statistical Analysis

The statistical analysis of the results was carried carried out according to the following formulae : -

1) Mean value $(\bar{x}) = \frac{\sum x}{n}$

where $\sum x$ = The sum of all observations .

n = The numder of all observations .

2) Standard deviation (S.D) $= \sqrt{\frac{\sum (x^- - x)^2}{n-1}}$

where $\sum (x^- - x)^2$ = sum of squares of differences .

3) Standard error (S.E) $= \frac{S.D}{\sqrt{n}}$.

4) To test for significance of difference between two means, "t" was calculated and compared with degree of freedom

(d.f) $= (n_1+n_2) -2$ where n_1 the number of observations in the first group and n_2 = the number of observation in the second group , "t" was calculated from the following formula : - " t" $= \frac{x_1 - x_2}{\sqrt{(SE\,1)^2 + (SE\,2)^2}}$

Results and analysis of results

Table (1) showed that the distribution of main clinical signs in various groups. We found that initail presence of seizures and focal neurological signs was more frequent in bacterial group than other three groups . Four cases of bacterial group (26.67%) had initail seizures and 3 cases (20 %)

had focal neurological signs. These signs carry bad prognosis . State of consciousness is also important, 3 cases (20 %) of bacterial group were in semicoma and one case was in deep coma .

Table (2) demonstrated that there was significant difference between rectal body temprature of control group with mean = 39.47 ±0.59 and partially treated group with mean =38.74 ±0.69 but there was no significant difference between the other 2 groups as regards body temprature .

Table (3) showed that the mean total blood WBCS ofbacterialgroup = 13393 ± 6974 which was significantly different from control and viral groups ($p < 0.05$) . There was no signifcant difference between viral and contral groups as regards total blood leukocytes .

Table (4) showed that the mean of absolute count of blood neutrophils in ABM group was 9445.53 ± 5148.48 which is significantly higher than those of ANM and control groups ($p < 0.05$) . But there was no significant differerence between mean count of blod neutrophils in control and viral groups .

Table (5) showed that there was no significant difference between all groups as regards absolute count of lymphocytes ($p > 0.05$) .

Table (6) showed that there was significant differrence between bacterial meningitis group and both viral and control groups as regards mean CSF glucose value, which equals 21.47 ± 15.43 for bacterial meningitis group, and equals 60.67± 12.38 mg /dl for viral group and 65.4± 16 mg /dl for control group .Also CSF gulcose of partially treated group is significantly lower than viral and control group which equal 28.7 ± 10.82 mg /dl ($p < 0.05$) .

Table (7) showed that CSF chloride of bacterial group was significantly lower than that of both viral and control groups .

Table (8) showed that there was significant difference between bacterial meningitis group and all other three groups as regards mean value of CSF protein which equals 353.07 ± 247.76 mg /dl for bacterial group ($p<0.05$) LSD = 167.56 mg /dl

Table (9) showed that mean of CSF cells /CC = 3088.27/CC which was significantly higher than mean value of CSF cells/C.C of both viral and control groups ($p< 0.05$) but not significantly higher than that of partially treated group .

Table (10) showed that the mean value of CSF TNF -α of bacterial group was significantly higher than those of all other 3 groups with mean = 891.964 ± 604.5 pg /ml ($p < 0.05$) LSD = 405.624 pg /ml .

Table (11) showed that the value of plasma TNF -α of bacterial group was significantly higher than those of all other 3 groups with mean = 110.62 ± 114.88 pg /ml and ($p < 0.05$) LSD = 97.573 .

Table (12) showed that there was 3 types of organisms detected by culture of the CSF of 15 bacterial cases which were: H. influenzae(n=6) N. meningitidis (n=7) and St. pneumoniae (n=2) .CSF TNF -α was detected by significant value (> 35 pg /ml) in 6 cases of H.influenzae group 100 % and in 6 cases of N. meningitides group 85 7% and two cases St. pneumoniae group 100 % .

Table(13) showed that in bacterial group CSF TNF α was significantly correlated with CSF gulcose level , increase in gulcose level decrease C.SF TNF α . Also correlated significantly with cells / C.C in C.SF , The higher the CSF cells the higher the TNF- α of CSF. Also there was postive correlation of TNF- α of plasma and CSF but no correlation between CSF TNF -α and blood neutrophils or lymphocytes .

