Results

This study included 150 asymptomatic newborn infants, 71male and 79female, full and preterm, their mean gestational age was (38weeks± 2), with ages ranging between one and five days and their mean birth weight was (3 300 g),presented to Benha Children Hospital (Ministry of health), between August 2009 and February 2010. cases presented by hypoxia at time of examination were excluded from our study.

Pulse oximetry saturation (POS) measurements and routine clinical examinations were performed followed by echocardiographic studies which were arranged for all cases their POS values< 95 % and only for the cases with POS values ≥ 95 % but by routine clinical examinations clinical abnormality (murmur)was detected.

By statistical analysis of echocardiographic studies results, our study group was divided retrospectively into two groups:

- **Group I** (normal newborn infants) who had negative echocardiographic findings (142 neonates)
- **Group II** (abnormal newborn infants) who had positive echocardiographic findings (8 neonates)

Table(1) Sex distribution of the study groups

Study groups / Sex	Normal(GI)		Abnormal(GII)		Total number	
	number	Percentage	number	percentage	number	percentage
Male	68	47.9	3	37.5	71	47.3
female	74	52.1	5	62.5	79	52.7
Total	142	100.0	8	100.0	150	100.0

Chi squre (X^2)=0.044 P>0.05(NS)

Figure (1) Sex distribution of normal group

Chart (1) sex distribution of normal group

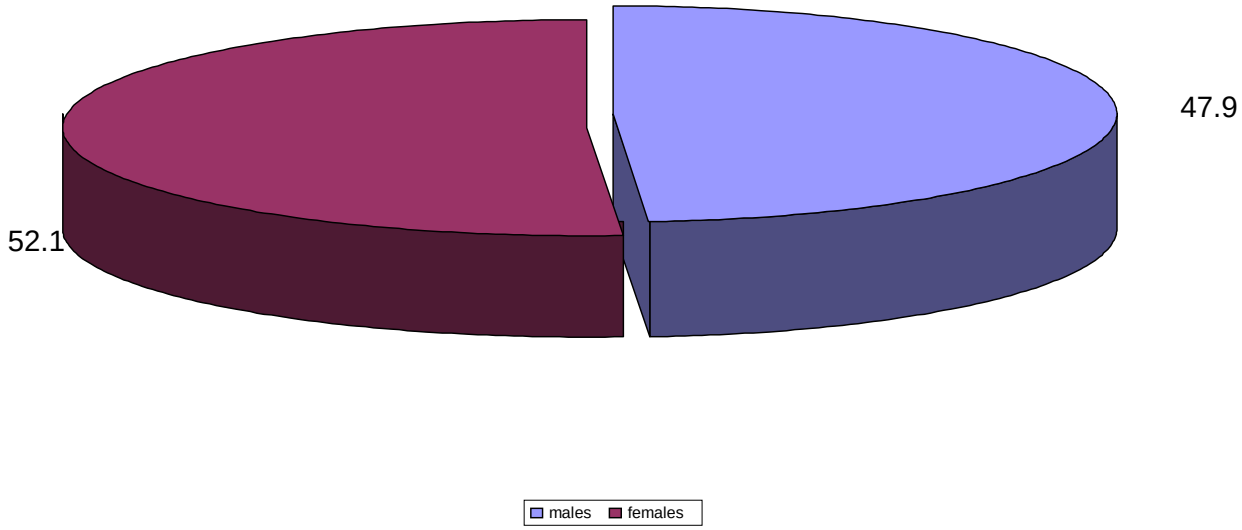
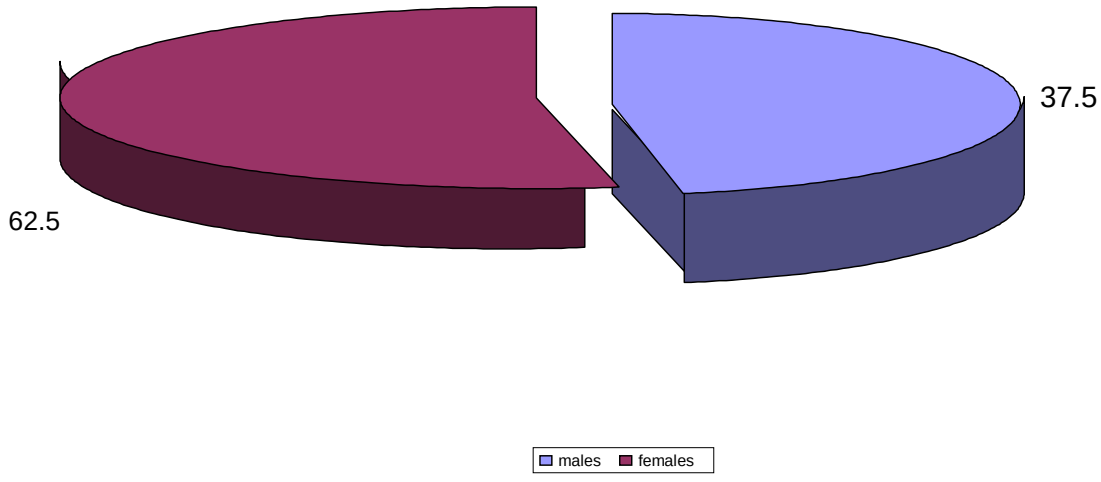


