

RESULTS

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Fig. (1) shows the percentages of operated children groups, according to the histopathological findings. It was 61% of acute appendicitis without perforation (non-perforated appendicitis group) then 12% of acute appendicitis with perforation (perforated appendicitis group), and 27% of cases showed no histopathological evidence of acute appendicitis (though some showed changes due to surgical manipulations).

Fig. (2) is a photograph of microscopic histological appearance of normal appendix with findings due to surgical manipulations, and *fig. (3)* shows histopathological finding of acutely inflamed appendix.

Table (1) and *fig. (4)* show the age distribution (in years) of all operated children.

Table (2) and *fig. (5)* show the sex distribution of positive group (perforated and non-perforated).

Table (3) and *fig. (6)* show the association between clinical manifestations in different groups. They show highly significant association as regards tenderness $p=0.0007$, mild significant association regarding history of fever and rigidity and no significant association regarding other manifestations.

Table (4) shows the distribution of measured temperature among the three studied groups and it statistically shows highly significant difference.

Table (5) and *fig(7)* show association between duration of abdominal pain (as the most common and constant feature of clinical presentations) and the final pathological findings. This period of time represents the duration from the onset of abdominal pain till the operation and it shows that most of unnecessary laparotomies had been done within the first day of complaint, and most of perforated cases had been found in the group

operated upon after 3 days. Patients that were operated upon -after longer duration- were unlikely having appendicitis.

Table (6 and 10) show a comparison between the preoperative laboratory findings of the three groups (perforated , non-perforated and negative) and the control group.

Table (7 and 11) show a comparison between preoperative laboratory findings of positive cases (perforated and non-perforated) and negative cases (unnecessary laparotomies). They show highly significant difference for the following parameters:

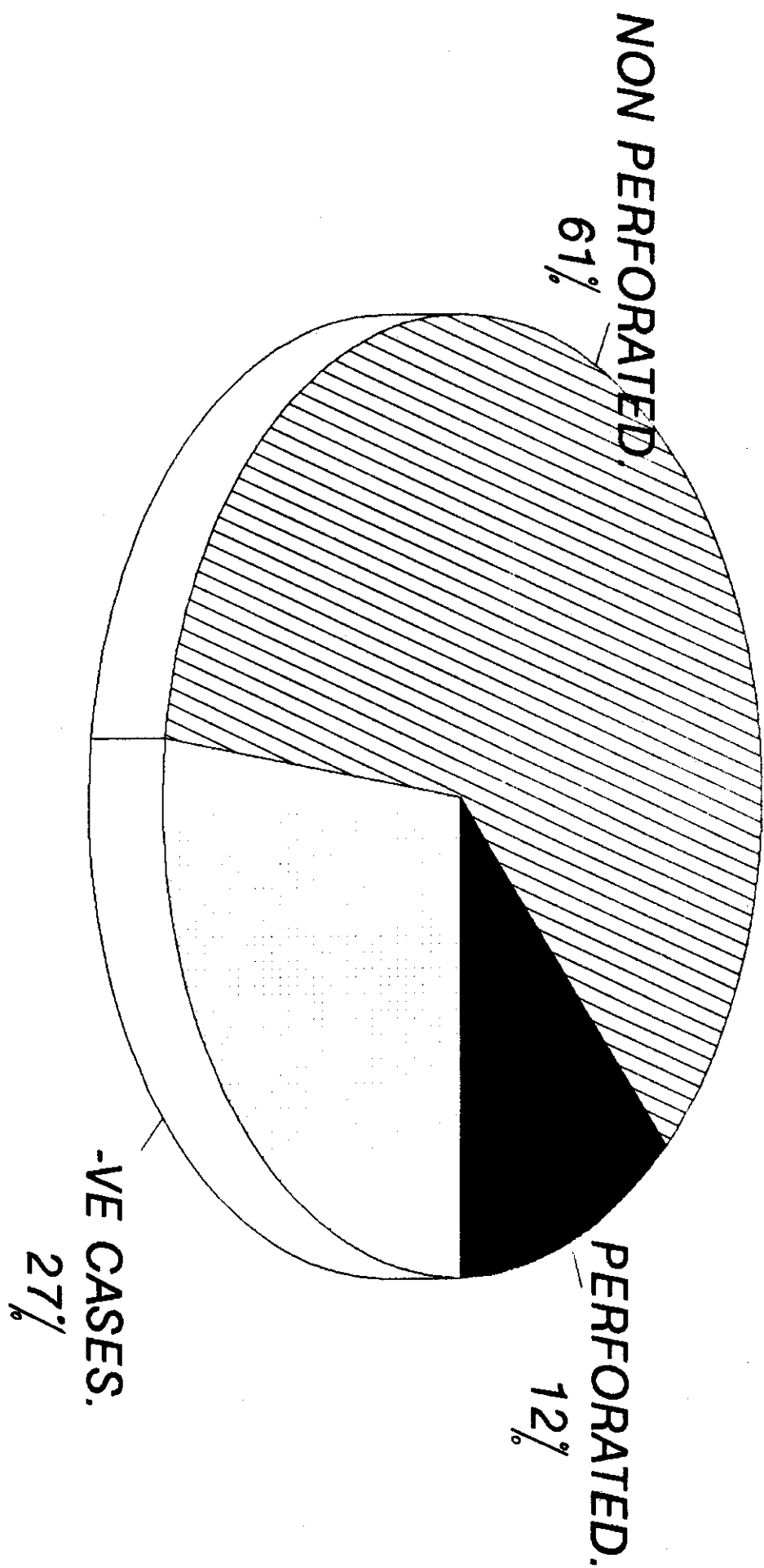
WBC, Neutrophil (%), ESR, CRP and C₃, and mild significant difference regarding IgA and non-significant difference regarding others.