Table (14) & (15) & (16) showed that there was no significant correlation between TNF α CSF & blood leukocytes and CSF variables (glucose - protein - chloride) ($p > 0.05$.) as regard the other three groups .

Graph (1) showed that there was postive significant correlation between CSF TNF α and number of cells /C.C in CSF .

Graph (2) showed that there was negative significant correlation between CSF TNF- α and CSF gulcose content .

Graph (3) showed that there was postive significant correlation between TNF -α of plasma and TNF -α of CSF .

Graph (4) showed that CSF TNF - α was correlated with the number of febrile days .

Graph (5) showed the mean value of TNF - α in CSF in bacterial group (n = 15) in different types of organisms : N. meningitidis (n = 7) mean of TNF - α = 542 .83 . H. infleunzae (n = 6) mean of TNF -α = 1128.033 . St . pneumniae (n = 2) mean of TNF - α = 1500 .

Tabel (1) Distribution of the studied and control cases according to clinical data.

	Bacterial n = 15	Viral n = 15	Partially treated n = 10	Control n = 10
Vomiting				
No	15	12	9	3
%	100.00	80.00	90.00	30.00
Headache				
No	14	13	9	2
%	93.33	86.67	90.00	20.00
Seizures				
No	4	3	0	10
%	26.67	20.00	0	100.00
F.N.S.				
No	3	1	2	0
%	20.00	6.67	20.00	0
Consciousness				
Irrit				
No	8	11	6	7
%	53.33	73.33	60.00	70.00
Smn				
No	1	1	1	1
%	6.67	6.67	10.00	10.00
Leth				
No	2	3	2	2
%	13.33	20.00	20.00	20.00
Semicoma				
No	3	0	1	0
%	20.00	0	10.00	0
Coma				
No	1	0	0	0
%	6.67	0	0	0

Table (2) Comparison between studied and control cases as regards rectal temperature.

Case No.	Bacterial	Viral	Partially treated	Control
1	40.2	39.5	39	38.7
2	38.9	38.5	38.5	39
3	39.2	39.7	37.5	39.5
4	40.2	39.2	38.7	39.9
5	39.5	38.9	38.5	40.2
6	37.9	38.7	39.5	39.5
7	38.5	39.5	38.2	38.9
8	39.5	39.2	39	39.5
9	39.6	39	40	39
10	40	38	38.5	40.5
11	38.8	39.5		
12	39.2	39		
13	39.7	39		
14	39.5	37.5		
15	38.5	38		
Range	37.9 - 40.2	37.5 - 39.7	37.5 - 40	38.7 - 40.5
$\bar{\chi}$	39.28	38.88	38.74	39.47 ○
SD	0.66	0.64	0.69	0.59
F = 3.077		p< 0.05	LSD = 0.70	

○ Significant.

The rest is non significant.

Table (3) Comparison between studies and control cases as regards total leucocytic count .

Case No.	Bacterial	Viral	Partially treated	Control
1	17200	9400	15000	7650
2	4700	12800	12400	7200
3	5700	8400	18250	6100
4	28000	4800	11600	10400
5	7500	6100	12100	6800
6	9800	6300	13600	8750
7	26000	8600	17200	7500
8	10700	11800	14000	6400
9	18600	7200	12000	8800
10	9200	9200	9400	9600
11	12400	9700		
12	8000	8200		
13	17800	6100		
14	14800	3500		
15	10500	8100		
Range	4700-28000	3500-12800	9400-18250	6100-10400
$\bar{x}$	13393.33	8013.33	13555	7920
SD	6974.29	2472.38	2678.56	1417.39
	F = 6.787	p < 0.05	LSD = 5047	

○ Non Significant.

The rest is significant.

Table (4) Comparison between studied and control cases as regards absolute count of neutrophils

Case No.	Bacterial	Viral	Partially treated	Control
1	10492	4888	9750	4819
2	3478	5376	5208	4464
3	3648	4536	11132	2745
4	18480	2064	8352	4680
5	4650	3843	10043	4284
6	6664	2394	8704	6300
7	20020	4472	12728	4650
8	6741	4956	9380	3904
9	12648	3672	8760	5456
10	6808	4232	6486	4320
11	10540	5044		
12	4880	4510		
13	14418	2623		
14	10656	1645		
15	7560			
Range	3478-20020	1645-5376	5208-12728	2745-6300
$\bar{x}$	9445.53	3779	9064.3	4562.2
SD	5146.48	1228.93	2146.66	930.2
	F = 11.892	p < 0.05	LSD = 3638	

○ Non significant.