Figure (2) Sex distribution of abnormal group

Chart (2) sex distribution of abnormal group



As illustrated in ***table(1),figure(1&2),***which showed sex distribution of the study groups: the study groups divided into 142 normal newborns [68 male(47.9%) and 74 female(52.1%)]and 8 abnormal newborns[3 male(37.5%) and 5 female (62.5%)].We found insignificant sex distribution of the study groups with p value > 0.05.

Table(2) means ± standard deviations of gestational age of the study groups

Gestational age(wk) / **Study groups**	**means ± standard deviations**	**t**	**P**
Normal(GI)	38.1 wk ± 1.2	11.7	< 0.001(HS)
Abnormal(GII)	33.4 wk ± 1.1		

Figure (3) distribution of study group according to gestational age

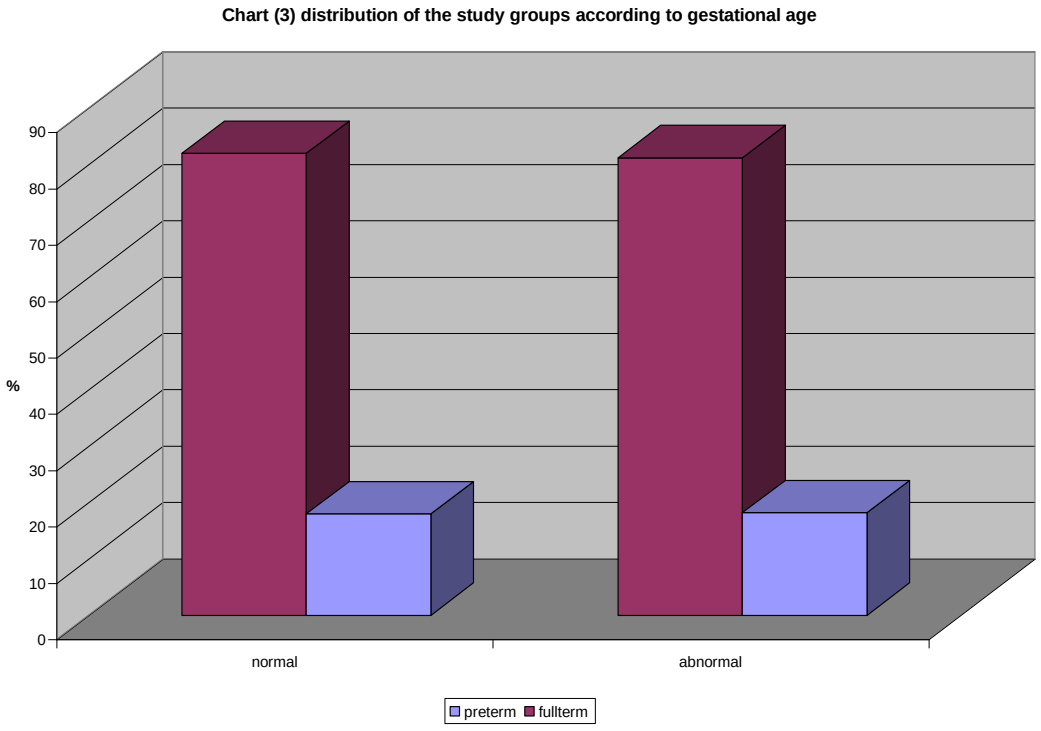


Table (2)and figure(3) illustrates means ± standard deviations of gestational age of the study groups which divided into normal group (38.1wk± 1.2) and abnormal group (33.4wk± 1.1). We found highly statistically significant difference of gestational age among study groups with p value < 0.001.

Table(3) means ± standard deviation of age of the study groups at the time of examinations.

age of neonate in days / Study groups	**means ± standard deviation**	**t**	**p**
Normal(GI)	3.6 days ± 1.9	0.21	> 0.05
Abnormal(GII)	3.8 days ± 2.6		

Table (3) shows means ± standard deviations of age of the study groups at the time of examination of normal group (3.6 days±1.9) and abnormal group (3.8days±2.6). We found statistically insignificant difference of distribution of study group according to the age at the time of examination with p value > 0.05.

Table(4) Distribution of study groups according to number of births

Study groups / number of births	**Normal (GI)**		**Abnormal (GII)**		**Total number**	
	number	percentage	number	percentage	number	percentages
single	137	96.5	6	75.0	143	95.3
Twins	5	3.5	2	25.0	7	4.7
Total	142	100.0	8	100.0	150	100.0

Chi squre (X^2) = 3.78 P<0.05(S)

Table(4) shows distribution of study groups according to number of births which divided into normal group[137 single (96.5%) and 5 twins (3.5%)] and abnormal group [6 single (75.0%) and 2 twins (25.0%)] .We found statistically significant difference of number of births with p value < 0.05.

Table(5) means ± standard deviation of age of parents

Study group / Age(years)	Normal (GI)	Abnormal (GII)	t	P
Father age(Ys)	32.4 ±6.2	36.9±3.8	3.12	<0.01(S)
Mother age(Ys)	26.8 ± 4.8	29.7±6.7	1.21	>0.05(NS)