Table (8 and 12) show the laboratory findings changes pre- and post-operatively among positive cases (perforated and non-perforated). They show highly significant difference statistically for all studied parameters.

Table (9 and 13) show the laboratory findings changes (pre- and post-operatively) among negative group (unnecessary appendicectomies). They show highly significant difference for α -1-Antitrypsin, IgM, IgG and IgA, significant difference for WBC and Neutrophil (%) and non-significant difference for ESR, CRP and C₃.

Table (14) shows sensitivity, specificity, predictive values and accuracy of each individual laboratory test in diagnosing acute appendicitis in children.

Finally, *table (15)* shows sensitivity, specificity, predictive values and accuracy of combined tests in diagnosing acute appendicitis in children.



(Fig. 1) Distribution of Cases According to Histopathological Findings.

Table (1)
Age distribution of operated cases (by years)

	Perforated group	Non- Perforated group	Negative group
$\bar{x} \pm SD$ (Range)	11.9 \pm 2.3 (8-15)	10.8 \pm 1.6 (7-15)	12.1 \pm 0.9 (11-14)

F = 7.169

P = 0.0016

(Sig.)

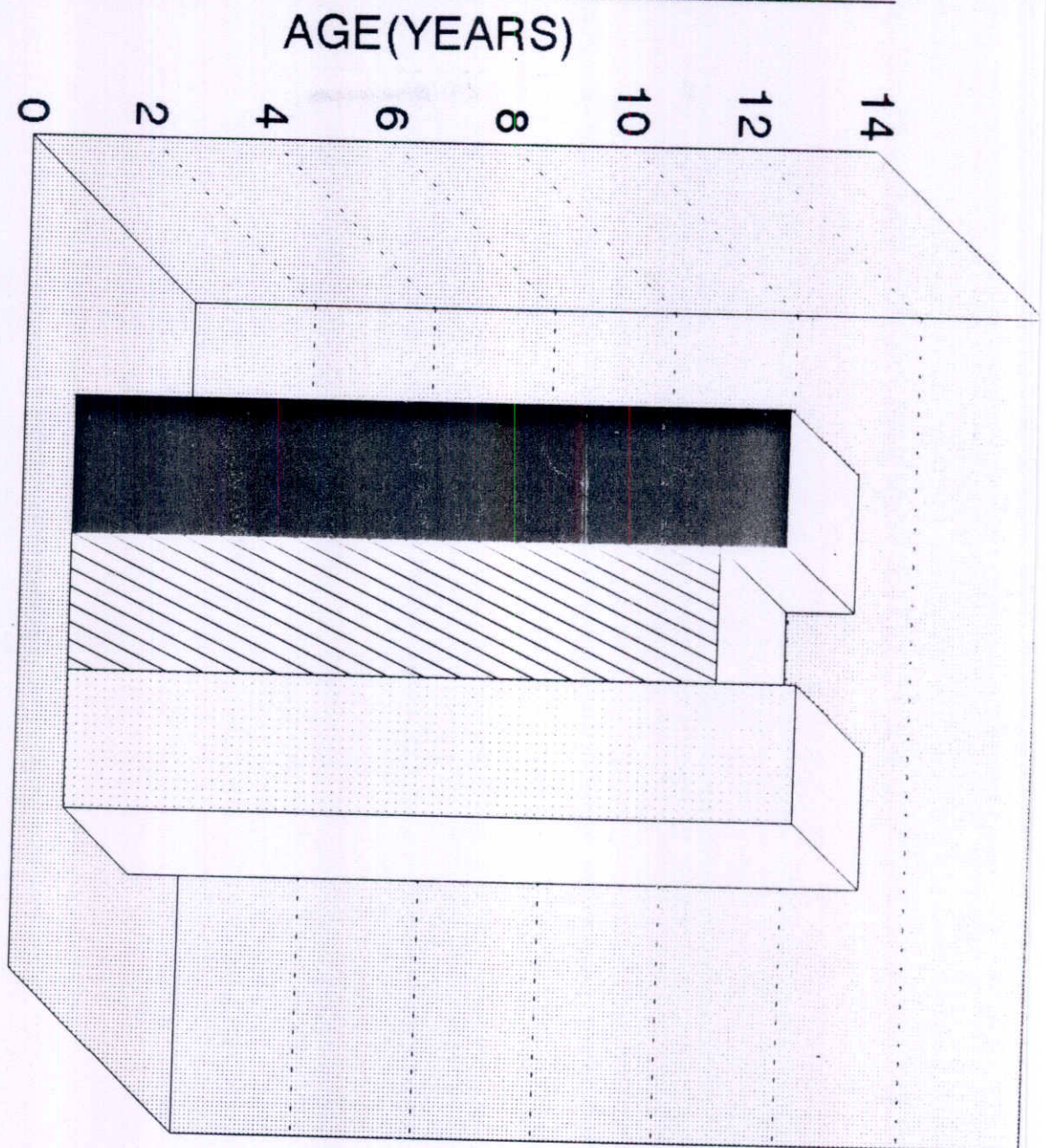
Table (2)
Sex distribution of positive group
(Perfoated + Non perforated) and negative group

