

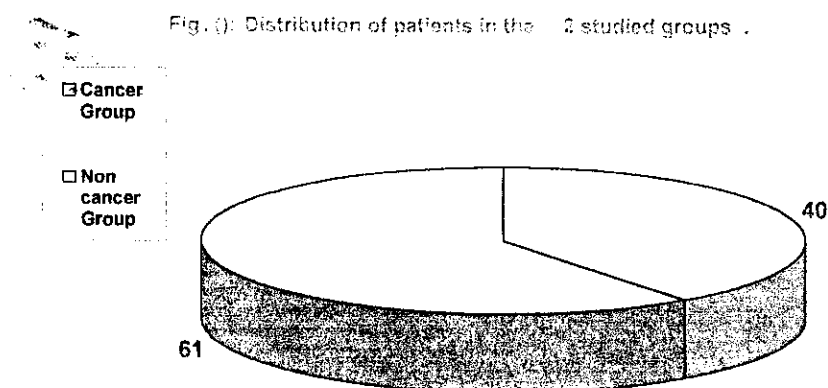
# *Results*

## Results

The current study was carried out on 101 male patients. Forty patients (39.6%) of them proved to have prostate cancer, while the remaining 61 patients (60.4%) were considered as non-cancer group. *Table (1) Fig. (1)*

**Table (1) : Distribution of patients in the studied groups.**

PATIENTS	FREQUENCY	PERCENT
Cancer Group	40	39.6%
Non cancer Group	61	60.4%
Total	101	100%



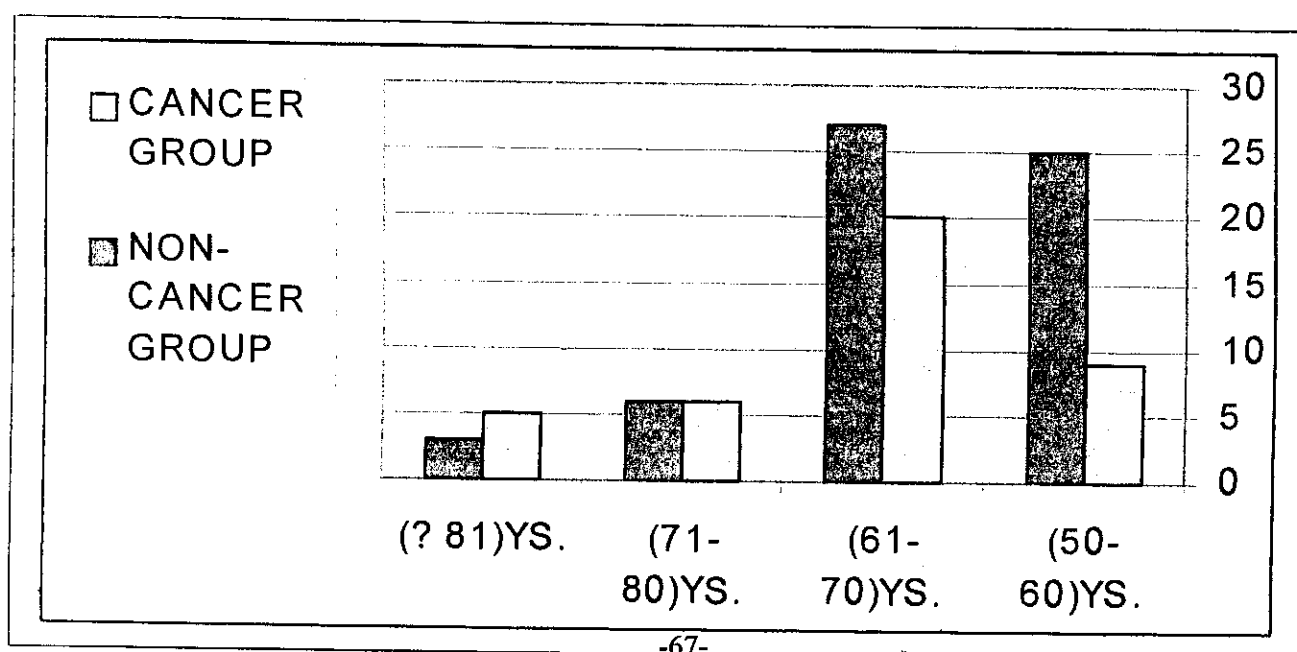
The age of cancer group ranged from 53 years to 87 years with a mean of  $68.54 \pm 8.87$  years. The largest number of prostate cancer

patients lies in the age range of 61-70 years; 20 cancer patients (50%), while the lowest number lies above age of 80 years; 5 cancer patients (12.5%). **Table (2) Fig. ( 2 )**

**Table (2): Age distribution of the studied groups**

AGE	CANCER GROUP	NON- CANCER GROUP
(50-60)YS.	9(22.5%)	25 (40.9%)
(61-70)YS.	20(50%)	27(44.4%)
(71-80)YS.	6(15%)	6(9.8%)
(≥ 81)YS.	5(12.5%)	3(4.9%)
TOTAL	40(100%)	61(100%)

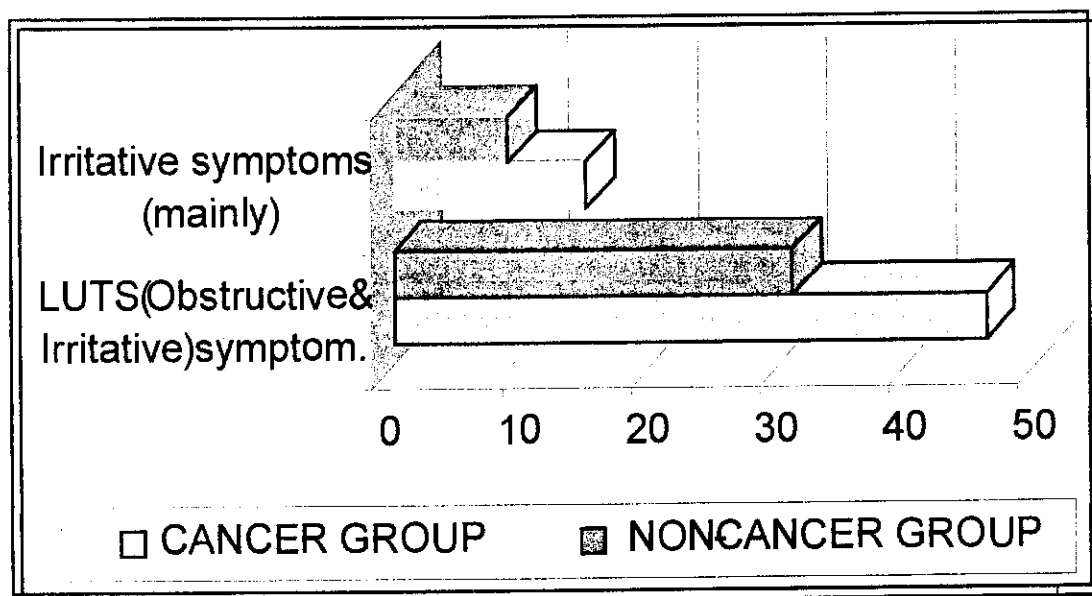
**Fig (2): Age distribution of the patients in the 2 groups.**



As regards the clinical presentation of patients; 31(77.5%) prostate cancer patients were complaining of Lower Urinary Tract Symptoms LUTS; irritative and obstructive urinary symptoms. Nine prostate cancer patients (22.5%) presented mainly with irritative symptoms. Also, 4 patients in the non-cancer group (7.8%) had positive family history of prostate cancer. **Table (3) Fig. ( 3 )**

**Table (3): Clinical Picture of patients in both groups.**

PRESENTATION	CANCER GROUP	NON-CANCER GROUP	TOTAL
LUTS (Obstructive& Irritative)symptom.	31 (77.5%)	46(75.4%)	77 (81.2%)
Irritative symptoms (mainly)	9 (22.5%)	15 (24.6%)	24 (18.8%)
TOTAL	40 (39.6%)	61 (60.4%)	101 (100%)



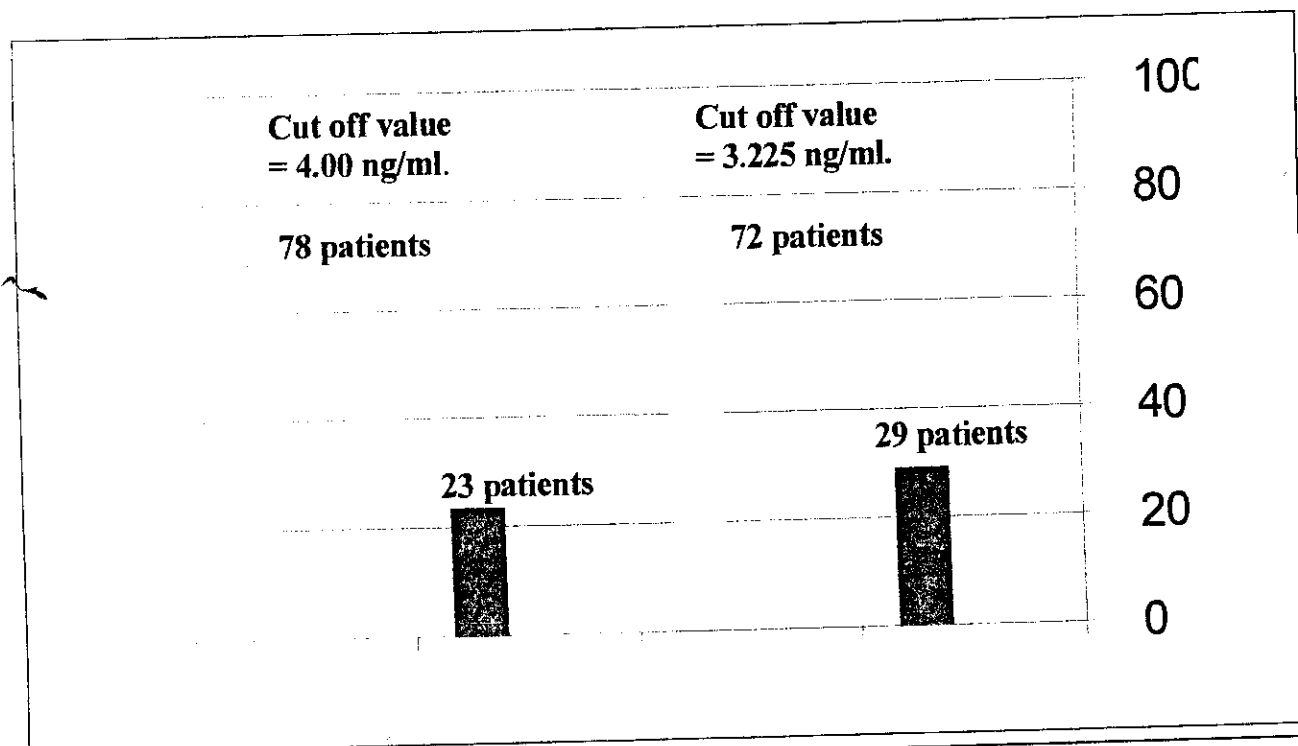
**Fig. ( 3 ): Clinical picture of patients in both groups.**

