

RESULTS

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Description of the studied cases:

This study included thirty neonates, divided into 2 groups:

Group I : "Septic group": included 20 neonates with clinical signs highly suggestive of sepsis.

Group II: "Control group": Included 10 healthy neonates, with no apparent clinical signs suggesting sepsis, or any other clinical condition that predispose to infection.

Each of the studied cases was subjected to detailed history, full clinical examination and the following laboratory tests:

1. *Complete blood count (CBC)*: with special stress on total leukocytic count (TLC), absolute neutrophil count (ANC), immature to total neutrophil ratio (I/T ratio), and platelets count.
2. *Blood culture.*
3. *Acute phase reactants*: - Erythrocyte sedimentation rate (ESR)
 - C - reactive protein (CRP)
 - α_1 - Acid glycoprotein (AGP)
4. *Third component of the complement system (C3).*

Distribution according to sex & weight

Table (1): Sex distribution of studied neonates

	Male		Female		Total	
	No.	%	No.	%	No	%
Group I	11	55	9	45	20	100
Group II	4	40	6	60	10	100
Total	15		15		30	100

Fisher's exact test : $P > 0.05$ (Non significant)

Table (2): Weight distribution of studied neonates

	No. of Cases	Weight in Kg	
		Range	Mean $\pm$
Group I	20	1.5 - 4.1	3.03 $\pm$ 0.78
Group II	10	2 - 4.3	3.30 $\pm$ 0.72

t value = 0.94 $P > 0.05$ (Non significant)

Tables (1) & (2) : Show that the newborn infants under study were comparable in both sex & weight.

Distribution according to Age**Table (3): Gestational age of studied neonates**

	No. of Cases	Gestational Age in Weeks	
		Range	Mean $\pm$ SD
Group I	20	32 - 41	37.9 $\pm$ 2.78
Group II	10	35 - 41	38.4 $\pm$ 1.83

t value = 0.59

p > 0.05

(Non significant)

Table (4): Post-natal age of studied neonates

	No. of cases	Age in days	
		Range	Mean $\pm$ SD
Group I	20	3 - 25	10.35 $\pm$ 6.23
Group II	10	2 - 22	10.2 $\pm$ 6.25

t value = 0.06

p > 0.05

(Non significant)

Tables (3) & (4): Show that the newborn infants under study were comparable in both gestational & post-natal ages.

Clinical Findings**Table (5): Clinical features of studied cases.**

Clinical feature	No. of cases	%
* Poor suckling	18	90
Jaundice	3	15
* Respiratory distress	11	55
Apneic Spells	4	20
Lethargy	4	20
* Sclerema	6	30
Hypothermia	4	20
Umbilical sepsis	2	10
Weak cry	2	10
Abdominal distension	1	5
Hepatomegaly	3	15
Vomiting	1	5
* Shock	8	40
Oedema	4	20
Anuria	1	5
Convulsions	1	5
Full fontanell	1	5
Skin rash	3	15
Pallor	1	5
Cyanosis	5	25
Constipation	1	5

This table shows that the most common clinical findings encountered were: Poor suckling , respiratory distress, shock, and sclerema; in order of frequency.

Laboratory Findings

Table (6): A). Laboratory Findings in Group (I)