	positive group		negative group		Total
	No.	%	No.	%	
Male	46	63%	11	40.7%	57
Female	27	37%	16	59.3%	43
Total	73		27		100

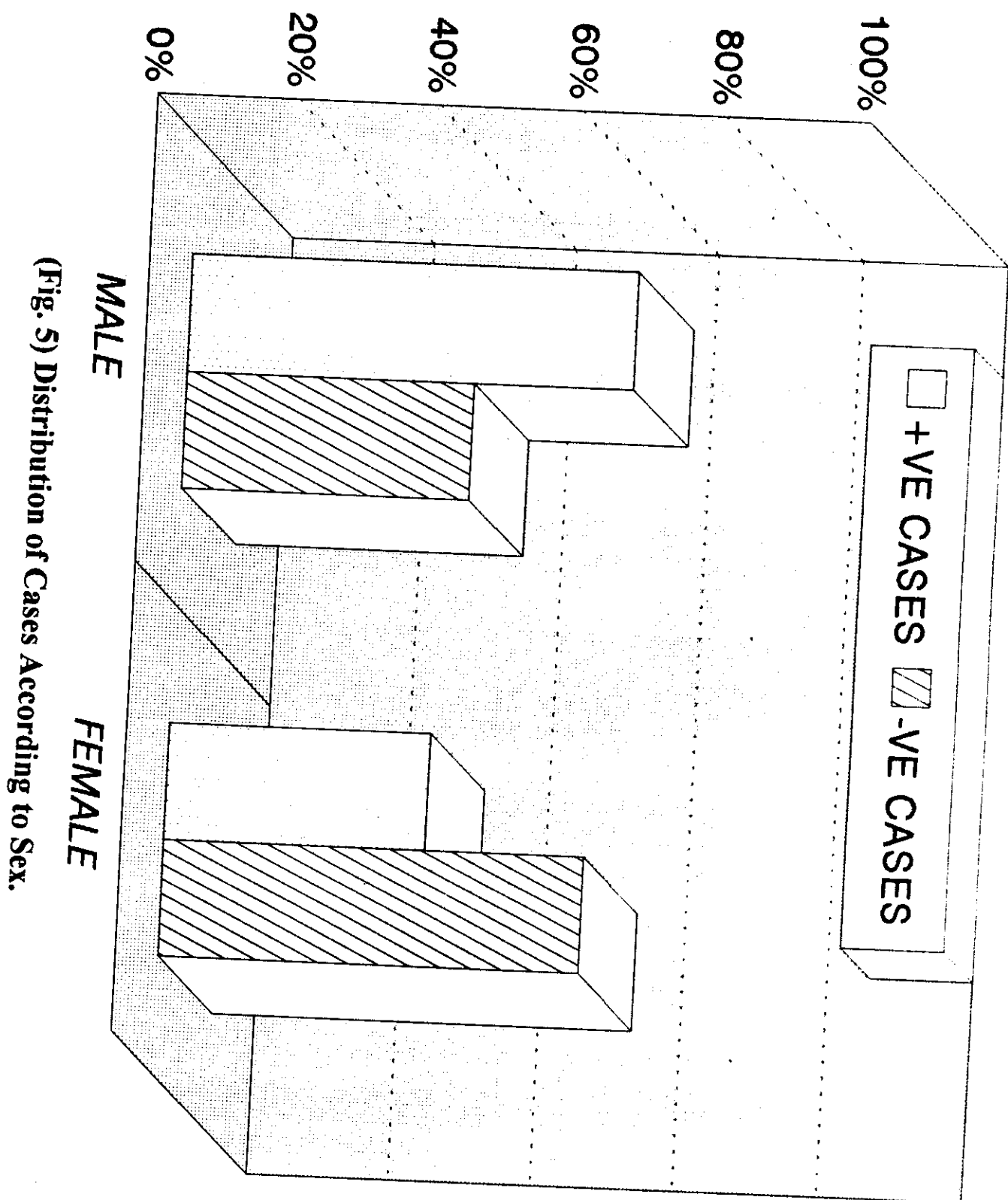
 $\chi^2 = 3.99$

P= 0.04

(Sig.)