From the statistical point of view there are 2 cut-off points at which there were obvious discriminations by PSA as a screening test, the first was at 3.255 ng / ml, and the second was at 4.000 ng / ml. These 2 thresholds were considered because of the high sensitivity and specificity of PSA at their values, but when compared together we decided to use the threshold of 3.255 ng/ml because of the higher PSA likelihood ratio and area under the curve  $AUC=0.676$ . So, PSA values above 3.255 ng / ml. were considered as high PSA and below that threshold as normal PSA. Accordingly, 72 patients (71.3%) were

considered having high PSA values, while 29 (28.7%) patients showed normal PSA values. **Table (4) Fig. (4)**

**Table (4) : PSA-thresholds [cut-off] values in the study.**

CUT-OFF VALUE	PSA	FREQUENCY	PERCENT (%)
3.255 ng / ml	Normal	29	28.7%
	High	72	71.3%
Total		101	100.0%
4.000 ng / ml.	Normal	23	22.8%
	High	78	77.2%
Total		101	100.0%



**Fig.( ): PSA-thresholds [cut-off] values in the study.**

○ = High PSA

● = Normal PSA

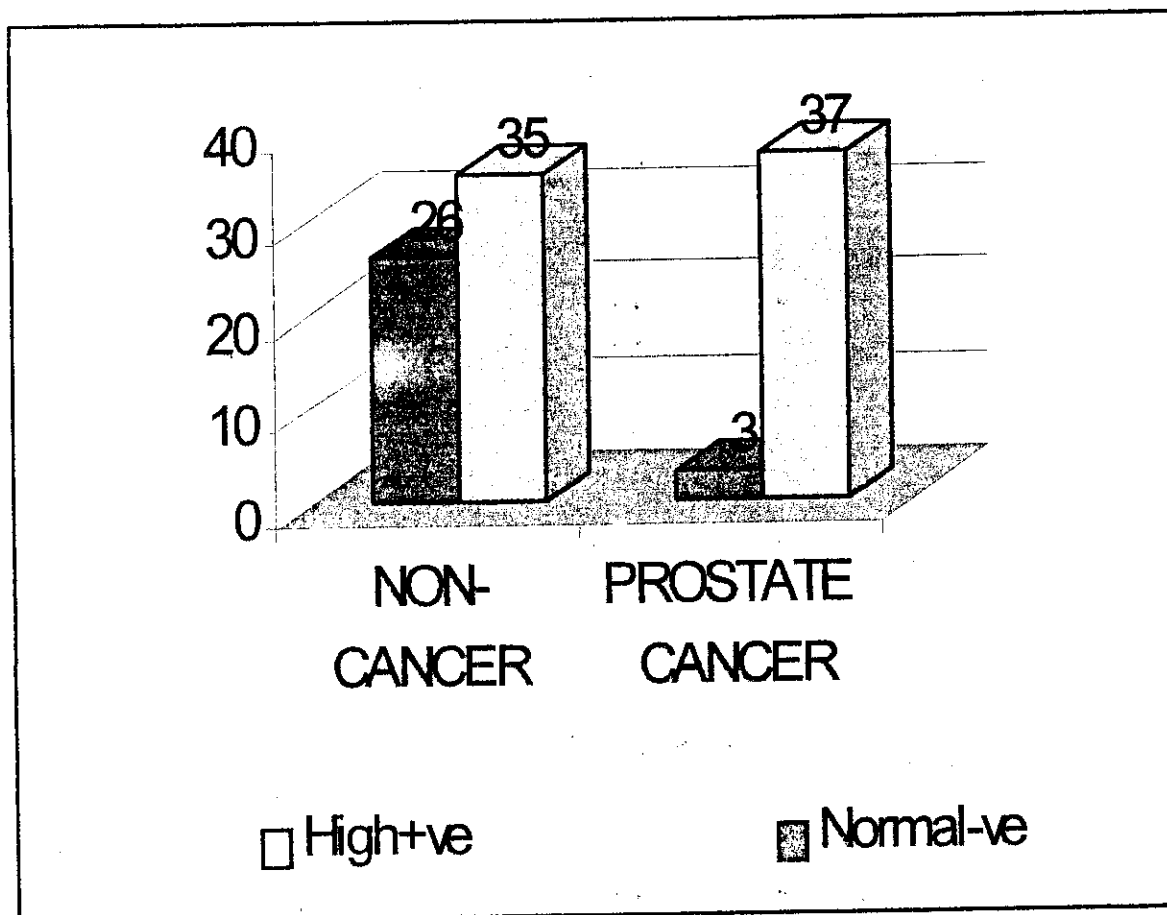
PSA was high in 37 prostate cancer patients (92.5%) and only 3 prostate cancer patients (7.5%) showed normal PSA levels. The sensitivity and specificity of PSA were 92.5% and 42.6% respectively, while the positive predictive and negative predictive values [PPV&NPV] were 51.4% and 89.7% respectively. **Table (5) Fig. (5)**

AUC equals 0.748 So, the likelihood of PSA was 125.3. **Fig. (6)**

**Table (5) : PSA results in both groups at cut-off value = 3.255 ng/ml.  
[Sensitivity & Specificity] , [Positive & Negative predictive values]**

PSA	PROSTATE CANCER	NON-CANCER	TOTAL
High  +ve	37	35	72
	92.5% ♣	57.4%	71.3%
	51.4% ♥	48.6%	100%
Normal  -ve	3	26	29
	7.5%	42.6% ♠	28.7%
	10.3%	89.7% ♦	100%
Total	40	61	101
	39.6%	60.4%	100%

♣ = sensitivity. ♠ = specificity. ♥ = PPV. ♦ = NPV.



**Fig.(5): Number of patients in both groups as regards their PSA levels.**

As regards digital rectal examination DRE results; there was positive DRE findings in 27 prostate cancer patients (67.5%), while 13 prostate cancer patients (32.5%) showed negative DRE results. The DRE had sensitivity and specificity of 67.5% and 67.2% respectively. **Table (6)** **Fig. (7)** The likelihood ratio of 134.7 % i.e > 100% and AUC, area under the curve = 0.674 The PPV & NPV of DRE were 57.4% and 75.9% respectively. **Fig. (8)**