Figure(4) means of ages father and mother among the study groups

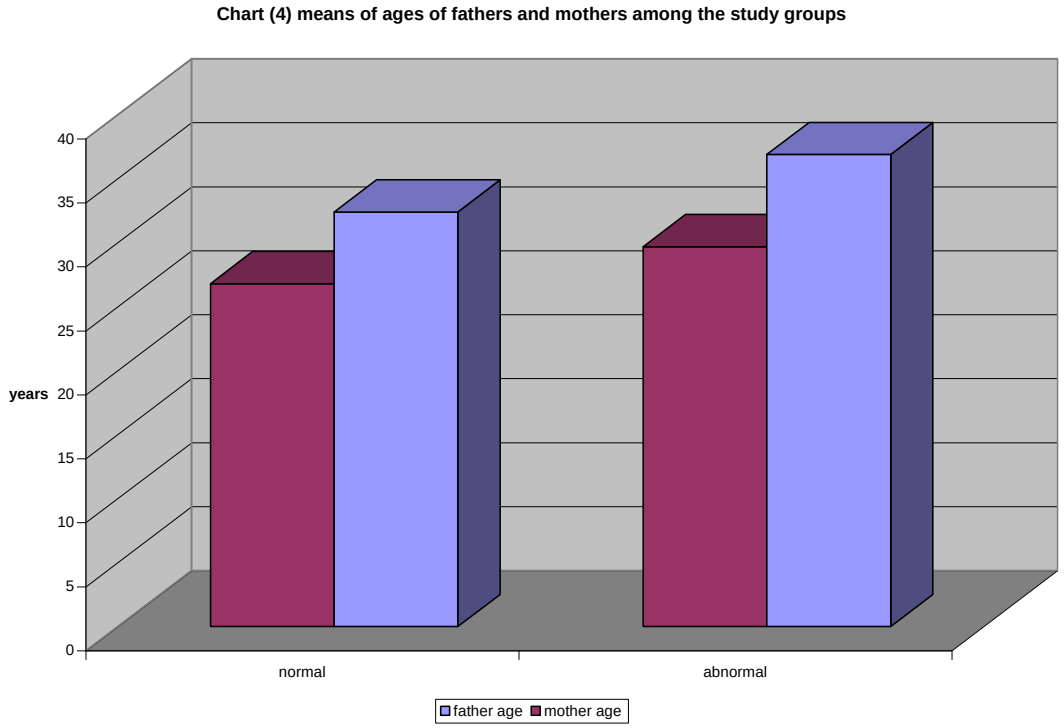


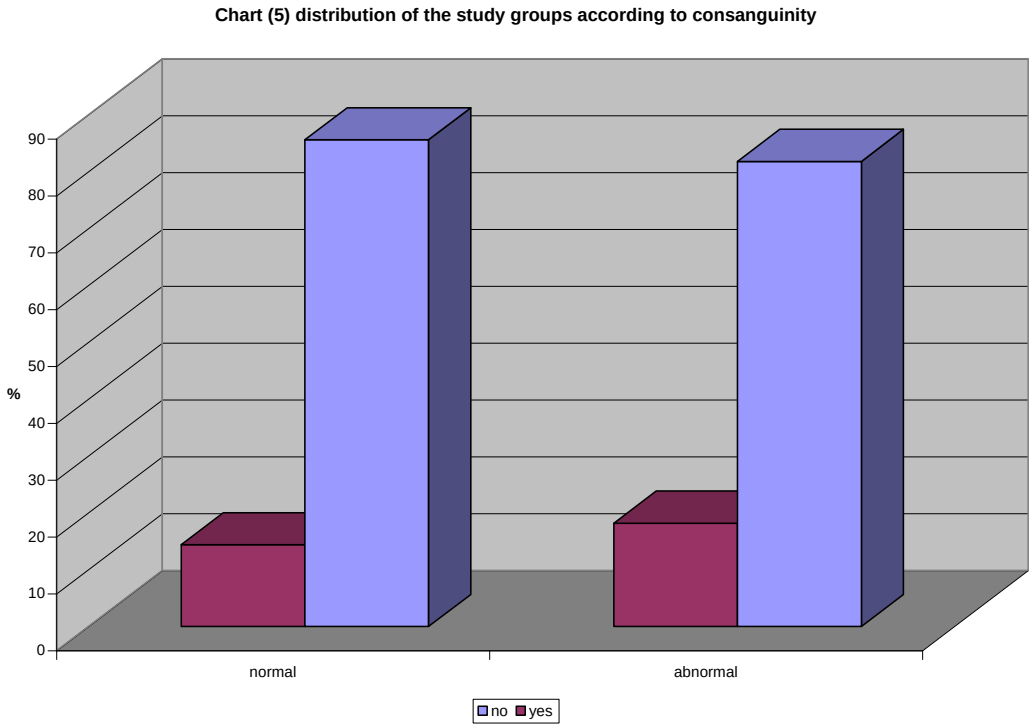
Table (5)and figure(4) show means ± standard deviations of age of parents of the study groups which divided into normal group[father age (32.4± 6.2 years) and mother age (26.8± 4.8 years)] and abnormal group [father age (36.9± 3.8 years) ,mother age (29.7± 6.7 years)].We found significant distribution of the study group according to age of the father with p value < 0.01but insignificant distribution of the study group according to age of the mother with p value > 0.05.