(Fig. 4) Mean Age Of Cases According To Histopathological Findings.



(Fig. 5) Distribution of Cases According to Sex.

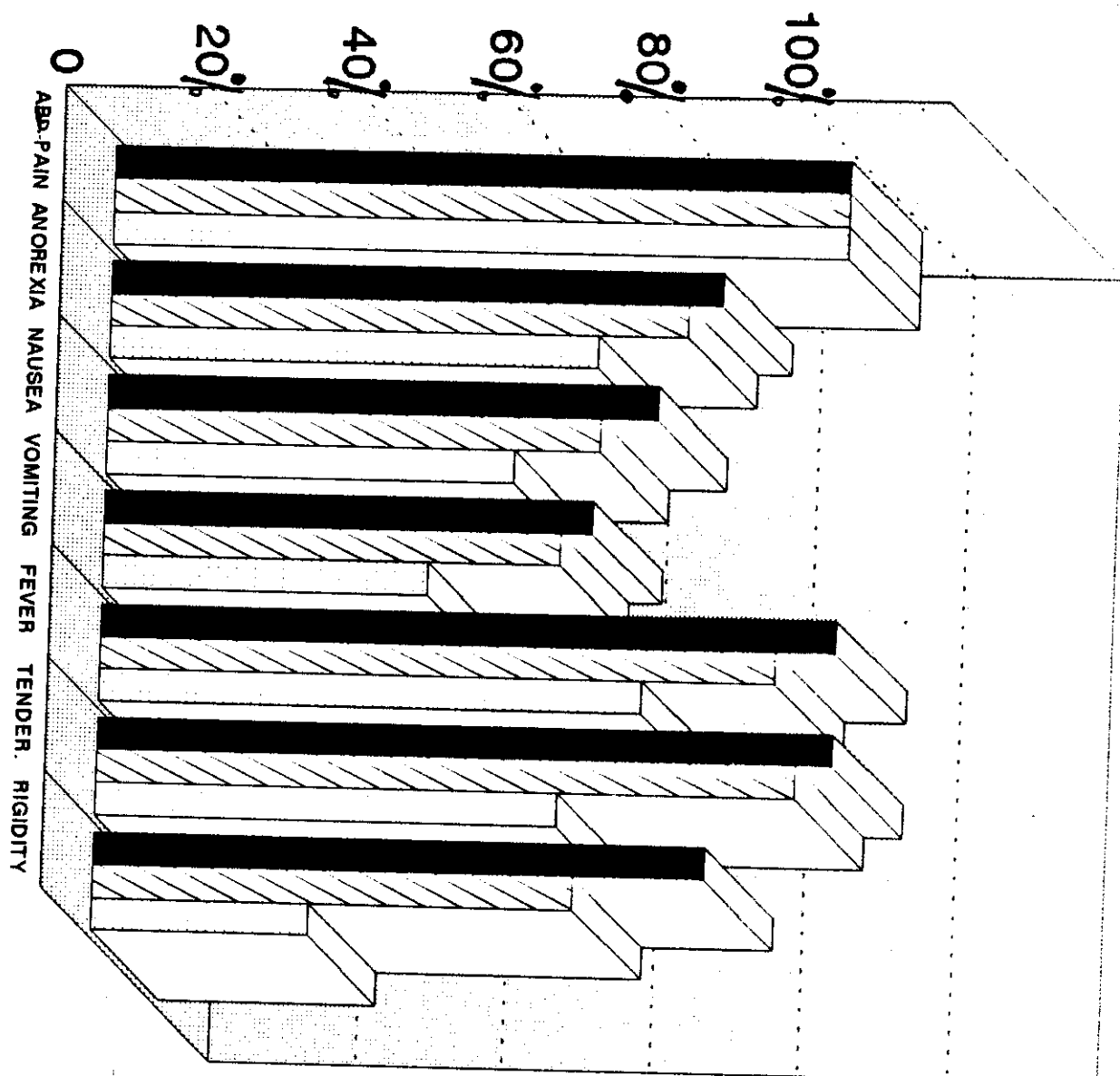
Table (3)
Association between clinical manifestations
and histopathological findings of the different groups