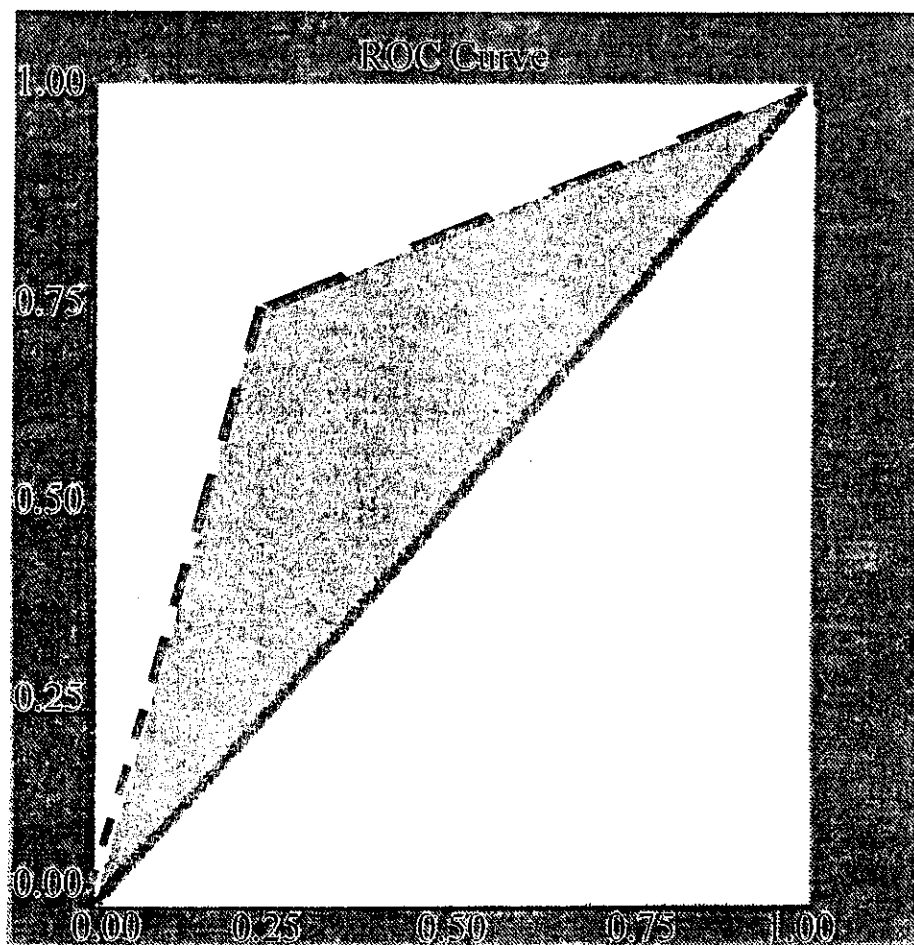


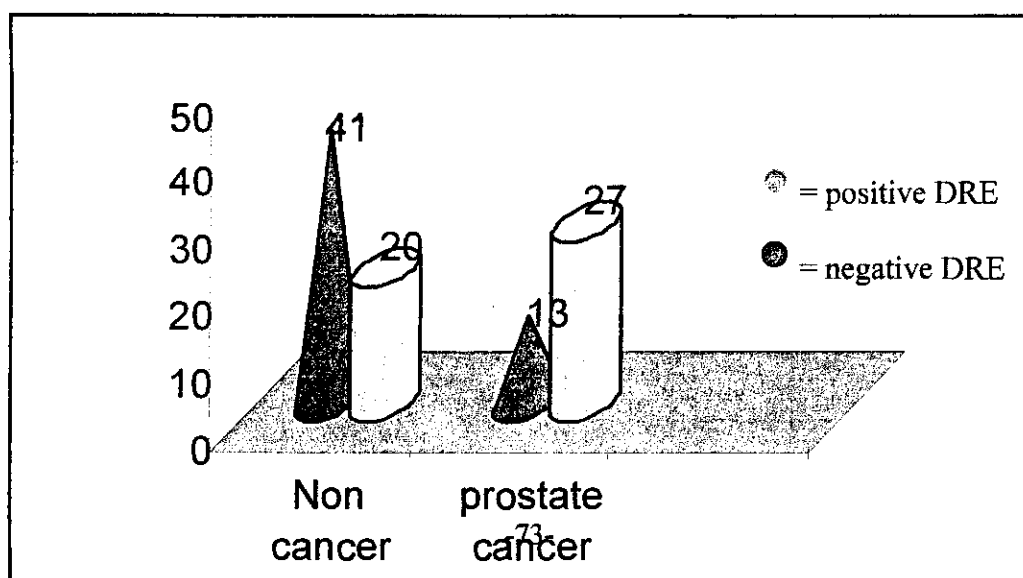
Fig.(6): ROC-curve of PSA values at threshold 3.255 ng/ml.;  
Area Under Curve-AUC=0.548.

**Table (6) : DRE results in both groups.[ Sensitivity & Specificity]**  
**[Positive & Negative predictive values].**

DRE	PROSTATE CANCER	NON-CANCER	TOTAL
Positive	27	20	47
	67.5 % ♣	32.8 %	71.3 %
	57.4 % ♥	42.6 %	100 %
Negative	13	41	54
	32.5 %	67.2 % ♠	53.5 %
	24.1 %	75.9 % ♦	100 %
Total	40	61	101
	39.6%	60.4%	100%

♣ = sensitivity. ♠ = specificity. ♥ = PPV. ♦ = NPV.

**Fig (7): Results of DRE in both groups.**



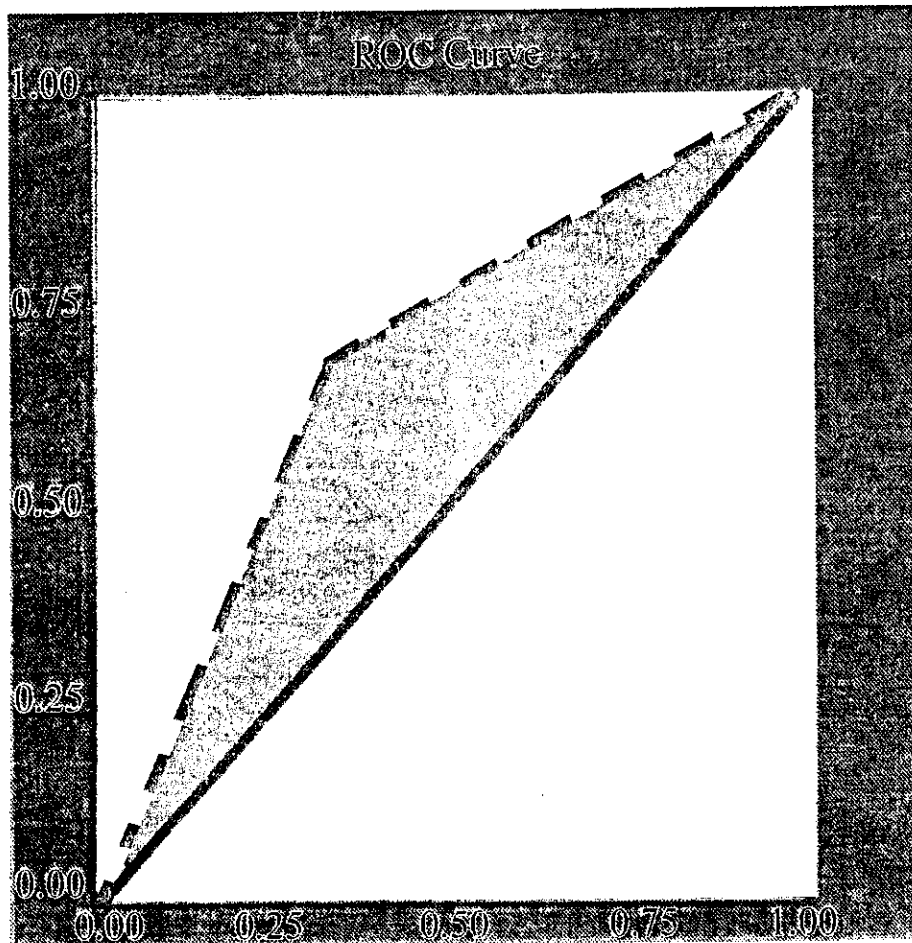


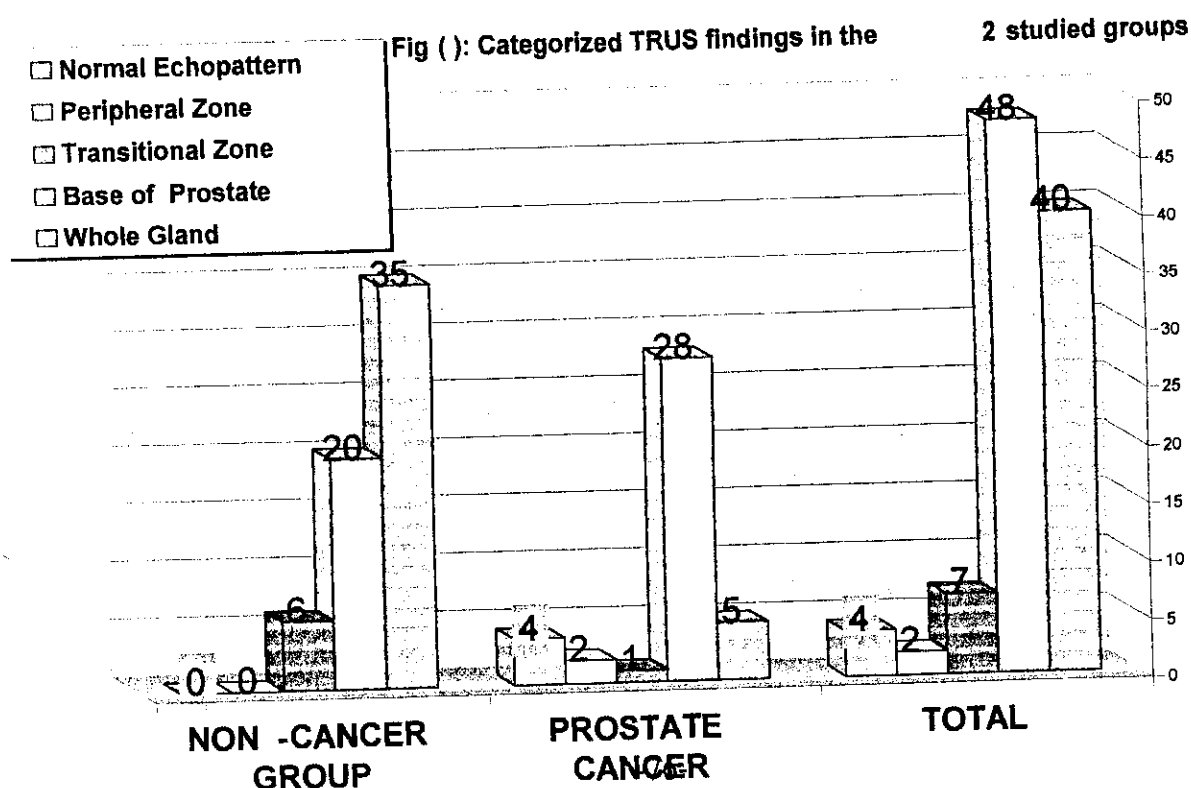
Fig.(8): ROC-curve of DRE; Area Under Curve-AUC=0.674

were cancer free. The TRUS was positive in the bases of prostate glands in 2/101 patients (2.00%) both were proved to be prostate cancer 2/2 (100%). Also, the whole gland was positive by TRUS in 4/101 pateints (4.00%)all of them had prostate cancer, 4/4(100.0%).