The rest is significant.

Table (5)Comparison between studied and control cases as regards absolute count of blood lymphocytes

Case No.	Bacterial	Viral	Partially treated	Control
1	6020	3948	4500	2295
2	1034	6784	2728	2160
3	1710	3444	5840	2989
4	3920	2496	2668	5096
5	2250	1891	1936	2176
6	2450	3654	4216	2012
7	5460	3698	3920	2625
8	3424	6608	3920	2240
9	4464	3160	1920	2816
10	1656	4508	2256	4608
11	922	4171		
12	2560	3362		
13	2670	3352		
14	3256	1610		
15	2415	5265		
Range	922-6020	1610-6784	1920-5840	2012-5096
$\bar{\chi}$	2952.07	3863.4	3390.4	2903.9
SD	1494.03	1479.32	1290.96	1078.06
$F = 1.444$ $p > 0.05$				

Table (6) Comparison between studied and control cases as regards C.S.F. glucose in (mg/dl).

Case No.	Bacterial	Viral	Partially treated	Control
1	14	65	48	76
2	65	67	22	35
3	45	40	45	63
4	5.5	56	24	62
5	35	59	25	95
6	20	62	18	56
7	7	35	38	65
8	16	55	22	76
9	12	72	20	54
10	22	55	25	72
11	18	71		
12	25	73		
13	12.5	75		
14	10	50		
15	15	75		
Range	5.5-65	35-75	18 - 48	35 - 95
$\bar{x}$	21.47	60.67	28.7	65.4
SD	15.93	12.38	10.82	16.00
F = 31.636		p < 0.05	LSD = 16.48	

○ Non significant.

The rest is significant.

Table (7) Comparision between studied and control cases as regards C.S.F. chloride (mg/dl).

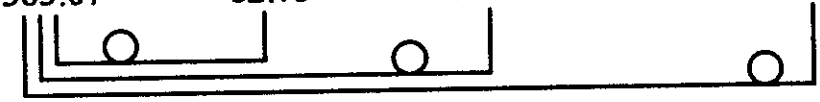
Case No.	Bacterial	Viral	Partially treated	Control
1	558	950	972	1126
2	723	945	650	1057
3	854	1075	445	987
4	868	842	875	875
5	325	1112	732	1050
6	546	1188	785	1026
7	612	1130	620	970
8	522	1073	140	1070
9	780	965	185	995
10	423	1140	375	1140
11	824	1230		
12	145	1020		
13	552	1015		
14	895	702		
15	720	972		
Range	145-895	702-1230	140-972	875-1140
$\bar{\chi}$	623.13	1023.93	577.9	1029.6
SD	216.24	136.69	238.26	78.00
F = 20.192		p < 0.05	LSD = 225.37	

○Non significant.

The rest is significant.

Table (8) Comparison between studied and control cases as regards C.S.F. proteins (mg/dl).

Case No.	Bacterial	Viral	Partially treated	Control
1	355	42	64	35
2	158	138	62	88
3	326	135	86	48
4	765	52	52	35
5	255	54	92	35
6	362	38	249	46
7	882	42	85	32
8	52	135	260	40
9	385	33	95	85
10	86	42	99	42
11	99	43		
12	260	42		
13	273	65		
14	548	25		
15	640	55		
Range	52-882	25-138	52-260	32-88
$\bar{\chi}$	363.07	62.73	114.4	48.6
SD	247.76	39.09	75.49	20.64
F = 14.833		p < 0.05	LSD = 167.56	



○ Significant.

The rest is non significant.

Table (9) Comparison between studied and control cases as regards cells /C.C.

Case No.	Bacterial	Viral	Partially treated	Control
1	6100	50	1500	10
2	89	145	2500	5
3	150	150	1400	20
4	7100	20	2200	30
5	185	45	1200	5
6	1500	25	3500	20
7	5200	60	2100	50
8	2700	40	300	40
9	4200	12	250	80
10	1500	30	1200	100
11	3100	35		
12	1200	25		
13	7500	50		
14	3300	150		
15	2500	200		
Range	89 - 7500	12-200	250-3500	5-100
$\bar{\chi}$	3088.27	69.13	1615	36
SD	2471.75	60.05	995	32.3
F = 14.219		p < 0.05	LSD = 1683.78	

○ Significant.