	Perfoated group (n=12)		Non Pertorated group (n=61)		Negative group (n=27)		χ^2	P
	No.	%	No.	%	No.	%		
Abdominal pain	12	100%	61	100%	27	100%	0.0	1.0 (NS)
Anorexia	10	83.3%	48	78.7%	18	66.7%	1.89	0.38 (NS)
Nausea	9	75%	41	67.2%	15	55.6%	1.72	0.42 (NS)
Vomiting	8	66.7%	38	62.3%	12	44.4%	2.87	0.23 (NS)
History of fever	12	100%	56	91.8%	20	74%	7.43	0.02 (Sig.)
Tenderness	12	100%	58	95%	17	63%	19.11	0.00007 (HS)
Rigidity	10	83.3%	40	65.6%	8	29.6%	13.52	0.0011 (Sig.)

(NS) = non-significant

(Sig.) = significant

(HS) = Highly significant



(Fig. 6) Association Between Clinical Manifestation and Histopathological Findings.

Table (4)
Measured temperature ($^{\circ}\text{C}$) for each group

	Perforated group	Non Perforated group	Negative group
$\bar{x} \pm \text{SD}$ (Range)	38.2 ± 0.4 (37.5-38.8)	37.9 ± 0.3 (37.2-38.7)	37.4 ± 0.2 (37.2-38.0)

F = 35.99

P = 0.0000

(HS)

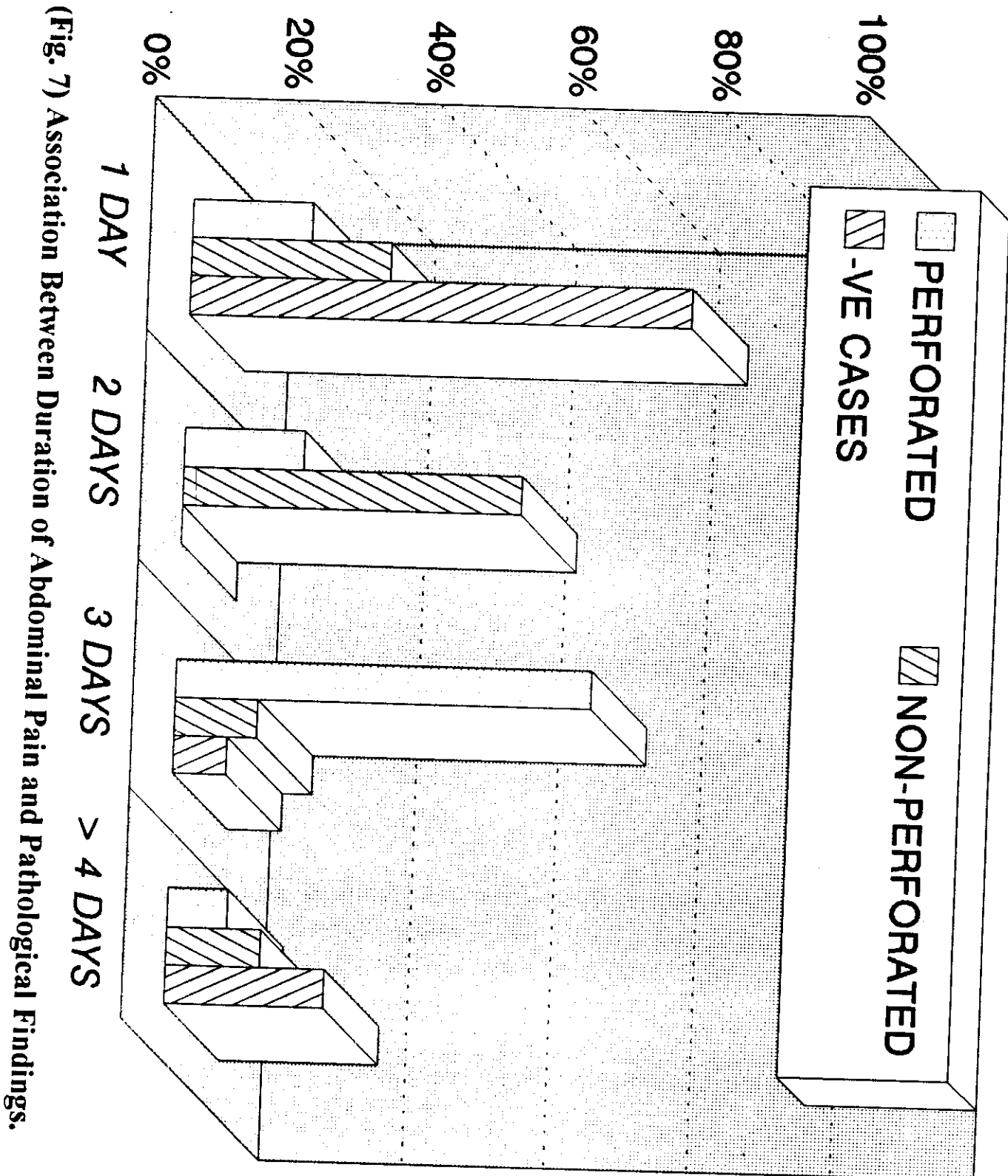
Table (5)
Association between duration of abdominal pain
and pathological findings