Table(6) Distribution of study groups according to consanguinity

Study group / **consanguinity**	**Normal (GI)**		**Abnormal (GII)**		**Total number**	
	number	percentage	number	percentage	Number	percentages
NO	122	85.9	6	75.5	128	85.3
YES	20	14.1	2	25.0	22	14.7
Total	142	100.0	8	100.0	150	100.0

Chi squre (X^2)=0.01 P>0.05(NS)

Figure (5) Distribution of study groups according to consanguinity



Table(6)and figure(5) show distribution of study groups according to consanguinity. In normal group there were 122 non consangous marriages (85.9%) and 20 consangous marriages (14.1%) .In abnormal group there were 6 non consangous marriages (75.5%) and 2 consangous marriages (25.0%). We found insignificant distribution of study groups according to consanguinity with p value > 0.05.

Table(7) Distribution of study groups according to mode of delivery

Study groups / **Mode of delivery**	**Normal(GI)**		**Abnormal(GII)**		**Total number**	
	number	Percentage	number	percentage	number	percentages
Cesarean section	102	85.9	5	75.0	107	71.3
Normal vaginal delivery	40	14.1	3	25.0	43	28.7
Total	142	100.0	8	100.0	150	100.0

Chi squre (X^2)**:**=0.28 P>0.05(NS)

Table(7) shows distribution of the study groups according to the mode of delivery .In normal group there were 102 cesarean section (85.9%) and 40 normal vaginal delivery (14.1%) and in abnormal group there were 5 cesarean section (75.0%) and 3 normal vaginal delivery (25.0%)].We found insignificant distribution of study groups according to mode of delivery with p value > 0.05.

Table(8) means ± standard deviation of weight of the study groups.

Study groups / **weight of neonate in kg**	**means ± standard deviation**	**t**	**P**
Normal(GI)	2.88 kg ± 0.52	2.04	< 0.05(S)
Abnormal(GII)	2.48 kg ± 0.54		

Table (8) shows means ± standard deviations of the weight of the study groups with mean weight of normal group (2.88kg± 0.52) and mean weight of abnormal group (2.48kg±0.54). We found statistically significant difference of weight among study group with p value < 0.05.

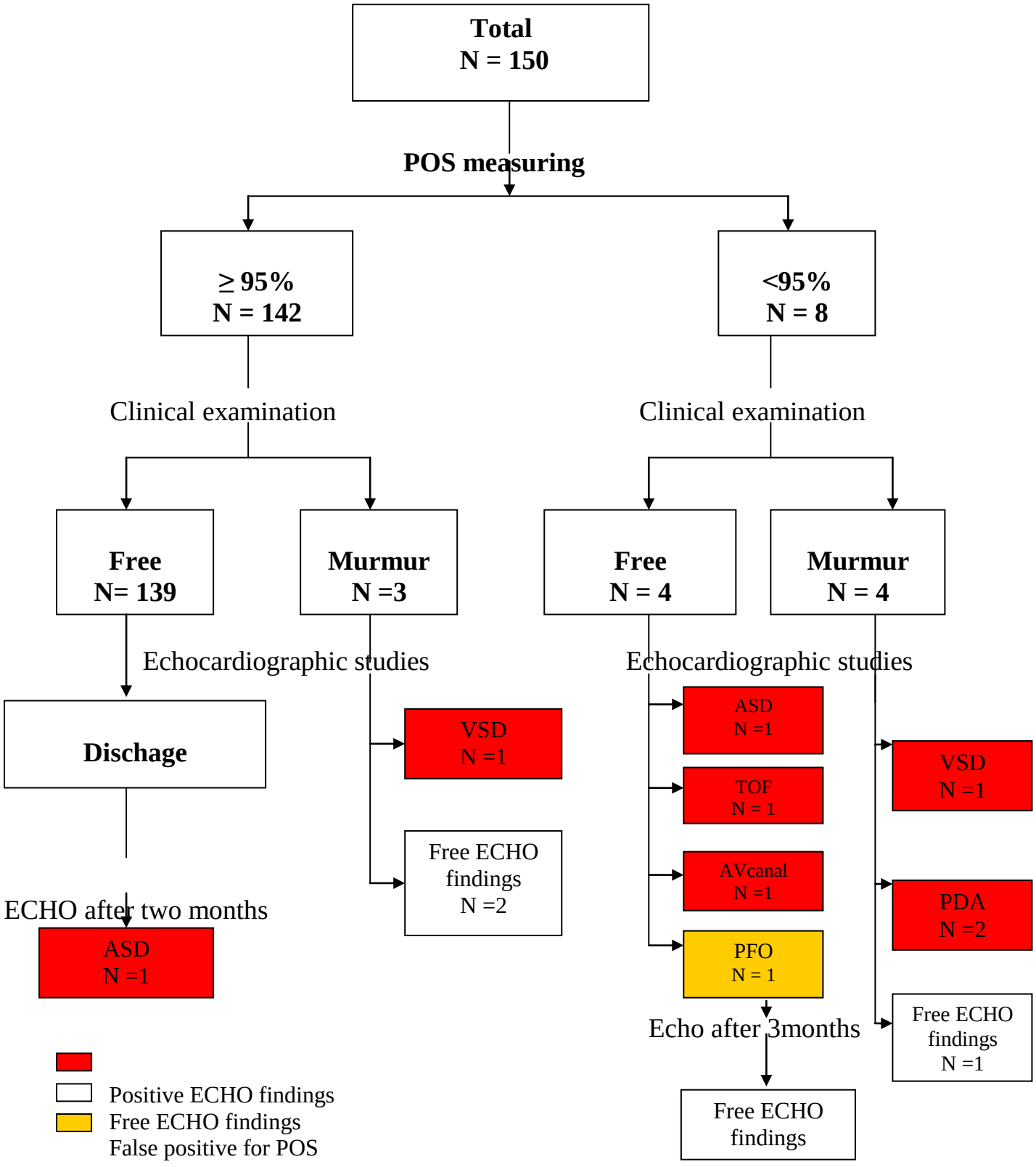
Table (9) distribution of the study groups according to clinical presentations at time of admission