The rest is non significant.

Table(10) Comparison between studied and control cases as regards TNF-α of C.S.F

Case No.	Bacterial	Viral	Partially treated	Control
1	1500	0	0	0
2	324.61	2.03	0	0
3	1500	25.48	0	0
4	455.94	0	0	6.93
5	1500	0	3.51	0
6	478.25	0	19.87	6.98
7	630.81	0	0	0
8	382.02	0.95	0	0
9	139.40	0	6.24	0
10	1500	15.98	32.82	2.64
11	28.18	0		
12	440.25	8.15		
13	1500	0		
14	1500	0		
15	1500	5.24		
Range	28.18-1500	0-25.48	0-32.82	0-6.98
$\bar{\chi}$	891.964	3.855	6.244	1.655
±SD	604.5	7.47	11.22	2.91
F = 24.81		p < 0.05	LSD = 405.624	

○ Significant.

The rest is non significant.

Table(11)Comparison between studied and control cases as regards of plasma TNF-α

Case No.	Bacterial	Viral	Partially treated	Control
1	80.69	5	2.43	0
2	12.91	0	0	27.38
3	17.02	22.27	2.30	0
4	563.49	14.18	15.98	8.40
5	48.53	0	0	0
6	27.63	17.80	9.69	13.41
7	301.91	2.03	0	0
8	29.53	32.54	0	0
9	180.41	0	2.16	0
10	38.36	0	0	0
11	73.44	0		
12	16.76	12.40		
13	166.63	19.37		
14	78.87	12.06		
15	23.07	0		
Range	12.91-563.49	0-32.54	0-25.98	0-27.36
$\bar{\chi}$	110.62	9.18	3.26	4.92
±SD	148.88	10.4	5.37	9.18
F = 5.615		p < 0.05	LSD = 97.578	

○ Significant.

The rest is non significant.

Table (12) Initial TNF- α of CSF in 15 pateints with bacterial meningitis

Oragnism	No.	TNF- α detected. (> 35 pg/ml)	Range	Mean in pg/ml
		no %		
Haem. influenzae.	6	6 (100 %)	382.02 to 1500	1128.033
N. meningitidis.	7	6 (85.71 %)	139.40 to 1500	542.83
St. pneumoniae.	2	2 (100 %)	1500	1500
Total	15	14 (93.33 %)	> 35 - 1500	1056.954

Table (13) Correlation between CSF TNF -α & Blood and CSF variables in bacterial group (n = 15).

	Blood			CSF				plasma TNF-α
	T.L.C.	A.C.N.	A.C.L.	glucose	protein	chloride	Cells	
r	-0.187	- 0.194	- 0.011	- 0.699	0.647	0. 120	0.733	0.512
p	> 0.05	> 0.05	> 0.05	< 0.01	< 0.01	> 0.05	< 0.01	< 0.05

T.L.C. Total leucocytic count

A.C.N. Absolute count of neutrophils

A.C.L. Absolute count of lympocytes

Table (14) Correlation between CSF TNF -α & Blood and CSF variables in viral group (n = 15).

	Blood			CSF				plasma TNF-α
	T.L.C.	A.C.N.	A.C.L.	glucose	protein	chloride	Cells	
r	0.171	0.232	0.074	- 0.335	0.372	0.192	0.301	0.155
p	> 0.05	> 0.05	> 0.05	> 0.05	> 0.05	> 0.05	> 0.05	> 0.05