Case No.	Sex	Gestational age (week)	Post- natal Age (day)	Weight (Kg)	Blood Culture	ESR (1st h)	TLC (mm ³)	ANC (/mm ³)	IT Ratio	Platelets (/mm ³)	CRP	AGP g/l	C3 (TU/ml)
1	M	40	3	2.5	Negative	4	22.500	13.500	0.33	160.000	+ ve	0.81	80.8
2	F	38	6	2.75	G -ve bacilli	15	4.500	2070	0.56	110.000	+ ve	2.08	105
3	M	32	7	1.5	G +ve cocci	20	9.600	5184	0.25	125.000	+ ve	1.22	58.8
*4	F	40	4	2.6	G +ve cocci	11	11.500	7274	0.23	120.000	+ ve	1.74	110
5	M	38	16	3.8	G +ve cocci	35	10.800	6264	0.2	115.000	+ ve	1.37	131
6	M	35	5	2.5	Negative	17	7.900	5214	0.15	190.000	+ ve	2.02	46.6
7	F	39	4	2.4	G -ve bacilli	9	6.500	3640	0.23	135.000	+ ve	1.74	121
*8	F	39	8	3.25	G -ve bacilli	14	7.700	2541	0.25	115.000	+ ve	0.61	80.8
*9	F	34	9	2.2	G +ve cocci	55	5.200	1872	0.22	160.000	+ ve	0.69	67.3
*10	F	40	8	3.5	G -ve bacilli	23	10.500	4200	0.25	260.000	+ ve	0.69	137
11	F	38	12	3	G +ve cocci	12	3.000	2250	0.26	180.000	+ ve	1.85	95.1
12	M	41	25	4.1	G -ve bacilli	10	3.200	2016	0.44	105.000	+ ve	1.63	137
13	M	38	18	3.7	Negative	1	13.700	5480	0.57	174.000	+ ve	1.58	100
14	M	40	16	3.5	G -ve bacilli	3	2.650	1092	0.57	160.000	+ ve	1.13	131
15	M	41	15	3.9	G +ve cocci	16	10.000	6600	0.33	90.000	+ ve	1.37	95.1
16	F	39	10	3.65	G -ve bacilli	18	10.500	6090	0.31	120.000	+ ve	1.58	58.8
*17	M	32	5	2.1	G +ve cocci	26	15.600	8424	0.14	80.000	+ ve	0.50	54.6
18	M	35	3	1.9	G -ve bacilli	15	8.000	3200	0.3	250.000	+ ve	1.91	76.2
19	M	39	19	4	G -ve bacilli	32	4.400	2156	0.28	60.000	+ ve	1.13	110
20	F	40	14	3.75	G -ve bacilli	14	21.900	6570	0.33	54.000	+ ve	1.52	160

* Cases who died (no =5)

Table (7): B) Laboratory Findings in Group (II)

Case No.	Sex	Gestational age (week)	Post - natal age (day)	Weight (Kg)	Blood culture	ESR (1st h.)	TLC (/mm ³)	ANC (/mm ³)	I/T ratio	Platelets (/mm ³)	CRP	AGP (g/l)	C3 (TU/ml)
1	F	39	5	2.5	Negative	4	12.000	6040	0.08	220.000	-ve	0.31	121
2	F	40	10	3.8	Negative	2	10.000	4120	0.05	190.000	-ve	0.30	131
3	M	38	7	3.15	Negative	2	9.200	3860	0.06	165.000	-ve	0.33	126
4	F	35	2	2	Negative	3	15.000	6150	0	210.000	-ve	0.27	95.1
5	M	38	18	4.1	Negative	7	8.200	3900	0.15	180.000	-ve	0.43	105
6	F	41	9	2.9	Negative	1	7.900	2560	0.07	160.000	-ve	0.39	100
7	M	39	6	3.5	Negative	5	10.500	4830	0.1	250.000	-ve	0.30	126
8	F	38	22	4.3	Negative	10	9.000	4610	0.06	190.000	-ve	0.40	166
9	F	40	8	3.7	Negative	3	8.500	4500	0	175.000	-ve	0.33	121
10	M	36	15	3.2	Negative	2	11.000	5900	0.09	300.000	-ve	0.36	137

ESR : Erythrocyte Sedimentation Rate.

TLC : Total Leukocytic Count.

ANC : Absolute Neutrophil Count.

I/T ratio : Immature to Total ratio.

CRP : C - Reactive Protein.

AGP : α_1 - Acid Glycoprotein.

C3 : Complement 3.

