Results

This study was carried out on 100 neonates whom delivered in Kafr Alzayat General Hospital during the period from November 2011 to Jun 2012, born to either diabetic or non diabetic mothers. The neonates divided into two groups to compare between perinatal outcomes (birth injury i.e. shoulder dystocia, and brachial plexus injury, neonatal respiratory distress, hypoglycemia and Hyperbilirubinemia). The 1st group (patients) included 50 newborn with birth weight 4000 g or more, while the 2nd group (control) included 50 newborn with birth weight less than 4000g.

Maternal characteristics:

1-Age of the mothers:

The mothers age in both study group ranged from 19 to 36 years which had no significant effect on birth weight, P-value 0.322 (Table 2).

Groups	Age of the mothers		T-Test	
	Range	Mean ± SD	t	P-value
Patients group	19.000 - 36.000	27.260 ± 4.309	0.995	0.322
Control group	19.000 - 36.000	26.440 ± 3.924		

Table (2): The Mothers ages in patients & control groups.

2- The Mothers body mass index (BMI):

In the present study the BMI for the mothers of patients group ranged from 23kg/m^2 to 30.8 kg/m^2 with mean 27.304 kg/m^2, while the BMI for mothers of control group ranged from 22.3 kg/m^2 to 30.1 kg/m^2 with mean 26.32 kg/m^2, with P-value =0.008. So mothers with higher BMI have higher incidence to have macrosomic baby (Table 3& figure 6).

Groups	Mothers BMI (kg/m^2)		T-Test	
	Range	Mean ± SD	t	P-value
Macrosomic group	23.000 - 30.800	27.304 ± 1.816	2.703	0.008*
Control group	22.300 - 30.100	26.320 ± 1.824		

Table (3): The mothers BMI in macrosomic & control groups.

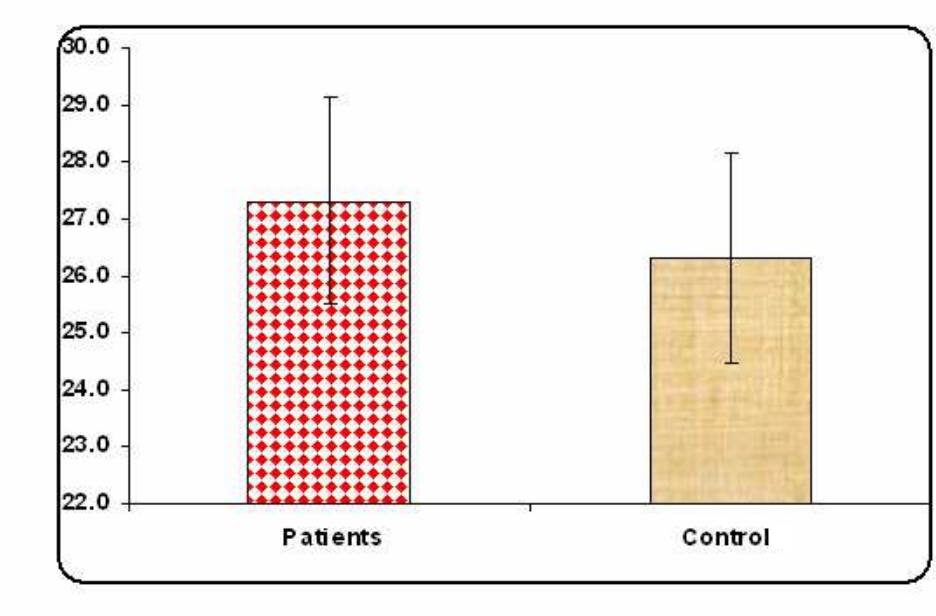


Fig. (6): The mean of Mothers BMI in macrosomic & control groups.

3- Antinatal ultrasound in the last trimester (At 37 weeks):

In the present study there is significant relation between antinatal ultrasound measurements of femur length (FL), biparietal diameter (BPD), and abdominal circumference (AC) to estimate fetal weight in the last trimester, when this measures increase the estimated fetal weight (EFW) increase and newborn body weight usually increase.

Femur length (FL):

The FL in macrosomic neonates ranged from 72.4 mm to 79.9 mm with mean 75.62mm, while in control group it ranged from 67.9mm to 74.2mm with mean 70.99mm, P-value 0.001 (Table 4 & figures 7 &12).

Groups	FL		T-Test	
	Range	Mean ± SD	t	P-value
Macrosomic group (patients)	72.400 - 79.900	75.620 ± 1.690	14.050	<0.001*
Control group	67.900 - 74.200	70.990 ± 1.604		

Table (4): The FL by antinatal ultrasound at 37week for macrosomic & control groups.