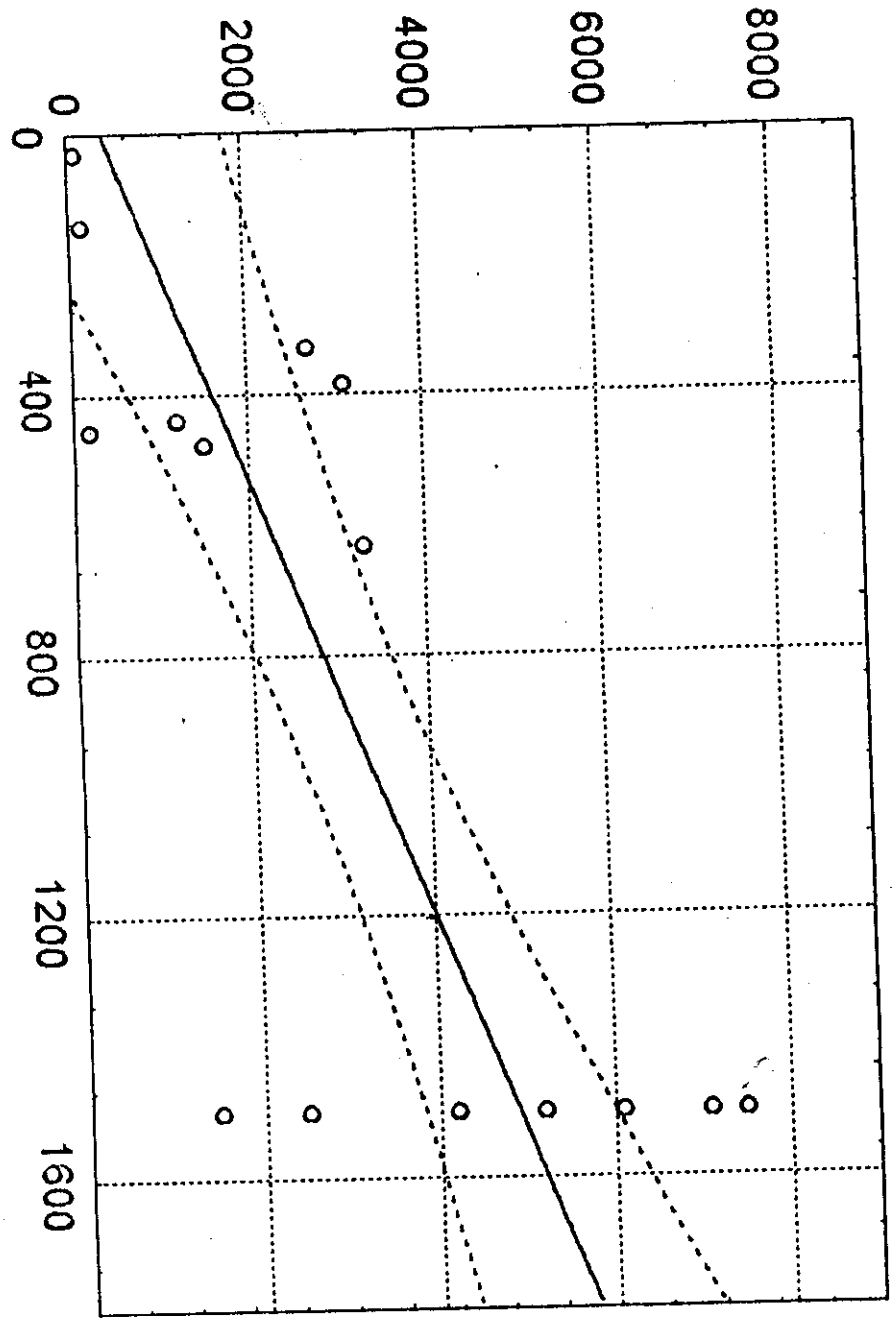
Table (15) Correlation between CSF TNF -α & Blood and CSF variables in partially treated group (n = 10).

	Blood			CSF				plasma TNF-α
	T.L.C.	A.C.N.	A.C.L.	glucose	protein	chloride	Cells	
r	-0.224	-0.063	-0410	- 0.296	-0.081	- 0.493	-0.477	0.005
p	> 0.05	> 0.05	> 0.05	> 0.05	> 0.05	> 0.05	> 0.05	> 0.05