F : Female M: Male

Comparison of laboratory tests in both groups

Table (8): A) Significance of quantitative tests in group I & II

	Measures	Group I no=20	Group I no=10	Statistics
ESR	Range $\bar{x}$ SD	1 - 55 17.5 12.43	1 - 10 3.9 2.77	t: 4.67 p>0.001 H.S.
TLC	Range $\bar{x}$ SD	2.650-22.500 9.482 5.624	7.900-15.000 10.130 2.150	t: 0.45 p>0.05 N.S.
ANC	Range $\bar{x}$ SD	2.156-13.500 4.780 2.957	2.560 - 6.640 4.647 1.137	t: 0.18 p>0.05 N.S.
I / T	Range $\bar{x}$ SD	0.14-0.57 0.31 0.13	0.05-0.15 0.07 0.04	t: 7.57 p<0.001 H.S.
Platelets	Range $\bar{x}$ SD	54.000-260.000 138.150 54.872	160.000-300.000 204.000 43.320	t: 3.58 p<0.001 H.S.
AGP	Range $\bar{x}$ SD	0.5 - 2.52 1.41 0.56	0.27 - 0.46 0.35 0.06	t: 8.37 p<0.001 H.S.
C3	Range $\bar{x}$ SD	46.6 - 160 97.8 32.1	95.1-166 122.8 20.5	t: 2.58 p<0.05 S.

This table shows that there was a significant difference between group I & group II in ESR, I/T ratio, Platelets count, AGP, and C3, while no significant difference in : TLC and ANC.

S.= Significant.

H.S= Highly significant.

N.S = Non Significant.

B) Significance of qualitative tests in group I & II

Table (9): CRP of studied neonates by latex agglutination test.

	Group I		Group II		Total	
	no.	%	no.	%	no.	%
Positive	18	90	-	-	18	60
Negative	2	10	10	100	12	40
Total	20	100	10	100	30	100

Fisher's exact test : $p < 0.0001$ (Highly Significant)

This table shows that CRP was highly significant in cases compared to controls.

Table (10): Blood culture in studied neonates.

	Group I		Group II		Total	
	No.	%	No.	%	No.	%
Positive	17	85	-	-	17	56.7
Negative	3	15	10	100	13	43.3
Total	20	100	10	100	30	100

Fisher's exact test: $p < 0.0001$ (Highly Significant)

This table shows that the blood culture was highly significant in cases compared to controls.

Evaluation of Individual Tests as Diagnostic Tools

Table (11):

Test	TP	TN	FP	FN
ESR ≥ 15	10	12	1	7
TLC < 5.000	5	13	0	12
* ANC (abnormal)	7	8	5	10
I/T ≥ 0.2	16	11	2	1
Platelets ≤ 150.000	12	13	0	5
CRP	15	10	3	2
* AGP > 0.47	17	10	3	0
* C3 < 81.8	6	11	2	11

(TP: True Positive, TN: True Negative, FP: False Positive, FN: False Negative)

* Normal range = 1,750 - 5,400 (Manroe et al. , 1979).

* 0.47 g/l: upper limit of normal (= mean of the controls + 2 SD).

* 81.8 IU/ml: lower limit of normal (= mean of the controls - 2 SD).

Table (12):

Test	Sensitivity	Specificity	PPV	NPV
ESR	58.52	92.3	90.9	63.16
TLC	29.41	100	100	52
ANC	41.17	61.54	58.33	44.4
I/T	94.12	84.62	88.89	91.67
Platelets	70.59	100	100	72.22
CRP	88.24	76.92	83.3	83.3
AGP	100	76.92	85	100
C3	35.29	84.62	75	50

Tables (11) & (12): Show that I/T ratio, CRP, and AGP have the best results as regards sensitivity, specificity, positive and negative predictive values (PPV & NPV) in comparison to other tests.

Sepsis Screen**Table (13):** Criteria of positive tests in sepsis screen.ESR ≥ 15 mm (First hour) ¹I/T ratio ≥ 0.2 ²Platelets count $\leq 150.000 / \text{mm}^3$ ³CRP: Positive ²AGP $> 0.47 \text{ g/l}$ ⁴

1. Alder & Denton, 1975.

3. Rodwell et al, 1988.

2. Philip & Hewitt, 1980.

4. Bienvenu et al , 1981.

This table shows the cut off values of individual tests used in sepsis screen.

Table (14): Validity of Sepsis Screen

TP	TN	FP	FN
17	10	3	0

Sensitivity	Specificity	PPV	NPV
100	76.92	85	100

This table shows a high validity of sepsis screen than any individual test.

Tests used as prognostic tools**Table (15):** Comparison of AGP level in survived & died cases (g/l).