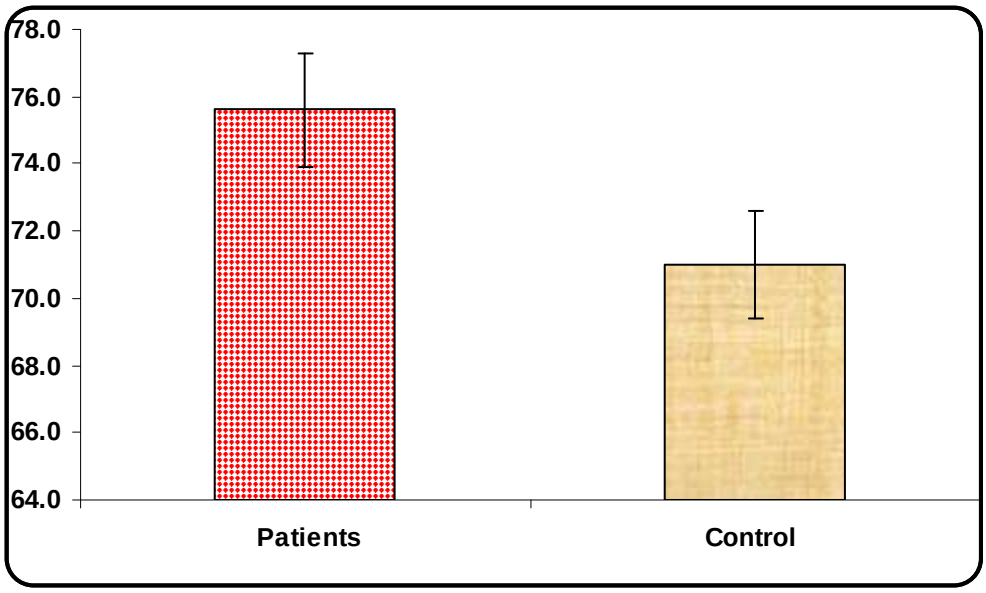


Fig. (7): The mean of FL by antinatal ultrasound at 37w for macrosomic &control groups.

Biparietal diameter (BPD):

The BPD in macrosomic neonates ranged from 90.7mm to 102mm with mean 96.02mm, while in control group the BPD ranged from 91mm to 98.3mm with mean 93.956mm, P-value 0.001 (Table 5& figures 8&11).

Groups	BPD		T-Test	
	Range	Mean ± SD	t	P-value
macrosomic group	90.700 - 102.000	96.020 ± 2.314	5.309	<0.001*
Control group	91.000 - 98.300	93.956 ± 1.484		

Table (5): The BPD in macrosomic and control groups.

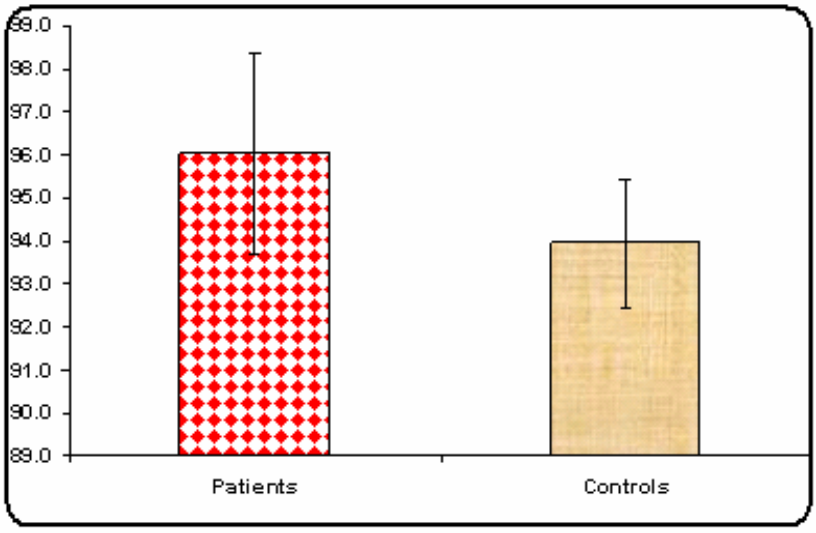


Fig. (8): The mean BPD in macrosomic and control groups.

Abdominal circumference (AC):

The AC in macrosomic neonates ranged from 339.6 mm to 371mm with mean 356.044mm, while in control group AC ranged from 310mm to 336mm with mean 321.048mm, P-value 0.001 (Table 6 & figures 9 &12).

Groups	AC		T-Test	
	Range	Mean ± SD	t	P-value
macrosomic group	339.600 - 371.000	356.044 ± 6.482	28.665	<0.001*
Control group	310.000 - 336.000	321.048 ± 5.702		

Table (6): The AC in macrosomic & control groups.

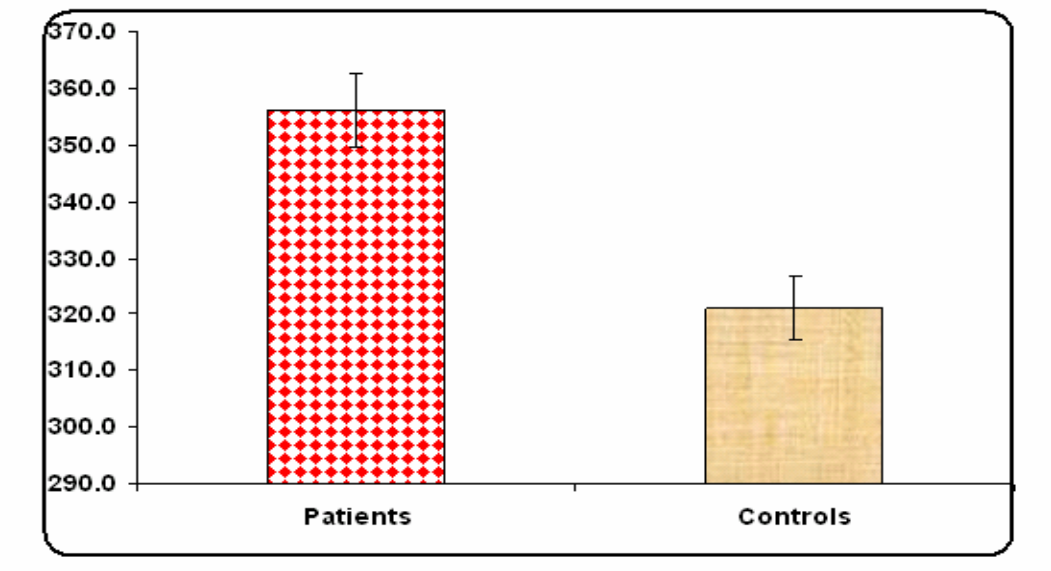


Fig. (9): The mean AC in macrosomic & control groups.