	Perforated Group	non perforated Group	Negative Group	Total
1 day No.	2	17	19	38
%	16.7%	27.9%	70.4%	
2 days No.	2	29	0	31
%	16.7%	47.5%	0.0%	
3 days No.	7	7	2	16
%	58.3%	11.5%	7.4%	
4 days \geq No.	1	8	6	15
%	8.3%	13.1%	22.2%	
Total	12	61	27	100

Chi square = 41.99

P value = 0.0000

(HS)



(Fig. 7) Association Between Duration of Abdominal Pain and Pathological Findings.

Table (6)

Comparison between laboratory findings of all groups.
(perforated, non perforated appendicitis, negative and control).
(preoperatively)

		WBC $\times 10^9 / L$	Neutrophils %	ESR mm/1st hour	CRP mg/dl	α -1- Antitrypsin mg / dl
Control group	$\bar{x} \pm SD$ (Range)	7.6 \pm 2.1 (3.8- 12.51)	57.7 \pm 9.2 (45-74)	5 \pm 1.9 (2-10)	0.39 \pm 0.4 (0.25-1.51)	253.4 \pm 5.3 (246-261)
Negative (-ve)group	$\bar{x} \pm SD$ (Range) t value p value	8.8 \pm 1.4 (6.5-12.5) 2.35 0.004 (Sig.)	59.6 \pm 6.1 (49-75) 0.89 0.054 (NS)	6.4 \pm 0.8 (5.0-8.0) 3.44 0.04 (Sig.)	0.33 \pm 0.27 (0.25-1.32) 0.73 0.5 (NS)	256.7 \pm 9.7 (245-275) 1.39 0.1 (NS)
Non perforated group	$\bar{x} \pm SD$ (Range) t value p value	14.0 \pm 1.9 (7.4-16.0) 12.75 0.000 (HS)	78.1 \pm 2.4 (75-85) 15.97 0.0000 (HS)	17.2 \pm 8.2 (5-32) 6.1 0.0000 (HS)	3.3 \pm 1.6 (0.7-6.21) 7.99 0.0000 (HS)	255.3 \pm 6.9 (248-278) 1.15 0.65 (NS)
perforated group	$\bar{x} \pm SD$ (Range) t value p value	13.8 \pm 2.7 (9-18.5) 7.3 0.00001 (HS)	84.9 \pm 9.2 (75-97) 8.13 0.00001 (HS)	39.9 \pm 11.0 (24-52) 13.97 0.0000 (HS)	13.3 \pm 5.7 (7.21-21.0) 10.2 0.00000 (HS)	252.8 \pm 10.8 (240-267) 0.21 0.89 (NS)

N.B. Statistically, all the three groups (negative, non-perforated and perforated groups) compared to the control group individually.

(NS) = non-significant (Sig.) = significant

(HS) = Highly significant

\bar{x} = mean

SD = standard deviation

Table (7)

Comparison between laboratory findings of positive group
(perforated + non perforated appendicitis groups)
and negative group (normal appendix)
(preoperatively)

		WBC $\times 10^9 / L$	Neutrophils %	ESR mm/1st hour	CRP mg/dl	α -1- Antitrypsin mg / dl
Negative (-ve)group	$\bar{x} \pm SD$ (Range)	8.8 \pm 1.4 (6.5-12.5)	59.6 \pm 6.1 (49-75)	6.4 \pm 0.8 (5.0-8.0)	0.33 \pm 0.27 (0.25-1.32)	256.7 \pm 9.7 (245-275)
Positive (+ve)group	$\bar{x} \pm SD$ (Range)	13.95 \pm 2 (7.4-18.5)	79.2 \pm 4.9 (75-97)	20.9 \pm 12.5 (5-52)	4.97 \pm 4.6 (0.7-21)	254.9 \pm 7.7 240-278
	t value	12.2	16.5	6.03	5.27	0.97
	p value	0.000 (HS)	0.0000 (HS)	0.0002 (HS)	0.00001 (HS)	0.1 (NS)

(HS) = Highly significant

(NS) = non-significant

Table (8)

laboratory findings changes pre- and postoperatively
among positive group (perforated + non perforated appendicitis groups)