	No.	Range	Mean	SD	Significance
Survived	15	0.81 - 2.52	1.60	0.44	t: 2.94 p<0.01 Significant
Died	5	0.50 - 1.74	0.85	0.51	

This table shows that AGP level was significantly lower in died neonates than in survived neonates.

Table (16): Comparison of C3 level in survived & died cases (IU / ml)

	No.	Range	Mean	SD	Significance
Survived	15	58.8 - 160	100.4	32.4	t: 0.61 p>0.05 Non Sig.
Died	5	54.4 - 110	89.9	33.4	

This table shows that there was no significant difference between died and survived neonates as regards C3 level..

Fig. (1): Blood culture in group I (septic group)

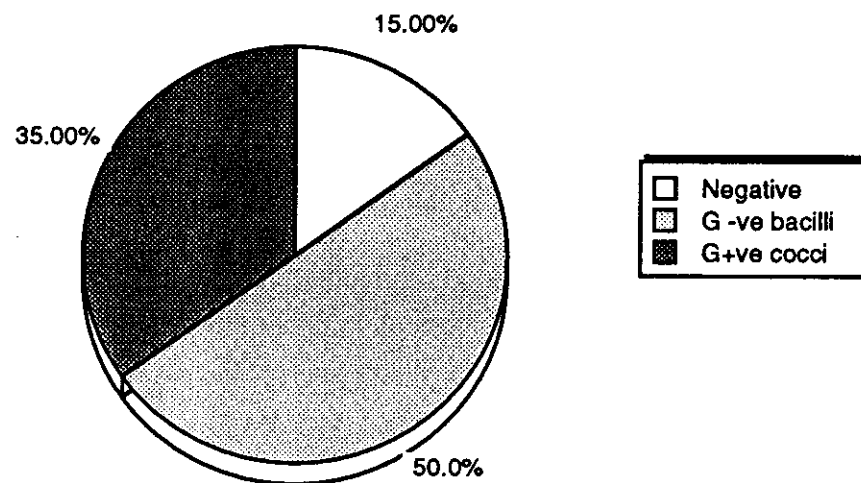


Fig. (2): Sensitivity & Specificity of acute phase reactants.