**Table(8) Fig (11)**

**Table (8): Categorized TRUS findings in both groups.**

TRUS FINDINGS	TOTAL	PROSTATE CANCER	NON-CANCER GROUP
Normal Echo-pattern	40 (39.6%)	5 (12.5%)	35 (87.5%)
+ve Peripheral Zone	48 (47.5%)	28 (58.3%)	20 (41.7%)
+ve Transitional Zone	7 (6.9%)	1 (14.3%)	6 (85.7%)
+ve Base of Prostate	2 (2.0%)	2 (100%)	0 (0.0%)
+ve Whole Gland	4 (4.0%)	4 (10.0%)	0 (0.0%)
Total	101 (100.0%)	40 (100.0%)	61 (100.0%)

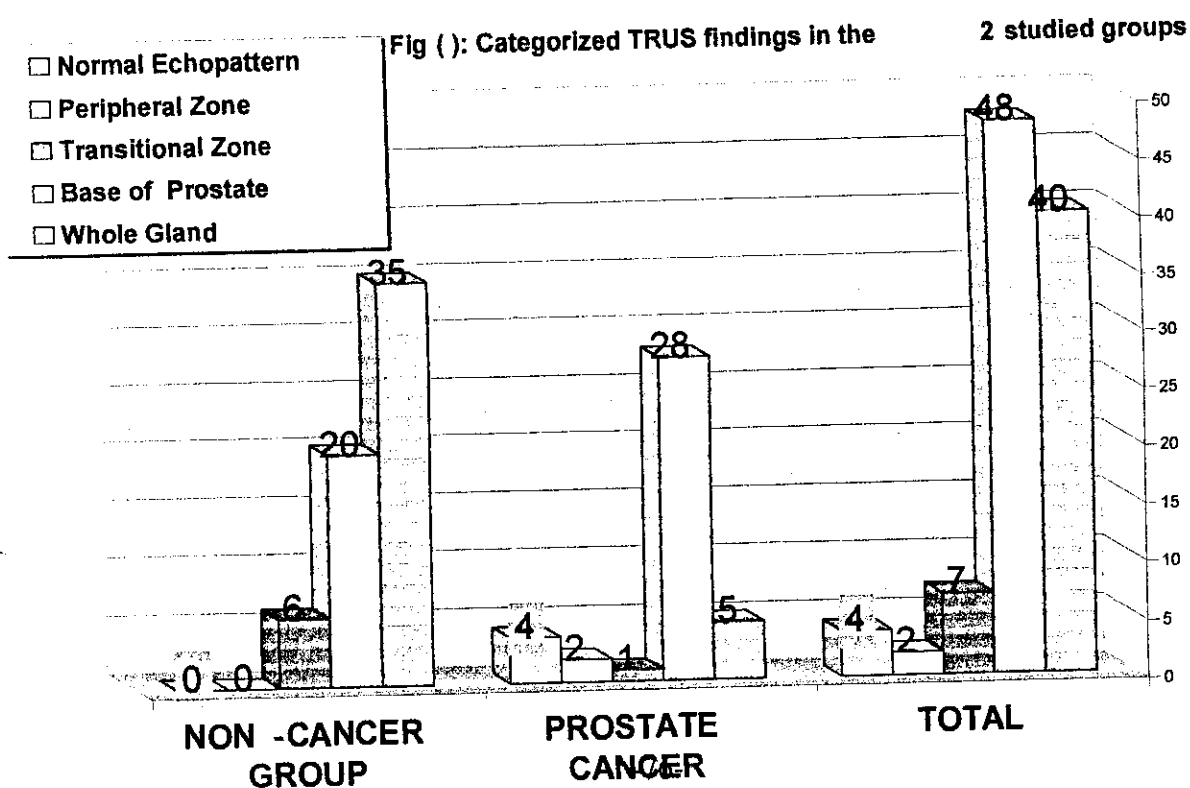


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+ve Base of Prostate	2 (2.0%)	2 (100%)	0 (0.0%)
+ve Whole Gland	4 (4.0%)	4 (10.0%)	0 (0.0%)
Total	101 (100.0%)	40 (100.0%)	61 (100.0%)

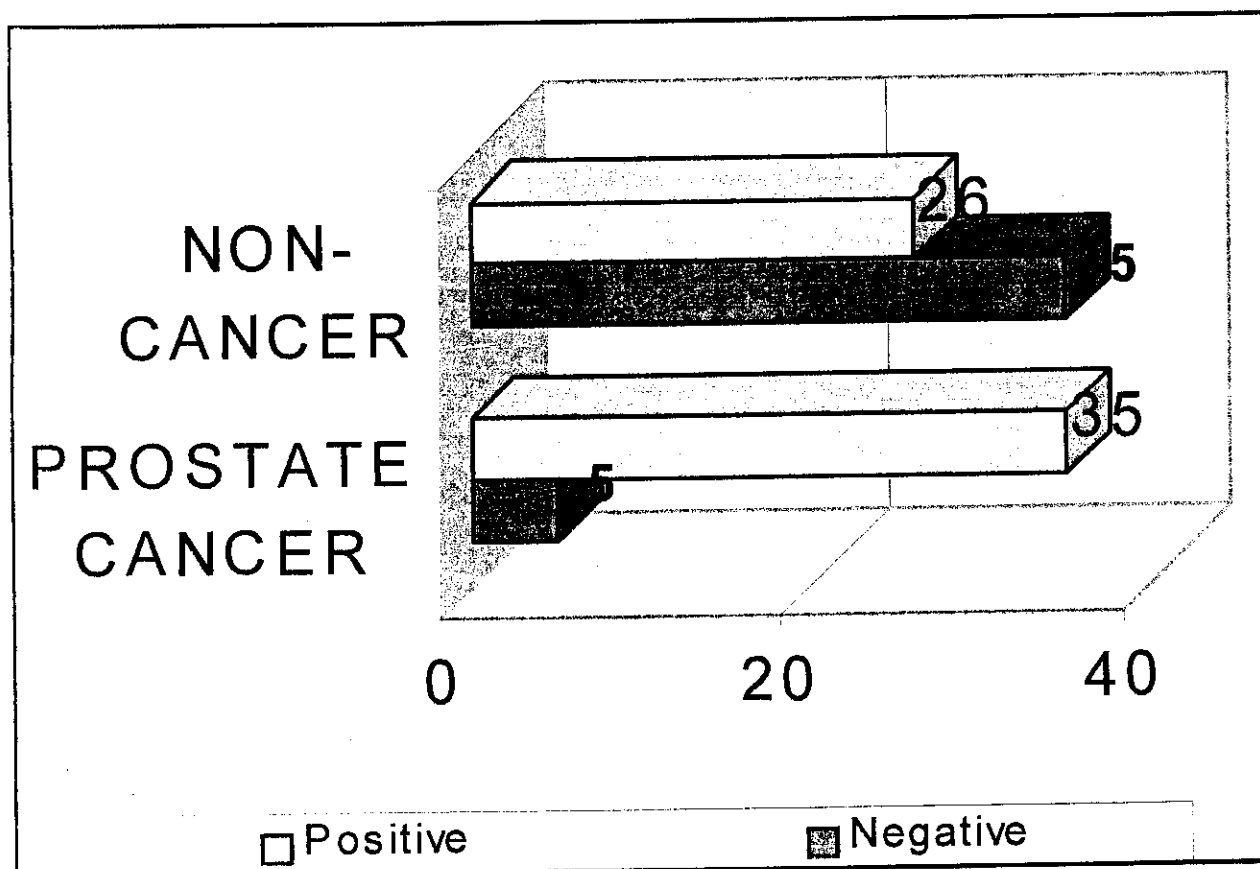


As regards TRUS findings, there were 35 (57.4%) out of 61 TRUS positive patients proved to be prostate cancer by biopsy. Only 5 (12.5%) prostate cancer patients out of 40 patients showed negative TRUS findings. The TRUS sensitivity and specificity were 87.5% and 57.4% respectively, while the PPV and NPV were 57.4% and 87.5% respectively. **Table (7) Fig. (9)** The likelihood ratio of TRUS was 144.9% i.e.  $> 100.0\%$  and  $AUC = 0.724$ . **Fig. (10)**

**Table (7) : TRUS results in both groups.[ Sensitivity & Specificity] , [Positive & Negative predictive values].**

TRUS	PROSTATE CANCER	NON-CANCER	TOTAL
Positive	35	26	61
	87.5% ♣	42.6%	60.4%
	57.4 % ♥	42.6 %	100 %
Negative	5	35	40
	12.5%	57.4% ♠	39.6%
	12.5%	87.5% ♦	100 %
Total	40	61	101
	39.6%	60.4%	100%

♣ = sensitivity. ♠ = specificity. ♥ = PPV. ♦ = NPV.