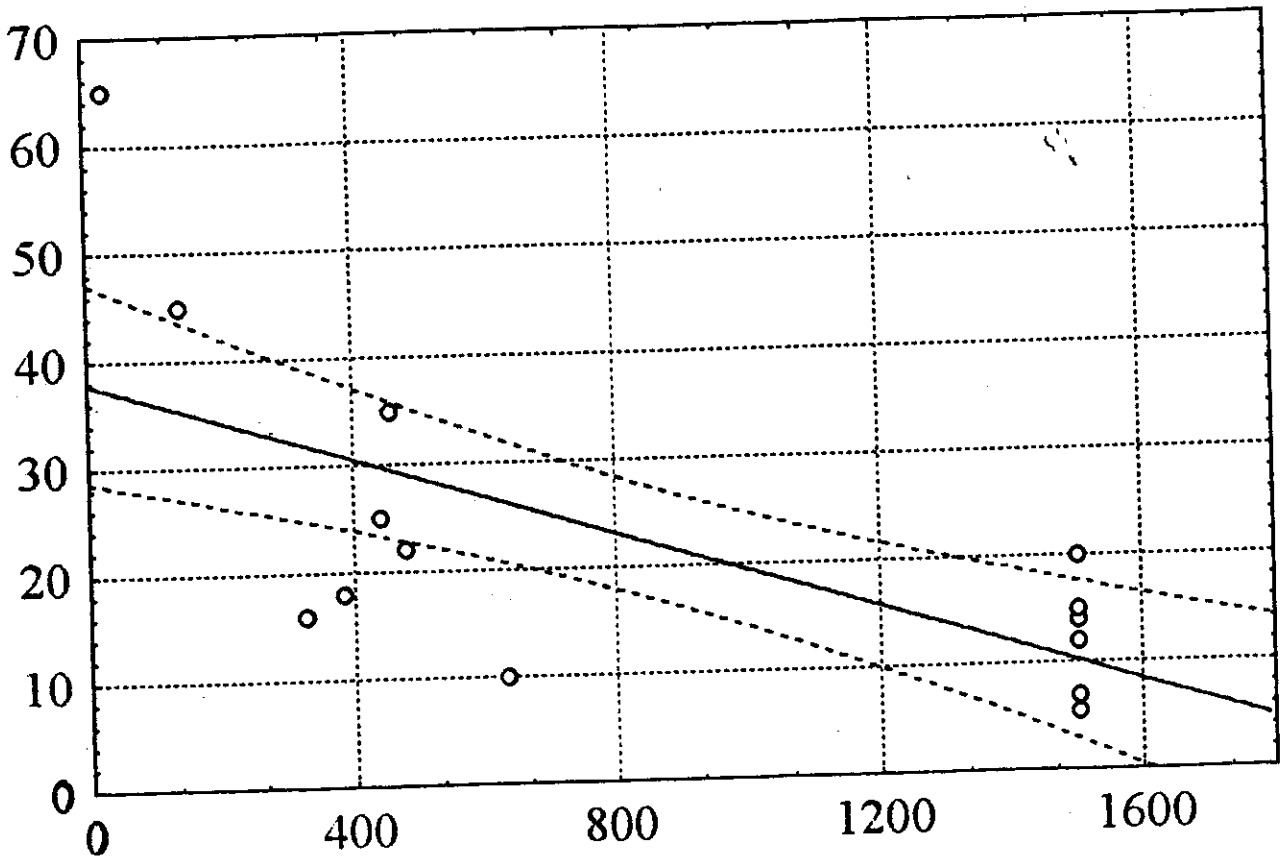
Table (16) Correlation CSF TNF -α & Blood and CSF variales in partially control group (n = 10).

	Blood			CSF				plasma TNF-α
	T.L.C.	A.C.N.	A.C.L.	glucose	protein	chloride	Cells	
r	0.738	0.505	0.477	-0.171	-0.240	-0.394	0.019	0.293
p	< 0.05	> 0.05	> 0.05	> 0.05	> 0.05	> 0.05	> 0.05	> 0.05