		WBC $\times 10^9 / L$	Neutrophils %	ESR mm/1st hour	CRP mg/dl	α -1- Antitrypsin mg / dl
Pre- operative	$\bar{x} \pm SD$ (Range)	13.95 \pm 2 (7.4-18.5)	79.2 \pm 4.9 (75-97)	20.9 \pm 12.5 (5-52)	4.97 \pm 4.6 (0.7-21)	254.9 \pm 7.7 240-278
Post- operative	$\bar{x} \pm SD$ (Range)	9.3 \pm 1.4 (6.2-13.5)	78 \pm 6.1 (50-84)	19.1 \pm 10.7 (6-48)	0.81 \pm 0.9 (0.25-4.31)	262.7 \pm 13.4 (200-299)
	t value	18.63	17.1	4.62	9.5	6.14
	p value	0.000 (HS)	0.0000 (HS)	0.0002 (HS)	0.000 (HS)	0.0000 (HS)

(HS) = Highly significant

Table (9)

Laboratory findings changes pre- and postoperatively
among negative group (unnecessary appendicectomies)

		WBC $\times 10^9 / L$	Neutrophils %	ESR mm/1st hour	CRP mg/dl	α -1- Antitrypsin mg / dl
Pre- operative	$\bar{x} \pm SD$ (Range)	8.8 \pm 1.4 (6.5-12.5)	59.6 \pm 6.1 (49-75)	6.4 \pm 0.8 (5.0-8.0)	0.33 \pm 0.27 (0.25-1.32)	256.7 \pm 9.7 (245-275)
Post- operative	$\bar{x} \pm SD$ (Range)	8.4 \pm 1.6 (5.6-12.5)	59.0 \pm 5.6 (50-70)	6.3 \pm 0.8 (5-8)	0.32 \pm 0.25 (0.25-1.41)	262 \pm 13.6 (249-292)
	t value	3.6	2.35	1.44	0.0	4.5
	p value	0.006 (Sig.)	0.02 (Sig.)	0.1 (NS)	1.0 (NS)	0.0001 (HS)

(NS) = non-significant

(Sig.) = significant

(HS) = Highly significant

Table (10)
 Comparison between laboratory findings of all groups.
 (perforated, non perforated appendicitis, negative and contral).
 (preoperatively)

		C ₃ mg/dl	IgM mg/dl	IgG mg/dl	IgA mg/dl	Phagocytic activity index
Control group	$\bar{x} \pm SD$ (Range)	109.1 \pm 19.5 (71-150)	121.5 \pm 30.5 (38-171)	1548.5 \pm 383 (1064-2160)	139.6 \pm 51.9 (79-240)	1.46 \pm 0.078 (1.34-1.61)
Negative (-ve)group	$\bar{x} \pm SD$ (Range) t value p value	108.3 \pm 8.9 (96-120) 0.19 0.67 (NS)	112.6 \pm 42 (67.7-200) 0.79 0.73 (NS)	1482.9 \pm 248 (1070-1870) 0.71 0.61 (NS)	154.3 \pm 63 (87.6-266) 0.85 0.2 (NS)	1.42 \pm 0.05 (1.30-1.60) 1.835 0.06 (NS)
Non perforated group	$\bar{x} \pm SD$ (Range) t value p value	76.6 \pm 7.7 (54-120) 10.79 0.00001 (HS)	102 \pm 19.4 (63.5-144) 3.36 0.0018 (Sig)	1528.5 \pm 315 (970-2210) 0.23 0.64 (NS)	129 \pm 23.1 (102-186) 1.23 0.2 (NS)	1.45 \pm 0.03 (1.38-1.53) 0.647 0.52 (NS)
perforated group	$\bar{x} \pm SD$ (Range) t value p value	59.7 \pm 4.5 (52-66) 8.6 0.0000 (HS)	123 \pm 42.6 (69-171) 0.14 0.77 (NS)	1317 \pm 346.5 (920-1598) 1.715 0.09 (NS)	146 \pm 52.2 (71.7-188) 0.35 0.97 (NS)	1.45 \pm 0.02 142-1.49 0.368 0.7 (NS)

N.B. Statistically, all the three groups (negative, non-perforated and perforated groups) compared to the control group individually.

(NS) = non-significant

(Sig.) = significant

(HS) = Highly significant

Table (11)

Comparison between laboratory findings of positive group
(perforated + non perforated appendicitis groups)
and negative group (normal appendix)
(preoperatively)

		C ₃ mg/dl	IgM mg/dl	IgG mg/dl	IgA mg/dl	Phagocytic activity index
Negative (-ve)group	$\bar{x} \pm SD$ (Range)	108.3±8.9 (96-120)	112.6±42 (67.7-200)	1483±248.2 (1070-1870)	154.3±63 (87.6-266)	1.41±0.07 (1.31-1.56)
Positive (+ve)group	$\bar{x} \pm SD$ (Range)	73.8±9.6 (52-92)	105.4±25.6 (63.5-171)	1483.4±324.6 (920-2210)	132±30 (71.7-182)	1.43±0.06 (1.31-1.61)
	t value	16.2	1.03	0.07	2.3	0.419
	p value	0.0000 (HS)	0.23 (NS)	0.7 (NS)	0.003 (Sig.)	0.7 (NS)