**Fig (9): TRUS results in the 2 groups.**

*The categorized results of TRUS findings were as follows;* TRUS was negative i.e normal echopattern in 40/101 patients (39.6%); only 5/40 of them (12.5%) were proved to be prostate cancer, while 35 patients (87.5%) were cancer free. And 48/101 patients (47.5%) showed TRUS positive lesions in the peripheral zone; where 28/48 patients (58.3%) of them were proved to be prostate cancer, while 20/48 (41.7%) were cancer free. Seven patients (6.9%) out of 101 patients had positive TRUS findings at transitional zone; where only 1/7 (14.3%) was prostate cancer, while the rest 6/7 patients (85.7%)

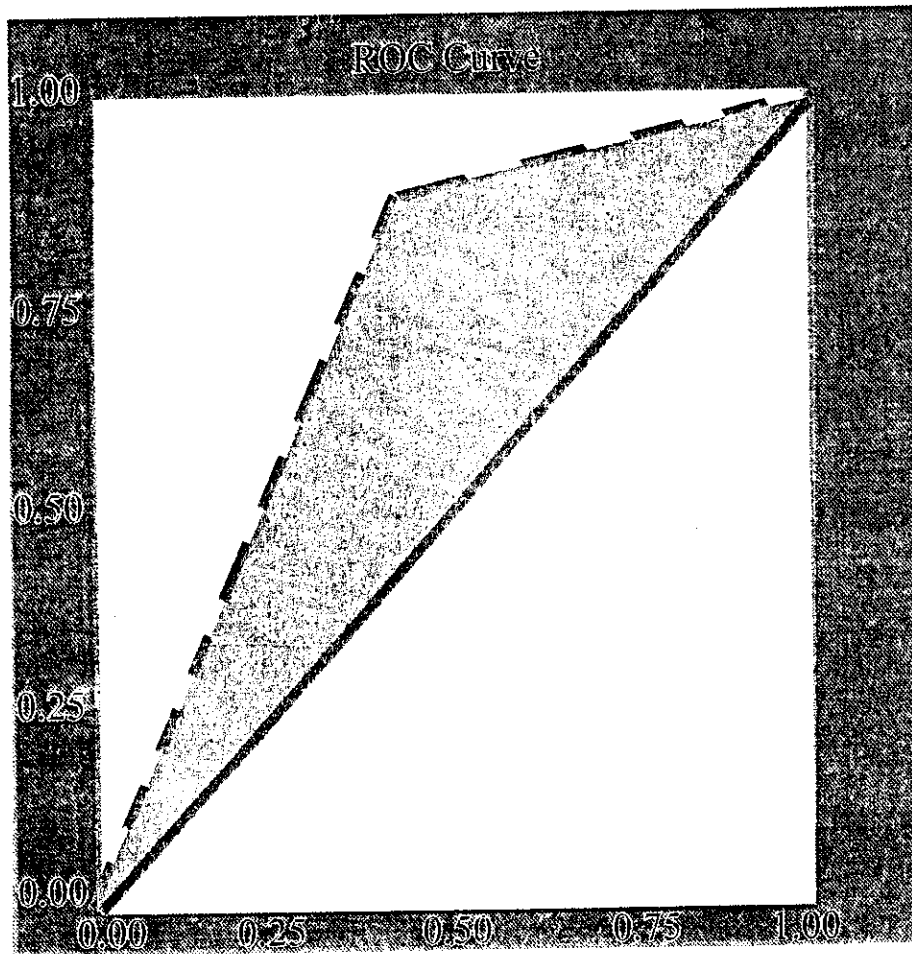


Fig.(10): ROC-curve of TRUS; Area Under Curve-AUC=0.548.



CDI results was positive in 15 prostate cancer patients (46.9%) out of 32 CDI positive patients, while it was negative in 25 (62.5%) out of 40 prostate cancer patients. The CDI sensitivity and specificity were 37.5% and 72.1% respectively and PPV and NPV were 46.9% and 63.8% respectively. **Table (9) Fig (12)** The likelihood ratio of CDI was 109.6% i.e. >100.0% and AUC = 0.548, Roc curve. **Fig (13)**

**Table (13) : CDI results in both groups.[ Sensitivity & Specificity] [Positive & Negative predictive values].**

CDI	PROSTATE CANCER	NON- CANCER	TOTAL
Positive	15	17	32
	37.5 % ♣	27.9 %	31.7 %
	46.9 % ♥	53.1 %	100 %
Negative	25	44	69
	62.5 %	72.1% ♠	68.3 %
	36.2 %	63.8 % ♦	100 %
Total	40	61	101

♣ = sensitivity. ♠ = specificity. ♥ = PPV. ♦ = NPV.

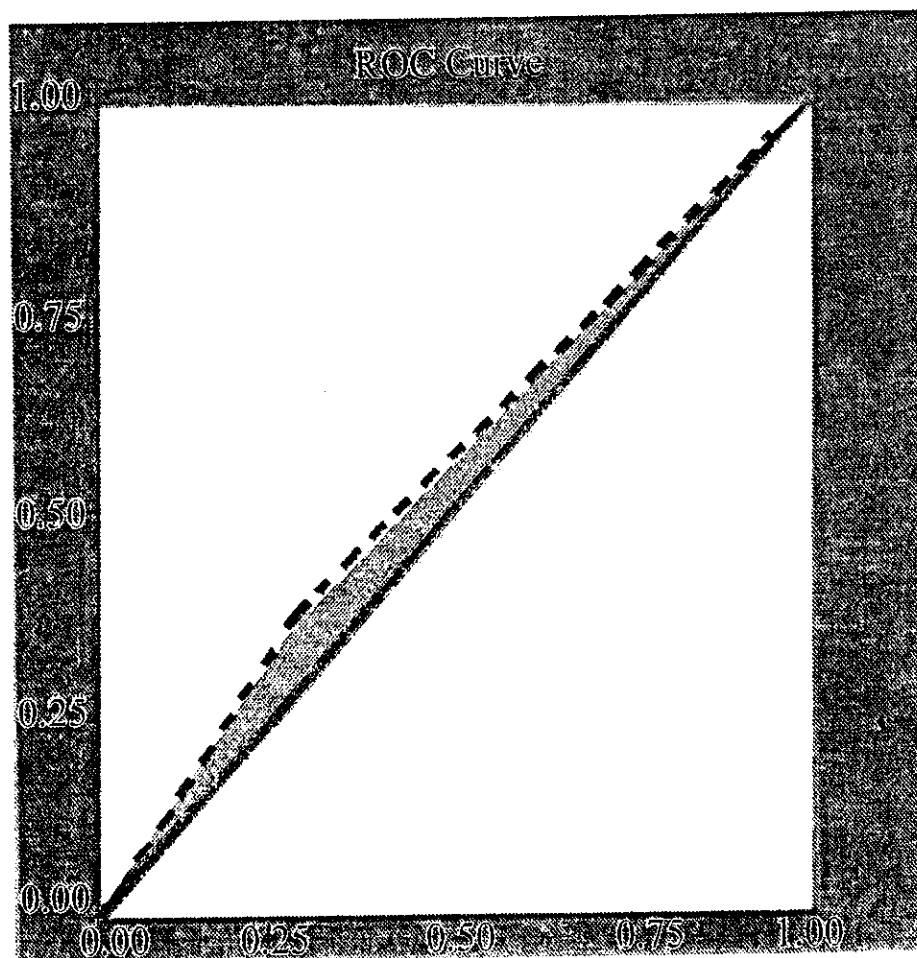
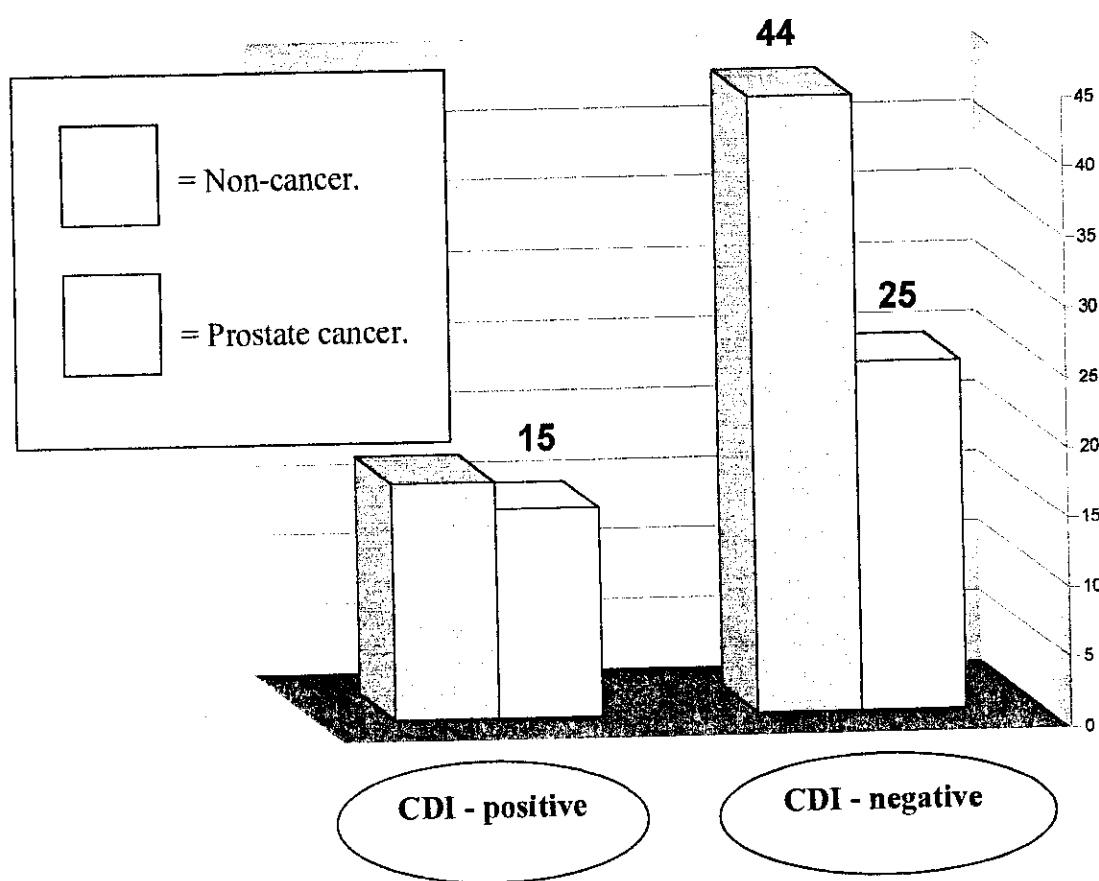


Fig.(13): ROC-curve of CDI; Area Under Curve-AUC=0.548.

Fig (1): CDI results in the 2 studied groups.



*The CDI results also were studied in view of the other old diagnostic triad of DRE, PSA and TRUS in order to evaluate the diagnostic efficacy of the test in early detection of prostate cancer, these results were as follows:-*

#### **[1]Results of CDI in view of DRE:-**

Out of 47 patients with abnormal DRE (i.e.DRE positive) 15 patients (31.9%) showed positive CDI findings; 9 patients only of them

(60.0%) proved to be prostate cancer, while 32 patients (68.1%) showed negative CDI findings; 18 patients only of them (66.7%) proved to be prostate cancer. The CDI sensitivity and specificity among patients with positive DRE findings were 33.3% and 70.0% respectively. The PPV and NPV of CDI in DRE positive patients were 60.0% and 43.8% respectively. **Table (10)** **Fig. (14)** The likelihood ratio of CDI in the DRE positive group was 103.3%.