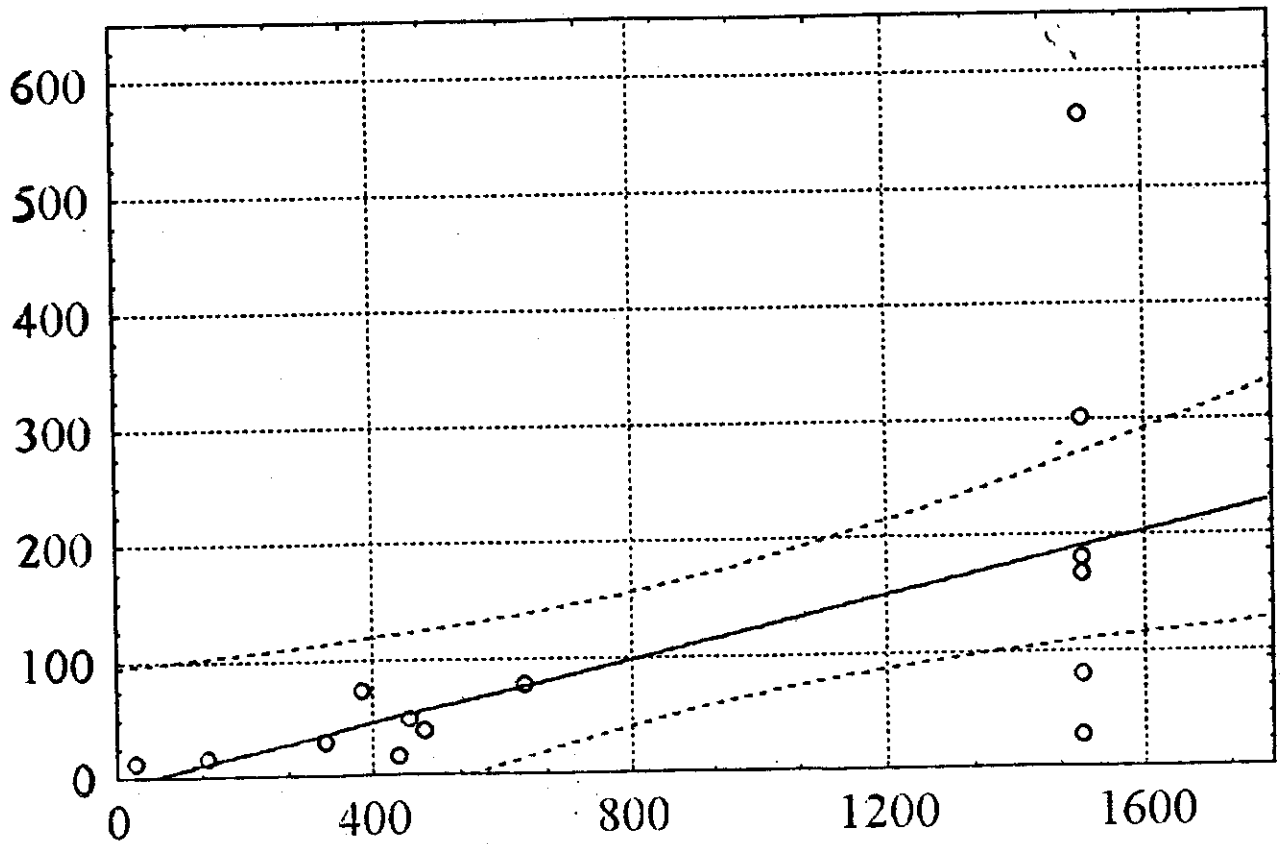
Graph (1) CORRELATION BETWEEN NO. OF CELLS & TNF- α OF CSF IN BACTERIAL GROUP.



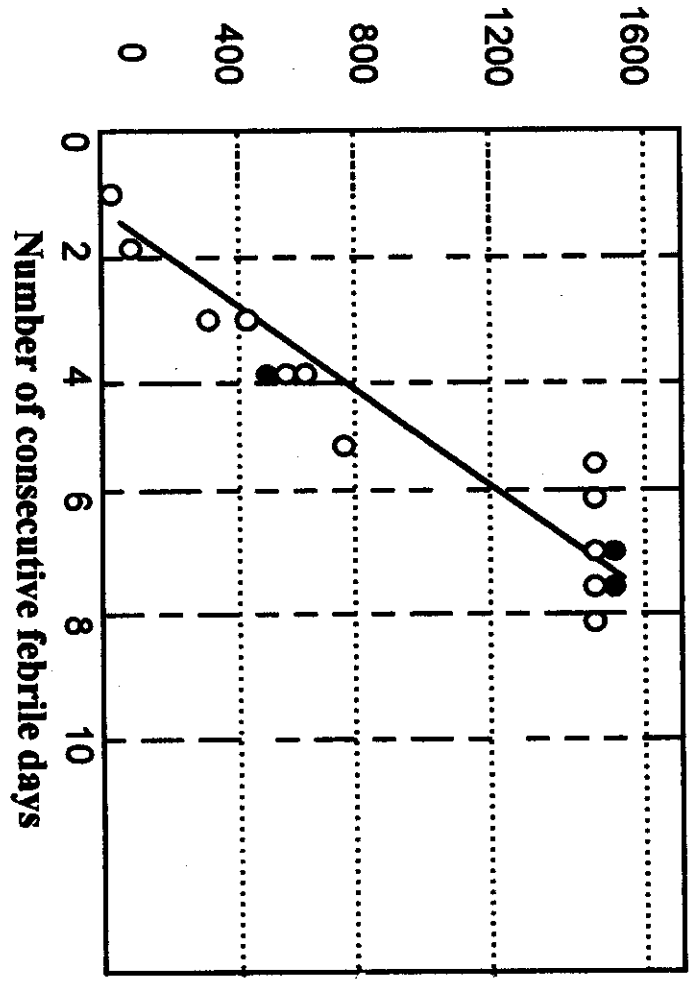
Graph (2) CORRELATION BETWEEN CSF GLUCOSE CONCENTRATION& TNF -α OF CSF IN BACTERIAL GROUP.