Estimated fetal weight (EFW):

The EFW in macrosomic group ranged from 3420g to 4103g with mean 3720.220 g, while in control group EFW ranged from 2720.0 g to 3460.0 g with mean 3023.08, P-value 0.001 (Table 7 & figures 10,11, 13&14).

Groups	EFW		T-Test	
	Range	Mean ± SD	t	P-value
Patients	3420.000 - 4103.000	3720.220 ± 159.899	22.072	<0.001*
Control	2720.000 - 3460.000	3023.080 ± 155.918		

Table (7): The estimated fetal weight (EFW) in macrosomic & control groups.

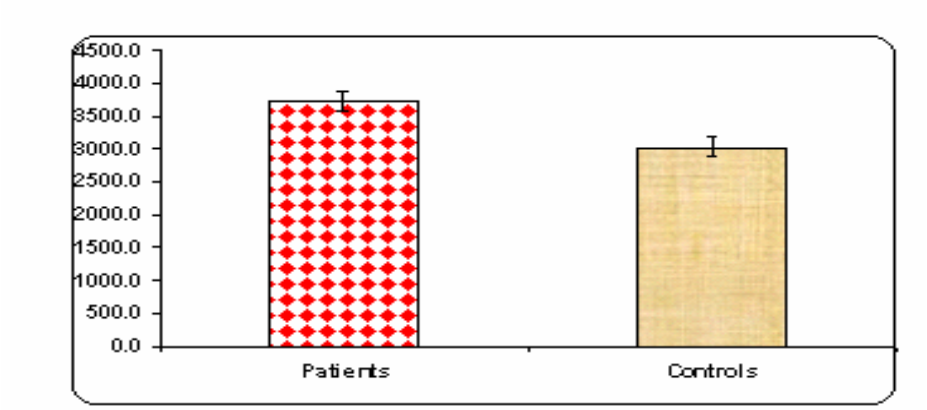


Fig. (10): The mean of estimated fetal weight (EFW) in macrosomic & control groups.

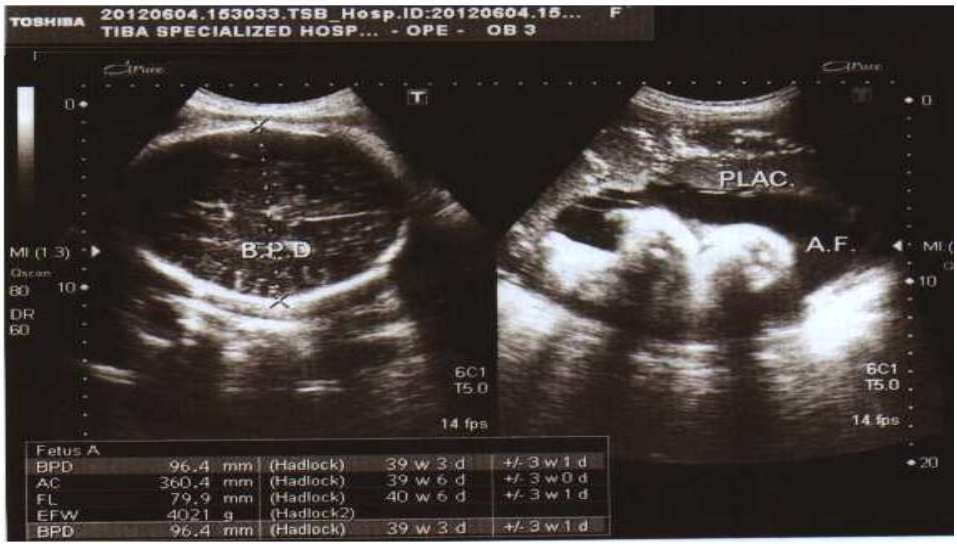


Fig.(11): Antenatal ultrasound in the last trimester shows BPD and estimated fetal weight in a macrosomic fetus

Fig.(12): Antenatal ultrasound in the last trimester shows FL and AC in a macrosomic fetus.

Fig. (13): Antenatal ultrasound in the last trimester shows estimated fetal weight in a macrosomic fetus.

Fig. (14): Antenatal ultrasound in the last trimester shows estimated fetal weight in a macrosomic fetus.

4- **The Mothers Parity**:

Five out of 50 mothers in macrosomic group were primigravida, 23 were second gravida, 19 were third gravida and 3 were fourth gravida, while in control group 20 out of 50 mothers were primigravida, 13 were second gravida, 17 were third gravida and none of them were fourth gravida. P-value = 0.0019. So the multiparous mothers have higher incidence to have macrosomic baby than primipara (Table 8 &Figure 15).