Study groups / clinical presentations at time of admission	Normal (GI)		Abnormal (GII)		Total number	
	number	percentage	number	percentage	number	percentages
Neonatal jaundice	137	96.5	7	87.5	144	96.0
Neonatal sepsis	2	1.4	1	12.5	3	2.0
Pallor	1	0.7	0	0.0	1	0.7
IUGR(Intrauterine growth retardation)	2	1.4	0	0.0	2	1.3
Total	142	100.0	8	100.0	150	100.0

Chi squre (X2)=4.89 P>0.05

Table(9) shows distribution of study groups according to clinical presentations at time of admission**,** in normal group 137 neonatal jaundice (96.5%) , 2 neonatal sepsis (1.4%), 1 pallor (0.7%) and 2 intrauterine growth retardation(1.4%).In abnormal group7 neonatal jaundice (87.5%) , 1 neonatal sepsis (12.5%), no pallor and no intrauterine growth retardation. We found statistically insignificant difference of clinical presentations among the study groups with p value > 0.05.

Figure(6)Postulated algorithm for POS screening and clinical examination with Echo results.



Normal oxygen saturation values was ≥ 95 % in142 neonates (94.7%), but by clinical examination three of them were presented by positive auscultatory findings(murmur). Echocardiographic studies carried out for these three cases, whose had murmur, which showed one of them had VSD and the other two neonates were normal. The rest139 cases of the study group were discharged as their pulse oximety values and clinical examinations results were free. But after about two months one of the discharged infants was admitted to Benha children hospital by respiratory distress, while being investigated for respiratory distress ,ASD was diagnosed by echocardiographic examination. This disorder had not been detected, at the time of the study, by the pulse oximetry screening or by the initial routine clinical examination. This case considered as false negative case in our study.

Abnormal oxygen saturation values < 95 % were noted in eight cases(5.3%). By clinical examination four of them were presented by positive auscultatory findings (had murmur). Echocardiographic studies carried out for these cases, whose had murmur ,which showed, one of them had VSD, two of them had PDA, and the fourth one was normal. The other four cases were clinically free but by echocardiographic examinations, one of them was ASD, one was tetralogy of fallot (TOF), one was common atrioventricular canal and the fourth was patent foramen oval (PFO) ,in this infant echocardiographic study which was done after three months as follow up , showed normal heart(closed foramen oval) so this case considered as false positive case for POS in our study.