**Fig (14): CDI results in view of DRE findings.**

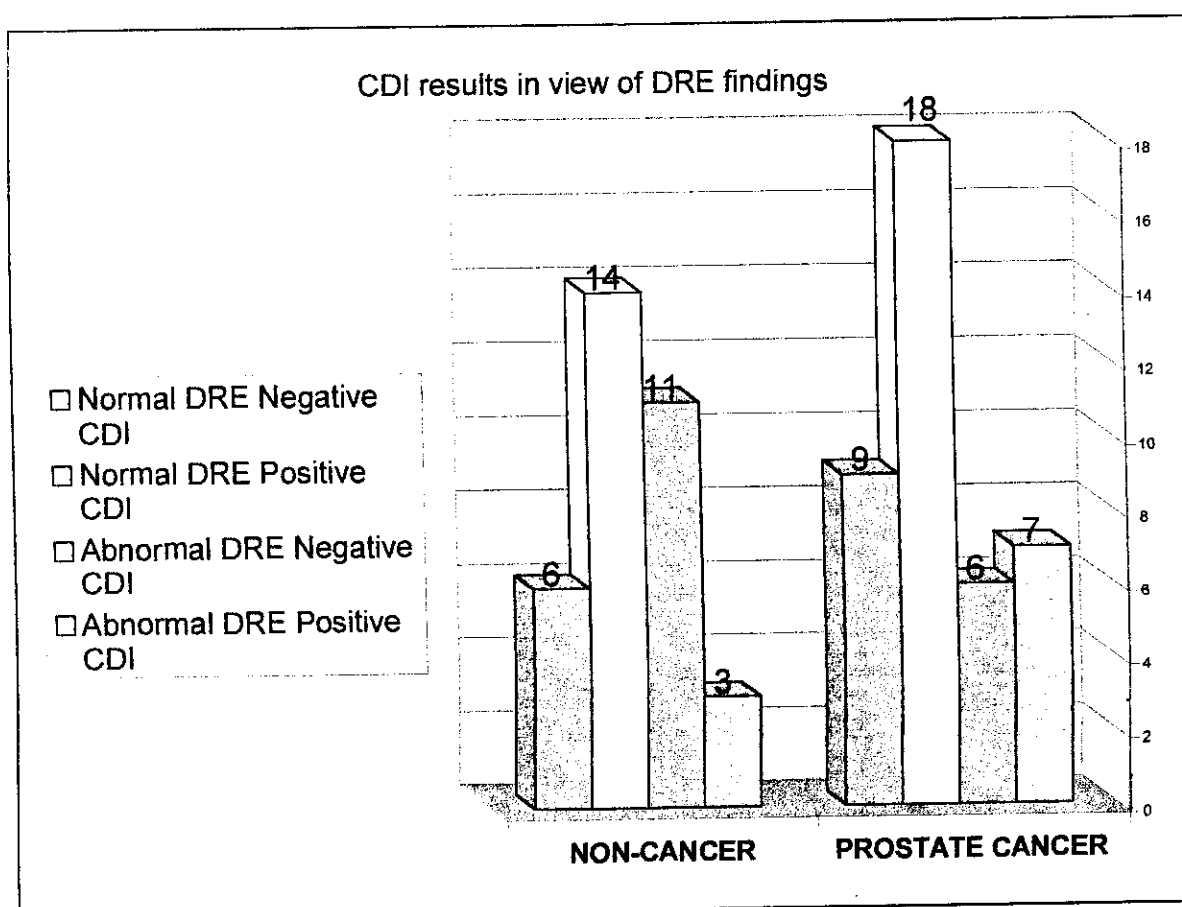


Table: (10) CDI results in view of DRE results in both groups.

[Sensitivity &amp; specificity] , [PPV &amp; NPV].

DRE	CDI	PROSTATE CANCER	NON- CANCER	TOTAL
Abnormal +ve	Positive	9	6	15
		33.3 % ♣	30.0 %	31.9 %
		60.0 % ♥	40.0 %	100 %
	Negative	18	14	32
		66.7 %	70.0 % ♠	68.1 %
		56.3 %	43.8 % ♦	100 %
	Total	27	20	47
Normal -ve	Positive	6	11	17
		46.2 %	26.8 %	31.5 %
		35.3 %	64.7 %	100 %
	Negative	7	3	37
		53.8 %	73.2 %	68.5 %
		18.9 %	81.1 %	100 %
	Total	13	41	54
Total		40	61	101

♣ = sensitivity. ♠ = specificity. ♥ = PPV. ♦ = NPV.

Table: (10) CDI results in view of PSA results in both groups.

[Sensitivity & specificity] , [PPV & NPV].

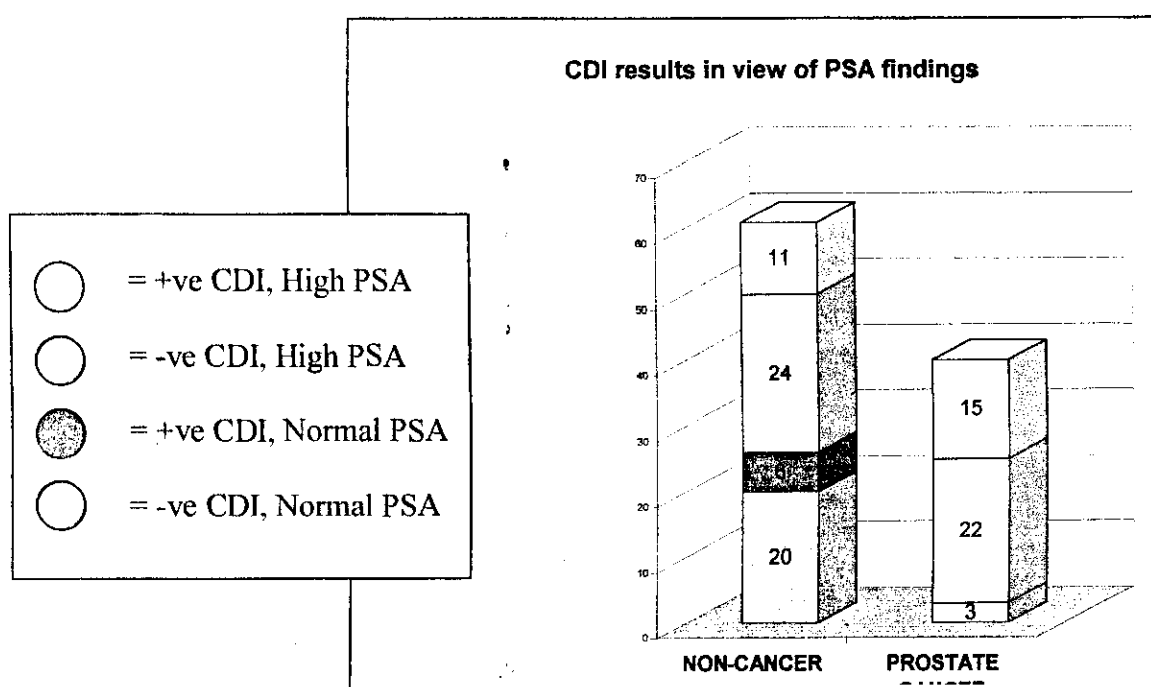
PSA	CDI	PROSTATE CANCER	NON- CANCER	TOTAL
High +ve	Positive	15	11	26
		40.5 % ♣	31.4 %	36.1 %
		57.7 % ♥	42.3 %	100 %
	Negative	22	24	46
		59.5 %	68.6 % ♠	63.9 %
		47.8 %	52.3 % ♦	100 %
	Total	37	35	72
Normal -ve	Positive	0	6	6
		00.0%	23.1 %	20.7 %
		00.0%	100 %	100 %
	Negative	3	20	23
		100%	76.9%	79.3%
		13.0 %	87.0 %	100 %
	Total	3	26	29
Total		40	61	101

♣ = sensitivity. ♠ = specificity. ♥ = PPV. ♦ = NPV.

## **[2]Results of CDI in view of PSA :-**

Out of 72 patients with abnormal high PSA levels; 26 patients (36.1%) showed positive CDI findings; 15 only of them (40.5%) proved to be prostate cancer, Forty six patients (63.9%) showed negative CDI findings, while still having high PSA levels; 22 patients of them (59.5%) proved to be prostate cancer. The CDI sensitivity and specificity among patients with high PSA levels were 40.5% and 68.6% respectively. The PPV and NPV were 57.7% and 52.3% in patients with high PSA levels. *Table (11) Fig. (15)* The likelihood ratio of CDI in high PSA patients was 109.1%.