Mothers Parity		Groups		
		Patients	Control	Total
1	N	5	20	25
	%	10.00	40.00	50.00
2	N	23	13	36
	%	46.00	26	36.00
3	N	19	17	36
	%	38.00	34.00	36.00
4	N	3	0	3
	%	6.00	0.00	3.00
Total	N	50	50	100
	%	100.00	100.00	100.00
Chi-Square	X^2	14.889		
	P-value	0.0019		

Table (8): The mother's parity in macrosomic & control groups.

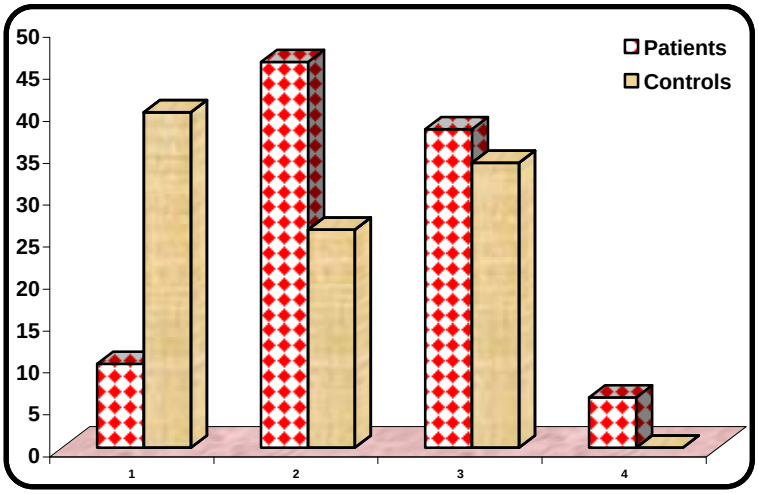


Fig (15): The percentage of mothers parity in macrosomic & control groups.

5- Maternal history of macrosomic baby:

In the macrosomic group 39 out of 50 mothers had no history of macrosomic baby and 11 had history of macrosomic baby, while in control group all mothers had no history of macrosomic baby, P-value < 0.001. So the mothers with history of macrosomic baby have higher incidence to have macrosomic baby (Table 9 & Figure 16).

Hist of macrosomic baby		Groups		
		Patients	Controls	Total
Negative	N	39	50	89
	%	78.00	100.00	89.00
Positive	N	11	0	11
	%	22.00	00.00	11.00
Total	N	50	50	100
	%	100.00	100.00	100.00
Chi-Square	X^2	12.360		
	P-value	<0.001*		

Table (9): The maternal history of macrosomic baby in macrosomic & control group.

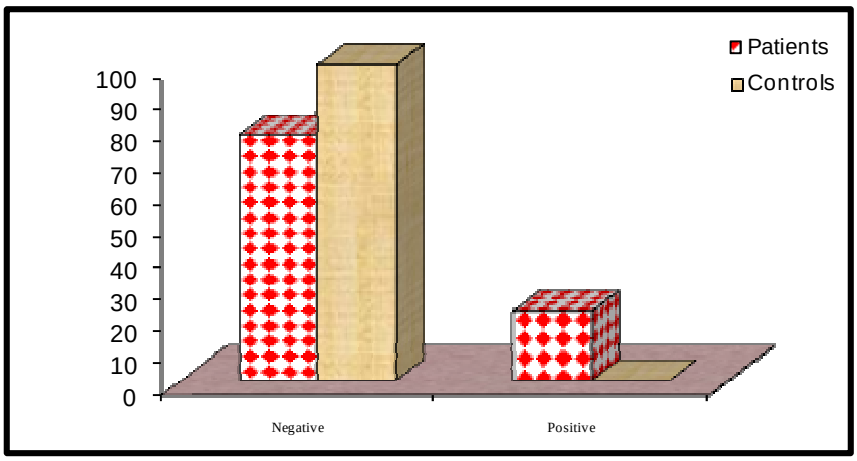


Fig. (16): The percentage of maternal history of macrosomic baby in macrosomic & control group.

6- Maternal gestational diabetes mellitus (GDM):

Maternal GDM diagnosed in 5 out of 50 mothers (10%) in macrosomic group, one of them delivered by cesarean section after a trial of normal vaginal delivery and her baby had respiratory distress, the other 4 mothers delivered by normal vaginal delivery, 2 babies had shoulder dystocia and 2 babies had hypoglycemia. So all Infant born to mothers with GDM had complications. While in control group 2 out of 50 mothers (4%) had GDM, both delivered by normal vaginal delivery and one of their 2 babies had hypoglycemia. So GDM is a risk factor for macrosomia and its related complications (Table 10 & Figure 17).

G.D.M		Groups		
		Patients	Control	Total
Negative	N	45	48	93
	%	90.00	96.00	93.00
Positive	N	5	2	7
	%	10.00	4.00	7.00
Total	N	50	50	100
	%	100.00	100.00	100.00
Chi-Square	X^2	1.425		
	P-value	0.233		

Table (10): Maternal GDM in macrosomic & control groups.