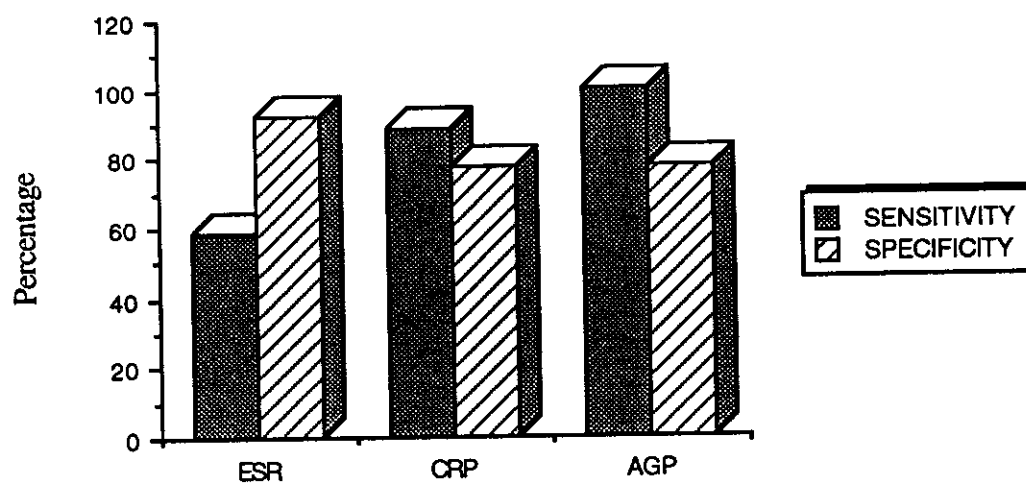


Fig. (3): PPV & NPV of acute phase reactants

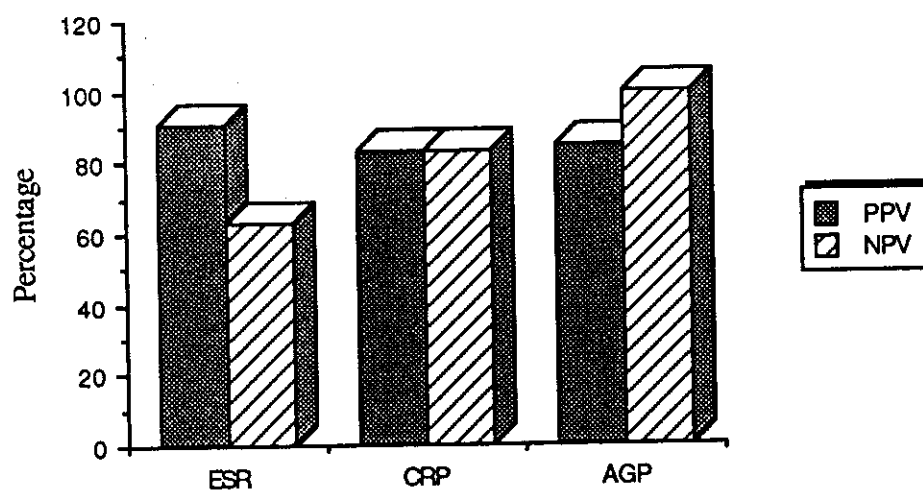


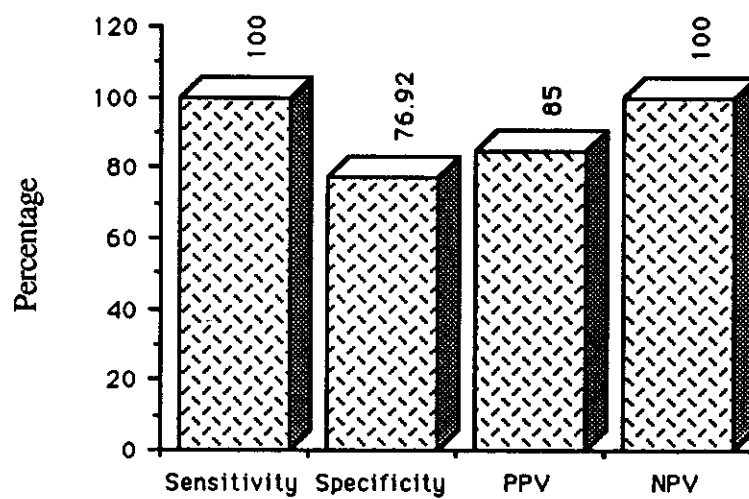
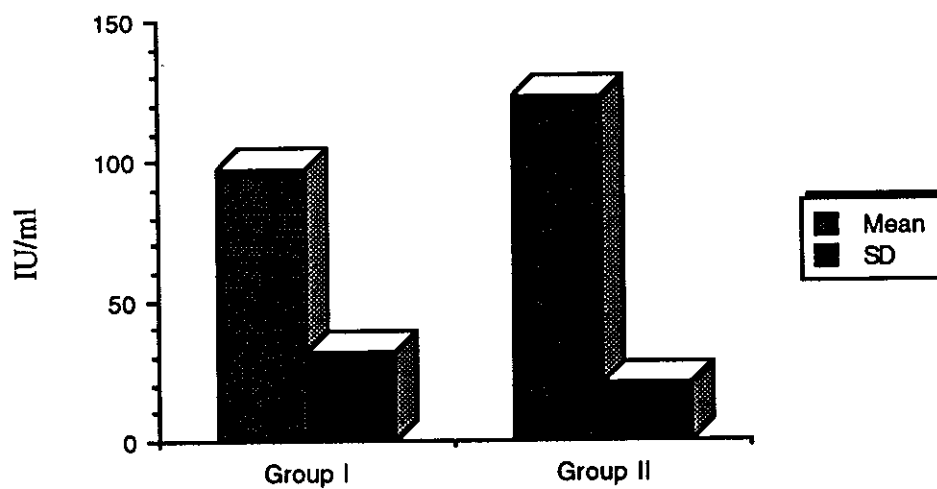
Fig. (4): Validity of Sepsis Screen

Fig. (5): C3 level as a diagnostic test.**Fig. (6): AGP level as a prognostic test**