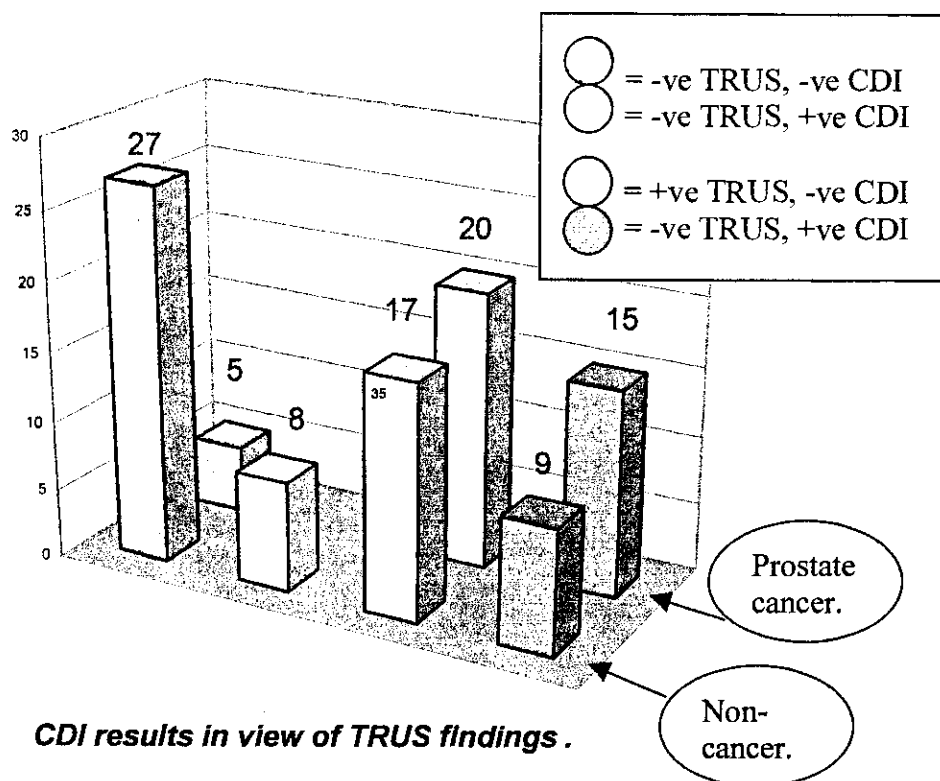
**Fig (15): Results of CDI in view of PSA :-**



### [3] CDI results in view of TRUS findings:-

Out of 61 patients with abnormal TRUS findings (i.e. TRUS positive), 24 patients (39.3%) showed CDI positive findings, while 37 patients (60.7%) showed negative CDI findings. Fifteen patients (42.9%) having positive CDI results proved to be prostate cancer, while 20 patients (57.1%) showed negative CDI findings proved to be prostate cancer. CDI sensitivity was 42.9% and specificity was 65.4% in patients with abnormal TRUS findings. The PPV and NPV of CDI in patients with TRUS abnormalities were 62.5% and 45.9% respectively. **Table (12) Fig. (16)** The likelihood ratio of CDI in TRUS positive cases was 108.3% .

**Fig (16): Results of CDI in view of TRUS results.**





**Table: (12) CDI results in view of TRUS results in both groups.[Sensitivity & specificity] , [PPV & NPV].**

TRUS	CDI	PROSTATE CANCER	NON- CANCER	TOTAL
Abnormal  +ve	Positive	15	9	24
		42.9 % ♣	34.6 %	39.3 %
		62.5 % ♥	37.5 %	100 %
	Negative	20	17	37
		57.1 %	65.4 % ♠	60.7 %
		54.1 %	45.9 % ♦	100 %
	Total	35	26	61
Normal  -ve	Positive	0	8	8
		00.0%	29.0%	100.0%
		00.0%	22.9%	20.0%
	Negative	5	27	32
		100 %	77.1 %	80.0 %
		15.6 %	84.4 %	100 %
	Total	5	35	40
Total		40	61	101

♣ = sensitivity. ♠ = specificity. ♥ = PPV. ♦ = NPV.

**PDI** was positive in 24 (60.0%) prostate cancer patients, while 16 prostate cancer patients (40.0%) showed negative PDI results. PDI sensitivity and specificity were 60.0% and 55.7% respectively and PPV and NPV were 47.1% and 68.0% respectively. *Tables (13) Fig. (17)* The likelihood ratio of PDI was 115.7% i.e. >100.0%, with the AUC = 0.579.

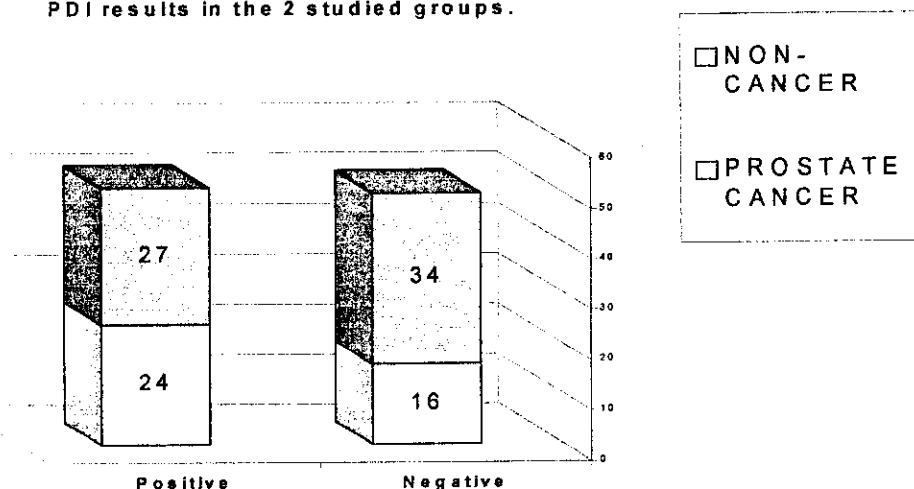
*Fig. (18)*

**Table (13) : PDI results in both groups.[ Sensitivity & Specificity] [Positive & Negative predictive values].**

PDI	PROSTATE CANCER	NON- CANCER	TOTAL
Positive	24	27	51
	60.0 % ♣	44.3 %	50.5 %
	47.1 % ♥	52.9 %	100 %
Negative	16	34	50
	40.0 %	55.7% ♠	49.5 %
	32.0 %	68.0 % ♦	100 %
Total	40	61	101

♣ = sensitivity. ♠ = specificity. ♥ = PPV. ♦ = NPV.

PDI results in the 2 studied groups.

**Fig (17): PDI results in both groups.**

*The PDI results also were studied in view of the other old diagnostic triade of DRE, PSA and TRUS in order to evaluate the diagnostic efficacy of the test in early detection of prostate cancer, these results were as follows:-*

#### **[1] Results of PDI in view of DRE:-**

PDI results were positive in 17 prostate cancer patients (63.0%) being with abnormal DRE findings, and also in 7 cases with normal DRE findings. Ten prostate cancer patients (37.0%) with positive DRE findings showed negative PDI findings. The sensitivity and specificity of PDI in DRE positive cases were 63.0% and 50.0% respectively. The PPV and NPV of PDI in TRUS positive cases were

63.0% and 50.0% respectively. *Table (14) Fig.(18)* The likelihood ratio of PDI among DRE positive cases was 113.0% i.e. >100.0%.

**Table: (14) PDI results in view of DRE results in both groups.[Sensitivity & specificity] , [PPV & NPV].**

DRE	PDI	PROSTATE CANCER	NON- CANCER	TOTAL
Abnormal  +ve	Positive	17	10	27
		63.0 % ♣	50.0 %	57.4 %
		63.0 % ♥	37.0 %	100 %
	Negative	10	10	20
		37.0 %	50.0 % ♠	42.6 %
		50.0 %	50.0 % ♦	100 %
	Total	27	20	47
		57.4 %	42.6 %	100 %
Normal  -ve	Positive	7	17	24
		53.8 %	41.5 %	44.4 %
		29.2 %	70.8 %	100 %
	Negative	6	24	30
		46.2 %	58.5 %	55.6 %
		20.0 %	80.0 %	100 %
	Total	13	41	54
		24.1 %	75.9 %	100 %
	Total	40	61	101

♣ = sensitivity. ♠ = specificity. ♥ = PPV. ♦ = NPV.