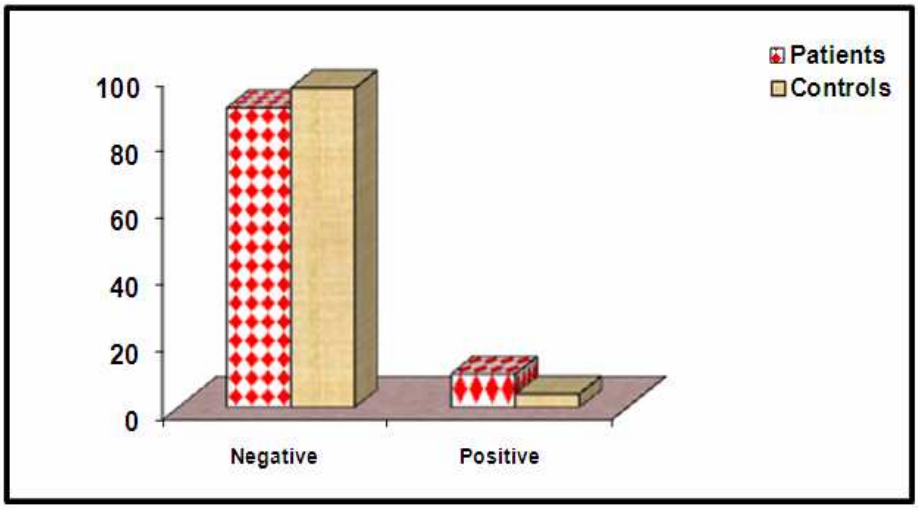


Fig. (17): The percentage of maternal GDM in macrosomic & control group.

Gestational diabetes mellitus & birth injury:

In the macrosomic group 4 out of 50 neonates (8%) had birth injury 2 of them (4%) born to mothers with GDM and the other 2 (4%) to non diabetic mothers, while in control group no birth injury was detected, P-value = 0.029 (Table 11 & Figure 18).

G.D.M		Birth injury		
		No	Yes	Total
Negative	N	43	2	45
	%	86.00	4.00	90.00
Positive	N	3	2	5
	%	6.00	4.00	10.00
Total	N	46	4	50
	%	92.00	8.00	100.00
Chi-Square	X^2	4.783		
	P-value	0.029*		

Table (11): Maternal GDM & birth injury in macrosomic group.

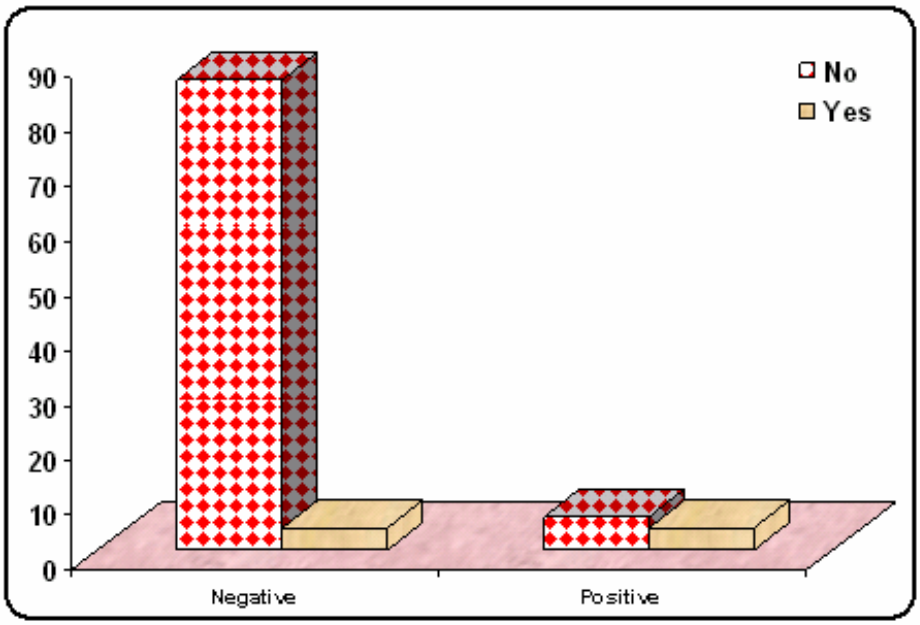


Fig.(18): Percentage of maternal GDM & birth injury in macrosomic group.

7-Method of delivery:

In the macrosomic group 46 out of 50 mothers (92%) delivered by normal vaginal delivery, and 4 mothers (8%) delivered by cesarean section after a trial normal vaginal delivery, while in control group 48 out of 50 mothers (96%) delivered by normal vaginal delivery and 2 mothers (4%) delivered by cesarean section after normal vaginal delivery trial. So the mothers of macrosomic group delivered by cesarean section after a trial normal vaginal delivery were 2 folds of control group, but it was statistically non significant, P-value = 0.395 (Table 12 & Figure 19).

Method of delivery		Groups		
		Patients	Control	Total
N.V.D	N	46	48	94
	%	92.00	96.00	94.00
N.V.D. trial then C.S	N	4	2	6
	%	8.00	4.00	6.00
Total	N	50	50	100
	%	100.00	100.00	100.00
Chi-Square	X^2	0.722		
	P-value	0.395		

Table (12): Method of delivery in macrosomic & control groups.

