8	>0.05

Table (8): comparison between G+ve and G-ve groups as regards chest manifestations, hypotension and chest x-ray abnormalities:

		G+ve (23attacks)		G-ve (13attacks)		Total		X ²	p
		No	%	No	%	No	%		
hypotension	+ve	9	39.1%	10	76.9%	19	52.8%	3.4	>0.05
	-ve	14	60.9%	3	23.1%	17	47.2%		
chest manifestations	+ve	2	8.7%	3	23.1%	5	13.9%	0.5	>0.05
	-ve	21	91.3%	10	76.9%	31	86.1%		
chest X ray abnormalities	+ve	3	13.0%	0	0.0%	3	8.3%	0.5	>0.05
	-ve	20	87.0%	13	100.0%	33	91.7%		

Non significant ($p>0.05$) differences were found between attacks of FN with gram +ve bacterial infection versus attacks of FN with gram –ve bacterial infection as regards fever and duration of neutropenia.

Also, hypotension, chest manifestations and chest X ray abnormalities showed non significant ($p>0.05$) differences between attacks of FN with gram +ve bacterial infection versus attacks of FN with gram –ve bacterial infection.

Table (9): comparison between only bacterial and only fungal infected groups as regards blood counts and CRP :

	Only bacterial (30 attacks)		Only fungal (16 attacks)		t	p
	Mean	SD	Mean	SD		
TLC	1.071	0.5436	1.675	0.9384	2.4	<0.05
ANC	0.2329	0.14117	0.3019	0.12281	1.7	>0.05
AMC	0.0529	0.08855	0.0569	0.08623	0.1	>0.05
APC	0.2858	0.16727	0.3588	0.13584	1.6	>0.05
PLT	64.71	74.030	186.25	167.085	2.8	<0.05
CRP	75.87	60.568	43.50	51.544	1.8	>0.05

There were significantly ($p < 0.05$) lower values of TLC and platelets in attacks of FN with only bacterial infection versus attacks of FN with only fungal infection.

On the other hand, non significant ($p > 0.05$) differences were found between attacks of FN with only bacterial infection versus attacks of FN with only fungal infection as regards ANC, AMC, APC and CRP

Table (10): comparison between only bacterial and only fungal infected groups as regards fever and duration of FN :

	Only bacterial (30 attacks)		Only fungal (16 attacks)		t	p
	Mean	SD	Mean	SD		
Fever (⁰ C)	39.18	0.386	38.84	0.544	2.4	<0.05
Duration of FN in ds.	8.65	2.823	9.69	3.198	1.1	>0.05

Table (11): comparison between only bacterial and only fungal groups as regards chest manifestations, hypotension and chest x-ray abnormalities:

		Only bacterial (30 attacks)		Only fungal (16 attacks)		Total		X ²	p
		No	%	No	%	No	%		
hypotension	+ve	14	46.7%	8	50.0%	22	47.8%	0.1	>0.05
	-ve	16	53.3%	8	50.0%	24	52.2%		
chest manifestations	+ve	3	10.0%	14	87.5%	17	37.0%	23.7	<0.001
	-ve	27	90.0%	2	12.5%	29	63.0%		
chest X ray abnormalities	+ve	0	.0%	14	87.5%	14	30.4%	33.7	<0.001
	-ve	30	100.0%	2	12.5%	32	69.6%		

There were significant ($p < 0.05$) differences between attacks of FN with only bacterial infection versus attacks of FN with only fungal infection as regards fever.

Moreover, chest manifestations and chest X ray abnormalities showed highly significant ($p < 0.001$) differences between both groups; being much evident in