(NS) = non-significant

(Sig.) = significant

(HS) = Highly significant

Table (12)

laboratory findings changes pre- and postoperatively
among positive group (perforated + non perforated appendicitis groups)

		C ₃ mg/dl	IgM mg/dl	IgG mg/dl	IgA mg/dl
Pre-operative	$\bar{x} \pm SD$ (Range)	73.8 \pm 9.6 (52-92)	105.4 \pm 25.6 (63.5-171)	1483.4 \pm 324.6 (920-2210)	132 \pm 30 (71.7-182)
Post-operative	$\bar{x} \pm SD$ (Range)	97.8 \pm 13.9 (58-112)	131.6 \pm 45.3 (80.1-276)	1671 \pm 306.3 (1210-2391)	144.7 \pm 32.5 (100-214)
	t value	22.79	4.2	4.7	6.38
	p value	0.0000 (HS)	0.000 (HS)	0.000 (HS)	0.000 (HS)

(HS) = Highly significant

Table (13)

Laboratory findings changes pre- and postoperatively
among negative group (unnecessary appendicectomies)

		C ₃ mg/dl	IgM mg/dl	IgG mg/dl	IgA mg/dl
Pre-operative	$\bar{x} \pm SD$ (Range)	108.3 \pm 8.9 (96-120)	112.6 \pm 42 (67.7-200)	1483 \pm 248.2 (1070-1870)	154.3 \pm 63 (87.6-266)
Post-operative	$\bar{x} \pm SD$ (Range)	107.7 \pm 7.5 (99-119)	122.7 \pm 38.3 (89-208)	1572 \pm 273.7 (1086-2150)	165.8 \pm 58.1 (110-280)
	t value	1.24	5.33	4.016	7.11
	p value	0.13 (NS)	0.0001 (HS)	0.0007 (SH)	0.000 (HS)

(NS) = non-significant

(Sig.) = significant

(HS) = Highly significant

Table (14)
Sensitivity, specificity, predictive values and accuracy of individual laboratory test
in the diagnosis of acute appendicitis

Test	Sensitivity %	specificity %	predictive values %		accuracy %
			+ve result	-ve result	
WBC $\times 10^9/L$ > 11.000 > 13.000	91.8(82.4-96.9) 76.7(65.1-85.5)	96.5 (79.1-99.8) 100.0 (84.5-100)	98.5 (91.-99.9) 100.0 (92-100)	81.3 (63-92.1) 61.4 (45.5-75.3)	93.0 83.0
Neutrophils % >75%	86.3 (75.8-92.9)	100.0 (84.5-100)	100.0 (92.8-100)	73.0 (55.6-85.5)	90.0
ESR mm/1st hour >10 >20	71.2 (59.3-80.9) 49.3 (37.5-61.2)	100.0 (84.5-100) 100.0 (84.5-100)	100.0 (91.4-100) 100.0 (88-100)	56.3 (41.3-70.2) 42.2 (30.2-55.2)	79.0 63.0
CRP mg/dl >0.6 >1.0	100 (93.8-100.0) 93.2 (84.1-97.5)	92.6 (74.2-98.7) 92.6 (74.2-98.7)	97.3 (89.8-99.5) 97.3 (89.1-99.5)	100 (83.4-100) 83.3 (64.5-93.7)	98.0 93.0
C ₃ mg/dl <100	100 (93.8-100.0)	70.7(49.7-85.5)	90.1 (81.1-95.3)	100 (79.1-100)	92.0

Table (15)
Sensitivity, specificity, predictive values and accuracy of combined tests
in the diagnosis of acute appendicitis

Test	Sensitivity %	specificity %	predictive values %		accuracy %
			+ve result	-ve result	
WBC>13.0×10 ⁹ /L Neutrophils>75% ESR>20mm/1st h. C ₃ <100mg/dl	63.0(50.9-73.8)	100(84.5-100)	100(90.4-100)	50(36.3-63.7)	73
WBC>13.0×10 ⁹ /L Neutrophils>75% CRP>0.6 mg/dl C ₃ <100mg/dl	72.6 (60.7-82.1)	100(84.5-100)	100 (91.6-100)	57.4(42.3-71.4)	80
WBC>13.0×10 ⁹ /L CRP>0.6 mg/dl C ₃ <100mg/dl	76.7 (65.1-85.5)	100 (84.5-100)	100(92-100)	61.4(45.5-75.3)	83
WBC>13×10 ⁹ /L CRP>0.6 mg/dl	91.8 (82.4-96.6)	100(84.5-100)	100(93.2-100)	81.8(63.9-92.4)	94