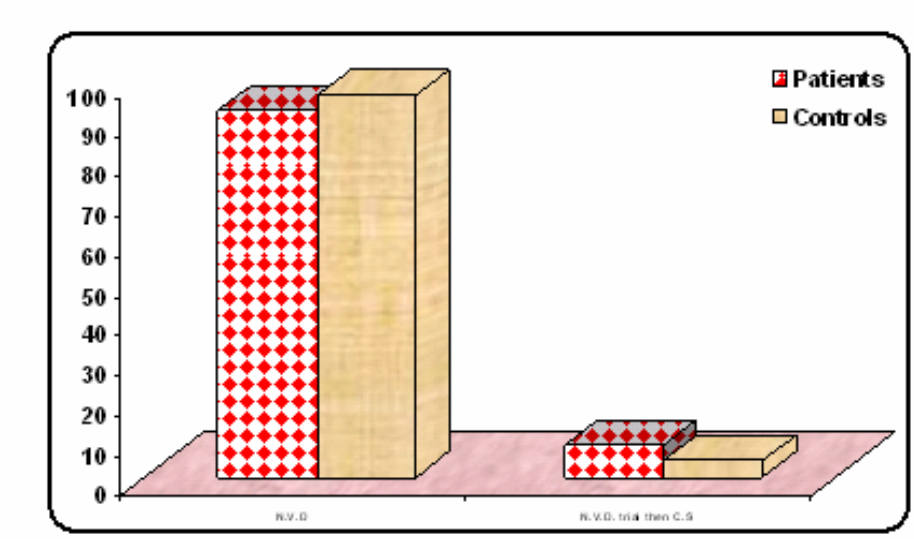


Fig. (19): Percentage of method of delivery in macrosomic & control groups.

Adverse neonatal outcomes:

1- Actual birth weights:

The birth weight after delivery in the macrosomic group ranged from 4080g to 4650g with mean 4274.6 g, and birth weight after delivery in control group ranged from 2750 g to 3650 g. with mean 3139.38g, P-value 0.001 (Table 13 & Figures 20&21).

Groups	Birth weight		T-Test	
	Range	Mean ± SD	t	P-value
patients	4080.000 - 4650.000	4274.600 ± 140.918	33.191	<0.001*
Control group	2750.000 - 3650.000	3139.380 ± 196.555		

Table (13): The birth weight after delivery in macrosomic & Control groups.

Fig. (20): A normal (Left) and a macrosomic baby (Right).

There is significant relation between estimated fetal weight (EFW) by ultrasound and the actual Birth weights, r=0.469 and P-value =0.001.

EFW and Birth weight	
r	**P-value**
0.469	0.001*

Table (14): The relation between EFW and birth weight.

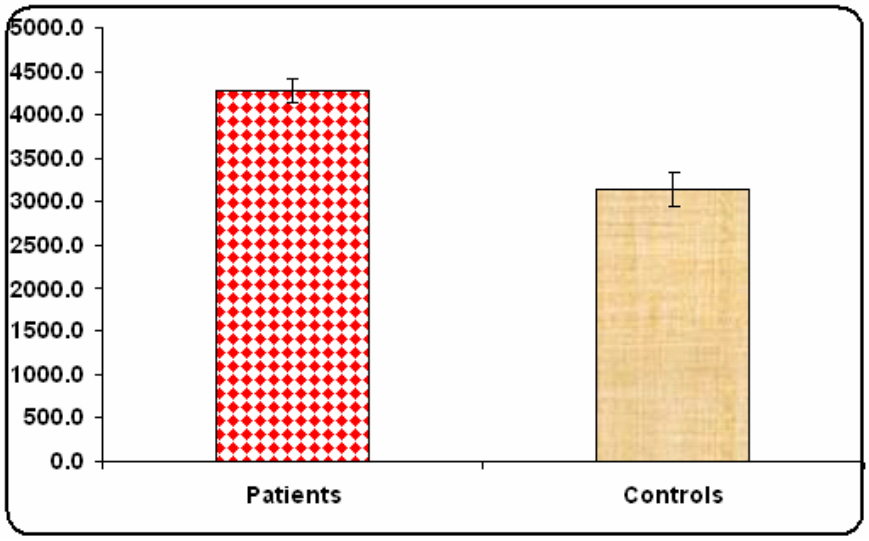


Fig. (21): The mean of birth weight after delivery in macrosomic & control groups.

2-Neonatal outcomes in the macrosomic & control group:

- **Incidence of neonatal complications:**

In the macrosomic group 34 out of 50 newborn (68%) had no complications and 16 (32%) had complications, while in control group 41out of 50 newborn (82%) no complications and 9 (18%) with complications, P-value = 0.1659, (Table 15 & Figure 22).

Complications		Groups		
		Patients	Controls	Total
No	N	34	41	75
	%	68.00	82.00	75.00
Yes	N	16	9	25
	%	32.00	18.00	25.00
Total	N	50	50	100
	%	100.00	100.00	100.00
Chi-Square	X2	1.920		
	P-value	0.1659		

Table (15): Incidence of neonatal complications in macrosomic & control group.