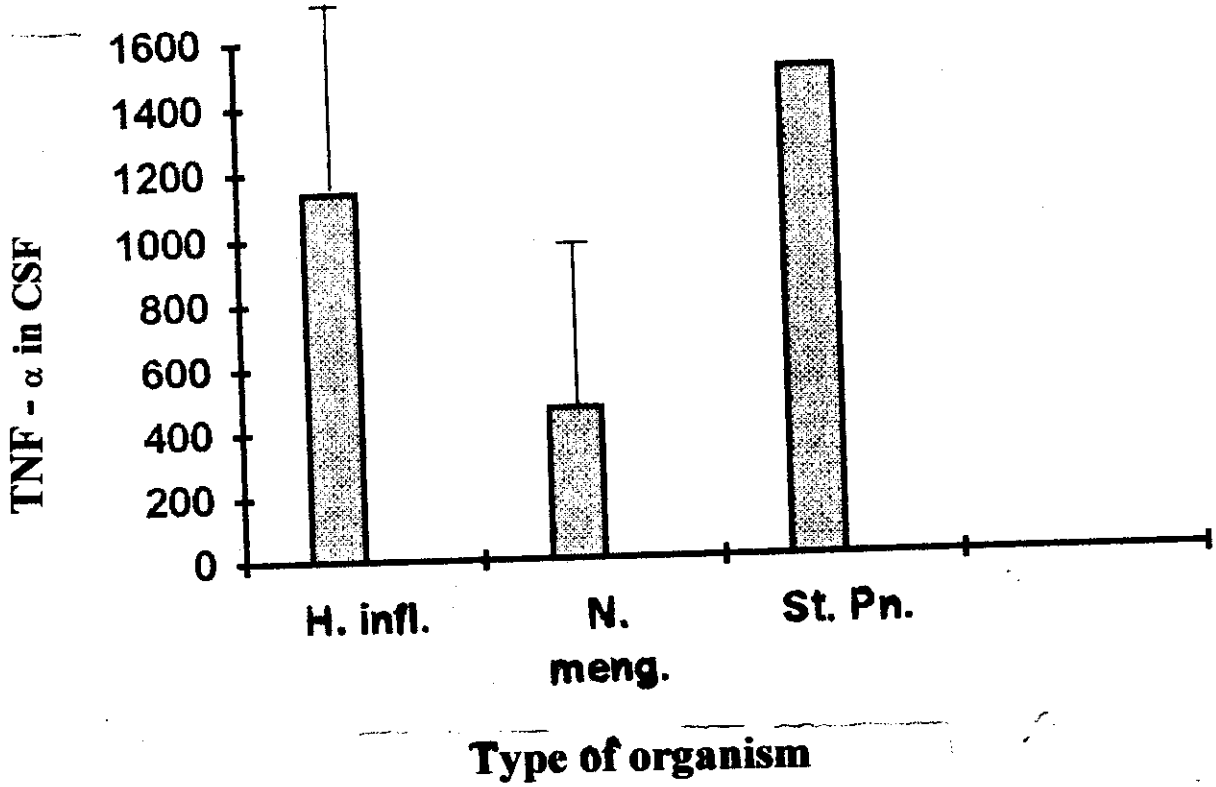
Graph (3) CORRELATION BETWEEN TNF-α OF PLASMA & TNF-α OF CSF IN BACTERIAL GROUP.



Graph (4) Correlation between CSF TNF - α and number of consecutive febrile days in bacterial group,



Graph (5)


1600
1400
1200
1000
800
600
400
200
0
TNF - α in CSF
H. infl.
N. meng.
St. Pn.
Type of organism