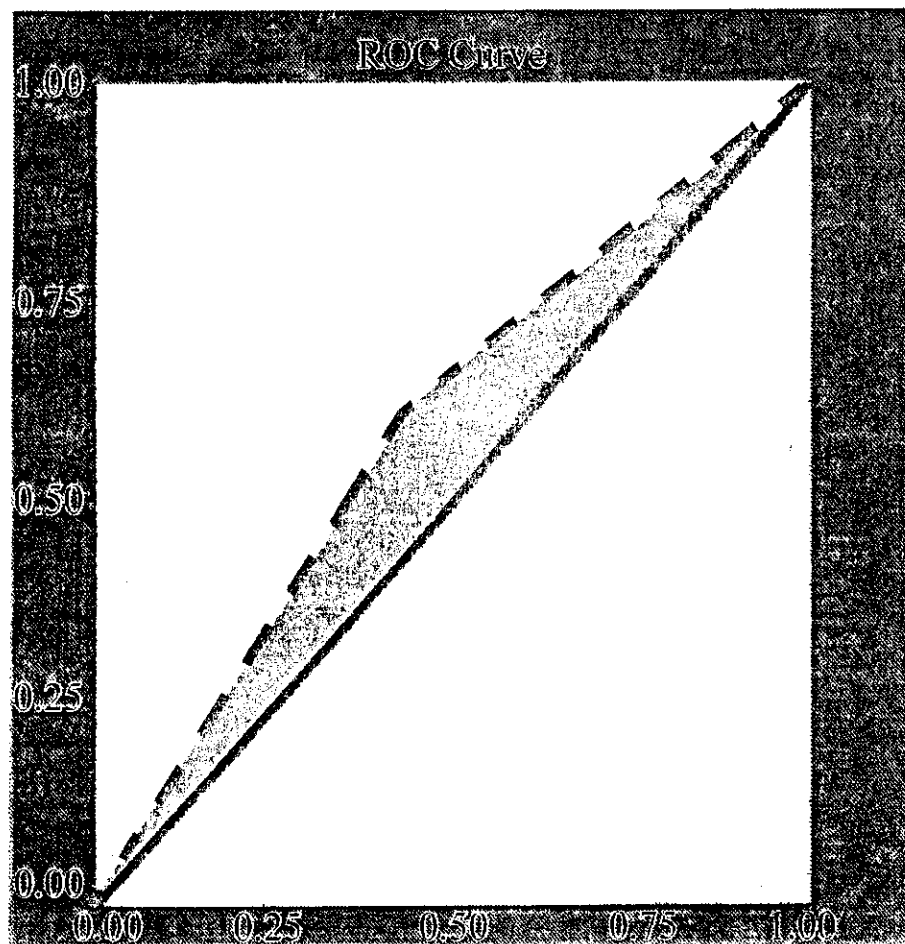
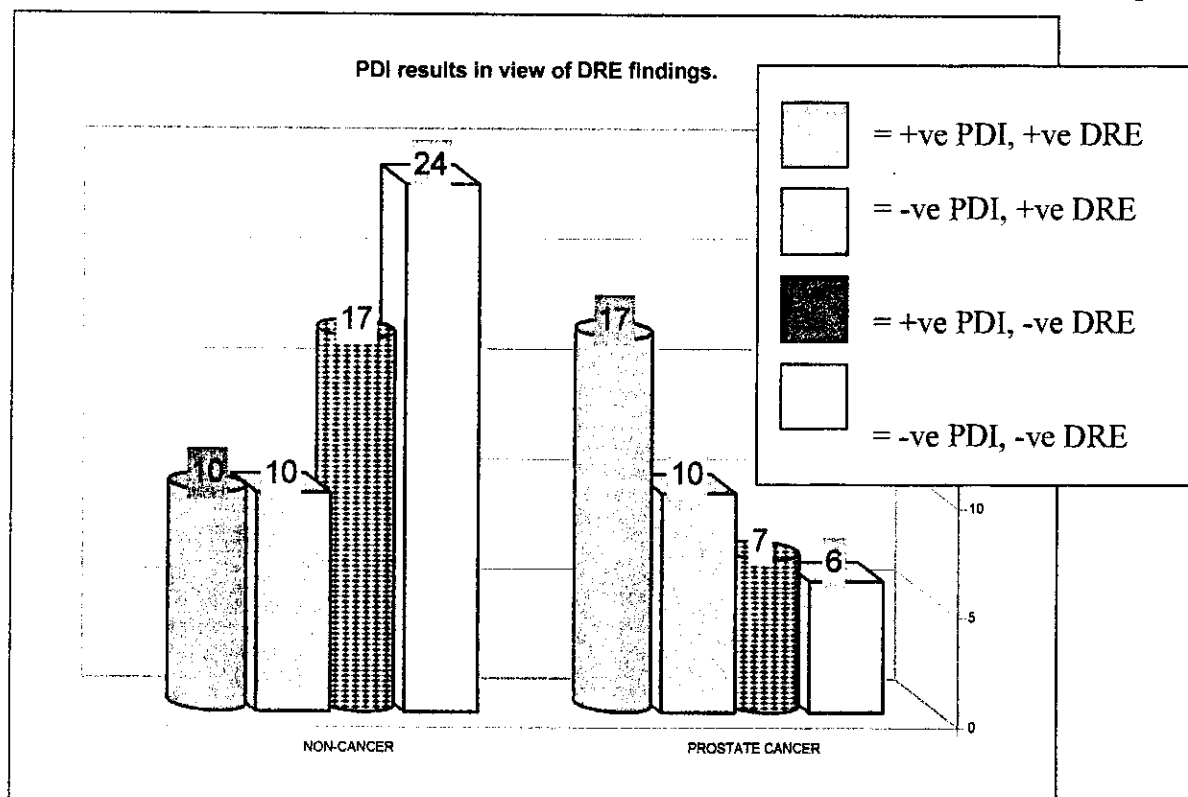


Fig.(18): ROC-curve of PDI; Area Under Curve-AUC=0.579.



**Fig (18): PDI results in view of DRE findings.**

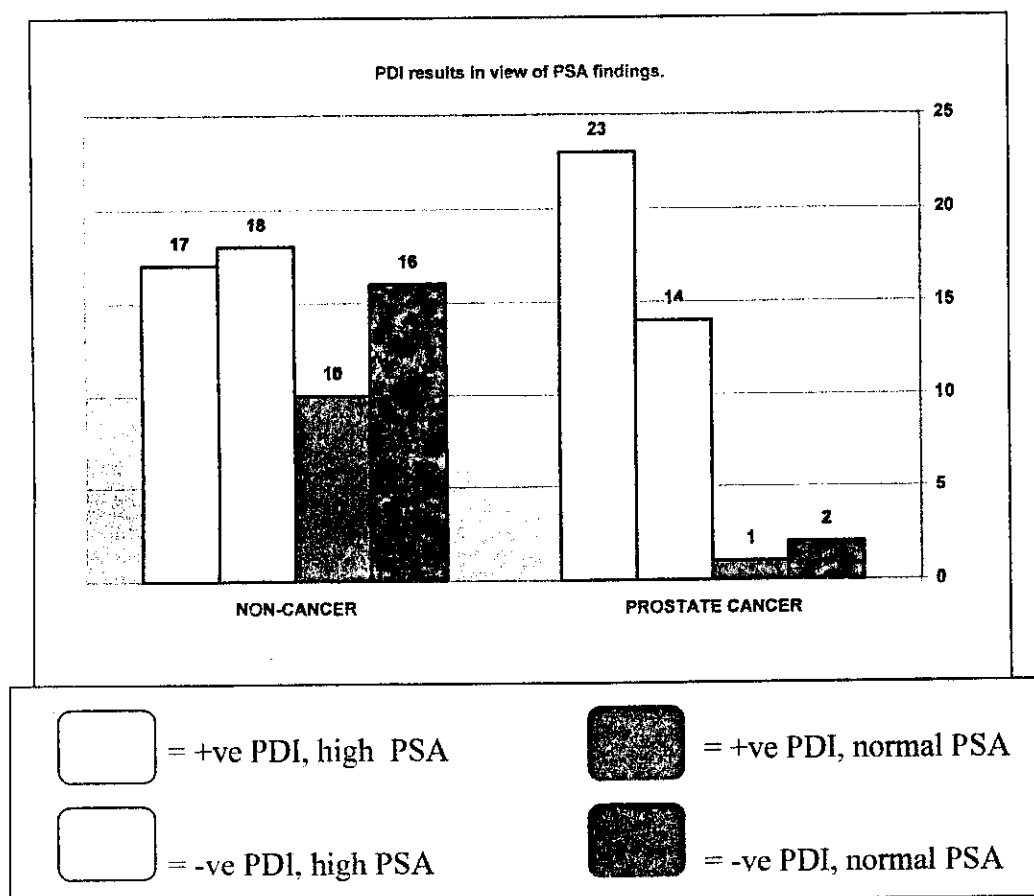
## **[2] Results of PDI in view of PSA:-**

There were 23 prostate cancer patients (62.2%) showed positive PDI results while being with high PSA levels, only one prostate cancer patient (9.1%) with positive PDI had normal PSA. Fourteen prostate cancer patients (37.8%) showed negative PDI findings with high PSA. The sensitivity and specificity of PDI among patients with high PSA were 62.2% and 51.4% respectively. The PPV and NPV were 57.5% and 56.3% respectively in high PSA group. *Table (15) Fig.(19)* The likelihood ratio of PDI was 113.6%.

Table: (14) PDI results in view of PSA results in both groups.[Sensitivity & specificity] , [PPV & NPV].

PSA	PDI	PROSTATE CANCER	NON- CANCER	TOTAL
High  +ve	Positive	23	17	40
		62.2 % ♣	48.6 %	55.6 %
		57.5 % ♥	42.5 %	100 %
	Negative	14	18	32
		37.8 %	51.4 % ♠	44.4 %
		43.8 %	56.3 % ♦	100 %
	Total	37	35	72
		51.4 %	48.6 %	100 %
Normal  -ve	Positive	1	10	11
		33.3 %	38.5 %	37.9 %
		9.1 %	90.9 %	100 %
	Negative	2	16	18
		66.7 %	61.5 %	62.1 %
		11.1 %	88.9 %	100 %
	Total	3	26	29
		10.3 %	89.7 %	100 %
Total		40	61	101

♣ = sensitivity. ♠ = specificity. ♥ = PPV. ♦ = NPV.

**Fig (19): PDI results in view of the PSA levels of the patients.****[3] Results of PDI in view of TRUS:-**

As regards the PDI results in positive TRUS patients, there were 23 prostate cancer patients (65.7%) with +ve PDI findings, while 12 prostate cancer patients (34.3%) showed negative PDI findings, one prostate cancer patient (7.1%) with -ve TRUS findings showed positive PDI findings. The sensitivity and specificity of PDI in TRUS positive cases were 65.7% and 46.2% respectively. The PPV and NPV of PDI in TRUS positive cases were 50.0% and 62.2% respectively. **Table (16)** **Fig.(20)** The likelihood ratio of the PDI among TRUS positive cases was 111.9%.



**Table: (16) PDI results in view of TRUS results in both groups.[Sensitivity & specificity] , [PPV & NPV].**

TRUS	PDI	PROSTATE CANCER	NON- CANCER	TOTAL
Abnormal  +ve	Positive	23	14	37
		65.7 % ♣	53.8 %	60.7 %
		50.0 % ♥	%	100 %
	Negative	12	12	24
		34.3 %	46.2 % ♠	39.3 %
		50%	62.2 % ♦	100 %
	Total	35	26	61
		57.4 %	42.6 %	100 %
Normal  -ve	Positive	1	13	14
		20 %	37.1 %	35 %
		7.1%	92.9%	100 %
	Negative	4	22	26
		80.0 %	62.9 %	65.0 %
		15.4%	84.6%	100 %
	Total	5	35	40
		12.5%	57.4%	100 %
Total		40	61	101

♣ = sensitivity. ♠ = specificity. ♥ = PPV. ♦ = NPV.

**Fig (20): Results of PDI in view of TRUS results in both groups.**