**On the basis of these data:*

Table(10) Statistically study of pulse oximetry in relation to echocardiographic examination.

sensitivity	37.5%
specificity	99.3%
PPV	75%
NPV	96.5%
accuracy	96%

Table (10)shows sensitivity, specificity , positive predictive value , negative predictive value and accuracy they were 37.5%, ,99.3%, 75%, 96.5% and 96% respectively for pulse oximetry in relation to echocardiographic examination.

Table (11) Statistically study of clinical examination in relation to echocardiographic examination.

sensitivity	50%
specificity	97.9%
PPV	57.1%
NPV	97.2%
accuracy	95.3%

Table (11) shows sensitivity, specificity , positive predictive value , negative predictive value and accuracy they were 50%, 97.7%, 57.1%, 97.2% and 95.3%respectively for clinical examination in relation to echocardiographic examination.

Table(12) Statistically study of combined clinical examination and pulse oximetry in relation to echocardiographic examination.

sensitivity	87.5%
specificity	97.2%
PPV	63.6%
NPV	99.3%
accuracy	96.66

Figure(7) Combined clinical examination and pulse oximetry in relation to echocardiographic examination.

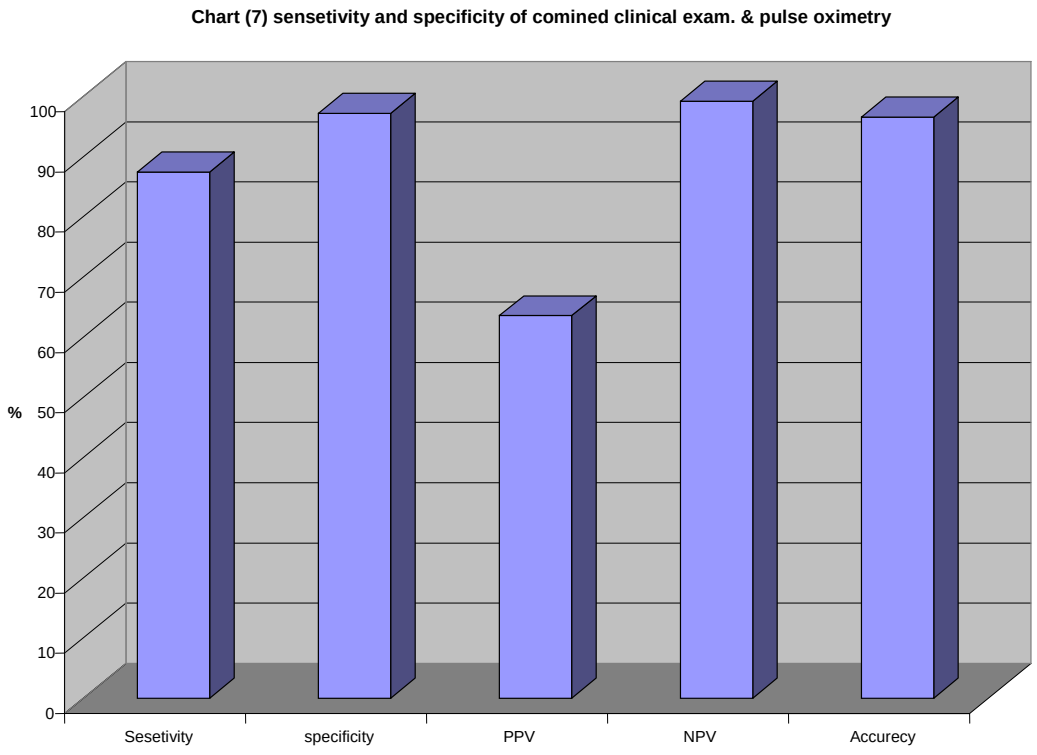


Table (12)and figure(7)show sensitivity, specificity , positive predictive value , negative predictive value and accuracy they were 87.5%, 97.2%, 63.6%, 99.3% and 96.66 %respectively for combined clinical examination and pulse oximetry in relation to echocardiographic examination.