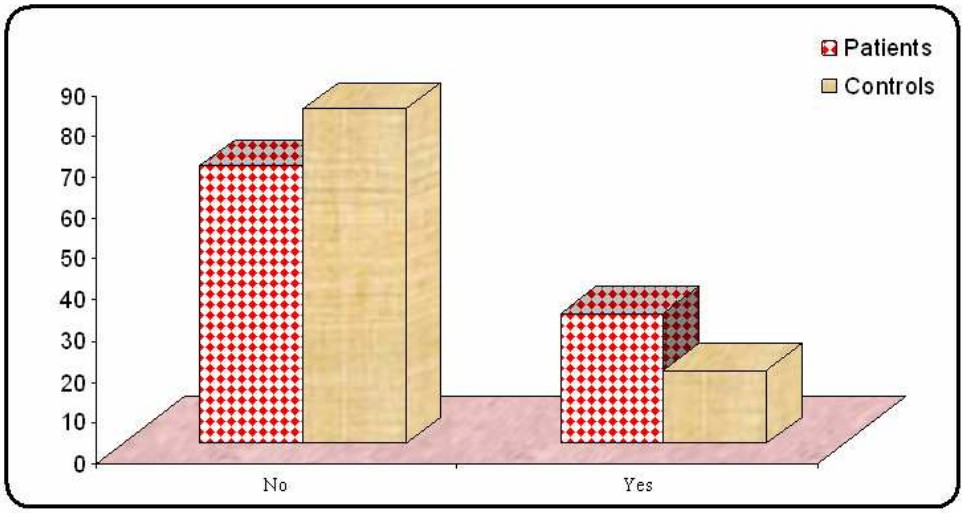


Fig. (22): Percentage of complications in macrosomic & control groups.

- **Details of the complications:**

In the macrosomic group out 16 of 50 newborn (32%) had complications in the form of; 3 newborn (6%) had shoulder dystocia, 5 (10%) had jaundice, 4 (8%) had respiratory distress, 3 (6%) had hypoglycemia and one (2%) had Erb's palsy. In control group, 9 out of 50 newborn (18%) had complications in the form of; 6 newborn (12%) had jaundice, 2 (4%) had respiratory distress, and one (2%) had hypoglycemia, P-value = 0.345 (Table 16& Figure 23).

Complication		Groups		
		Patients	Controls	Total
NO	N	34	41	75
	%	68.00	82.00	75.00
shoulder dystocia	N	3	0	3
	%	6.00	0.00	3.00
N.jaundice	N	5	6	11
	%	10.00	12.00	11.00
respiratory distress	N	4	2	6
	%	8.00	4.00	6.00
hypoglycemia	N	3	1	4
	%	6.00	2.00	4.00
Erb's palsy	N	1	0	1
	%	2.00	0.00	1.00
Total	N	50	50	100
	%	100.00	100.00	100.00
Chi-Square	X^2	6.744		
	P-value	0.345		

Table (16): Neonatal complications in macrosomic & control groups.

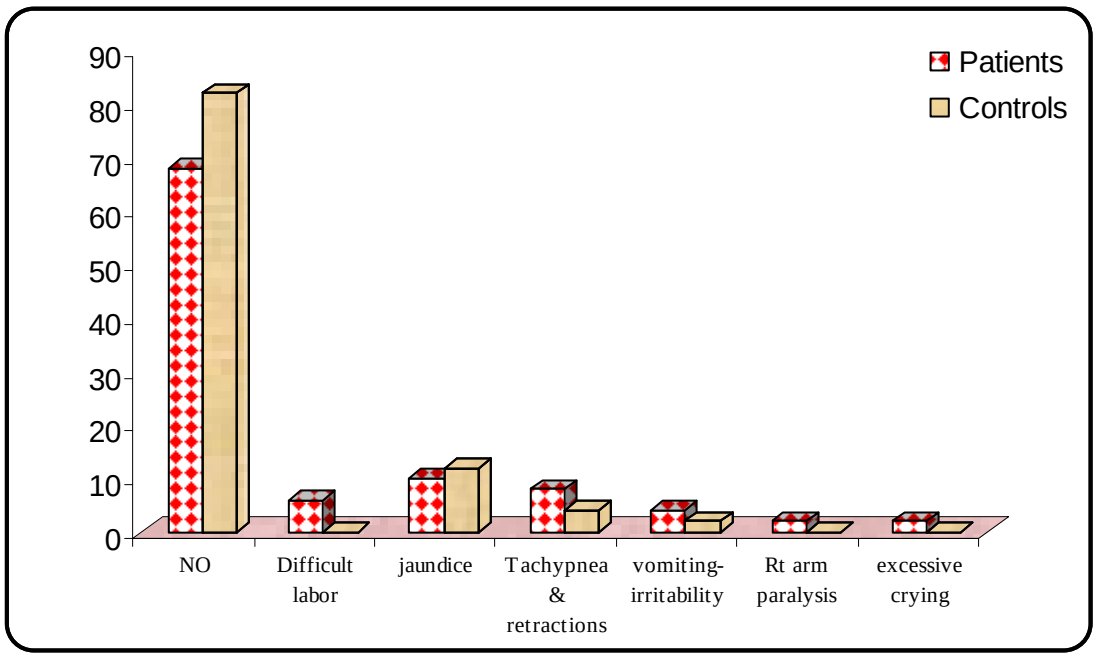


Fig.(23): Neonatal outcomes in macrosomic & control group.

- **Color of the neonates:**

In the macrosomic group 5out of 50 neonates (10%) were jaundiced, 4 (8%) neonates were pink on O2 (respiratory distress) and 41 (82%) neonates were pink (normal), while in control group 6 neonates (12%) were jaundiced, 2 (4%) neonates were pink on O2 (respiratory distress) and 42 (84%) neonates were pink (normal), P-value =0.582, (Table 17& Figure 24).

Color		Groups		
		Patients	Control	Total
Jaundiced	N	5	6	11
	%	10.00	12.00	11.00
Pink	N	41	42	83
	%	82.00	84.00	83.00
Pink on O2(RD)	N	4	2	6
	%	8.00	4.00	6.00
Total	N	50	50	100
	%	100.00	100.00	100.00
Chi-Square	X^2	1.082		
	P-value	0.582		

Table (17): Neonatal colors after 2 days in macrosomic & control groups.

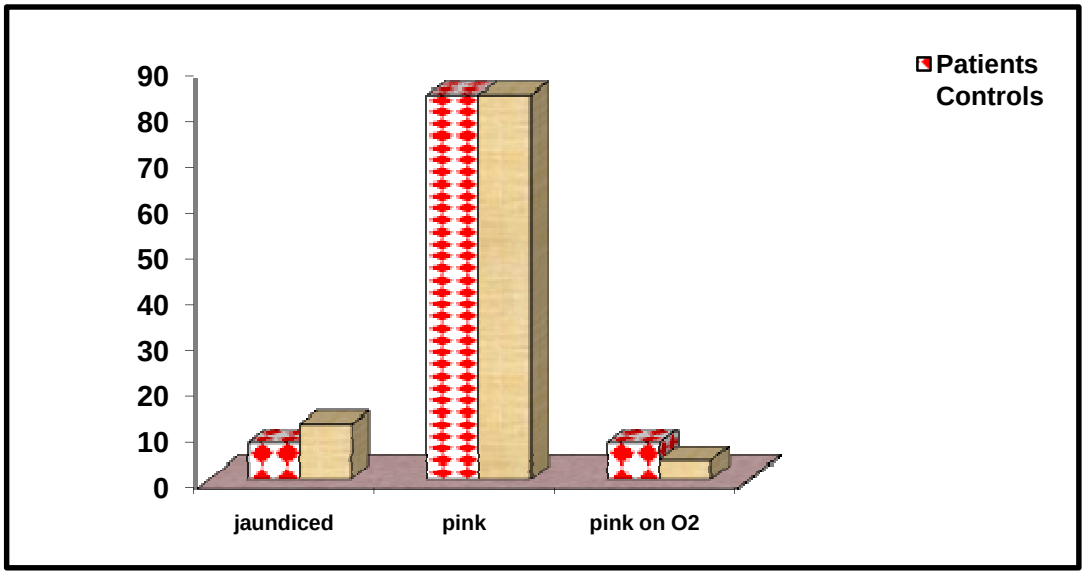


Fig. (24): Percentage of Neonatal colors after 2 days in macrosomic & control group.

- **Respiratory distress:**

In the macrosomic group 4 out of 50 neonates (8%) had respiratory distress one of them born to mothers with gestational diabetes mellitus and delivered by cesarean section after a trial of normal vaginal delivery, the other 3 neonates born to normal mothers by normal vaginal delivery, while in control group 2 out of 50 neonates (4%) had respiratory distress both born to normal mothers by normal vaginal delivery, P-value =0.395 (Table 18 & Figure 25&26).

Chest (RD)		Groups		
		Patients	Control	Total
Normal	N	46	48	94
	%	92.00	96.00	94.00
Tachypnea & retractions	N	4	2	6
	%	8.00	4.00	6.00
Total	N	50	50	100
	%	100.00	100.00	100.00
Chi-Square	X^2	0.722		
	P-value	0.395		

Table (18): Respiratory distress in macrosomic & control group.

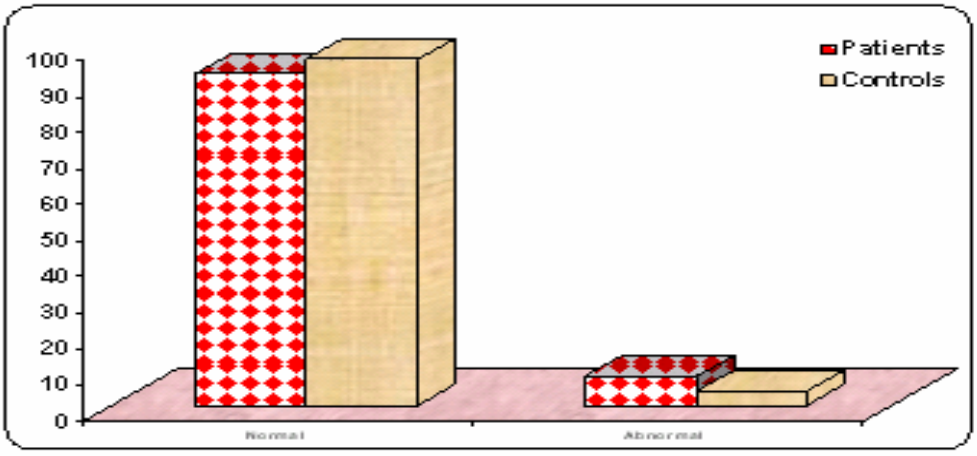


Fig. (25): Percentage of respiratory distress in macrosomic & control group.

Fig. (26): Respiratory distress in a macrosomic baby (Infant of diabetic mother)**.**

- **Neonatal birth injury**:

In the macrosomic group 4 out of 50 neonates (8%) had birth injury, 2 of them born to mothers with gestational diabetes mellitus, one had Erb's palsy, and the other 3 had shoulder dystocia , while in control group no birth injury was detected, P-value 0.017(Table 19 & Figure 25).

Birth injury		Groups		
		Patients	Control	Total
No	N	46	50	96
	%	92.00	100.00	96.00
Yes	N	4	0	4
	%	8.00	0.00	4.00
Total	N	50	50	100
	%	100.00	100.00	100.00
Chi-Square	X^2	5.712		
	P-value	0.017*		

Table (19): The birth injury in macrosomic & control group.

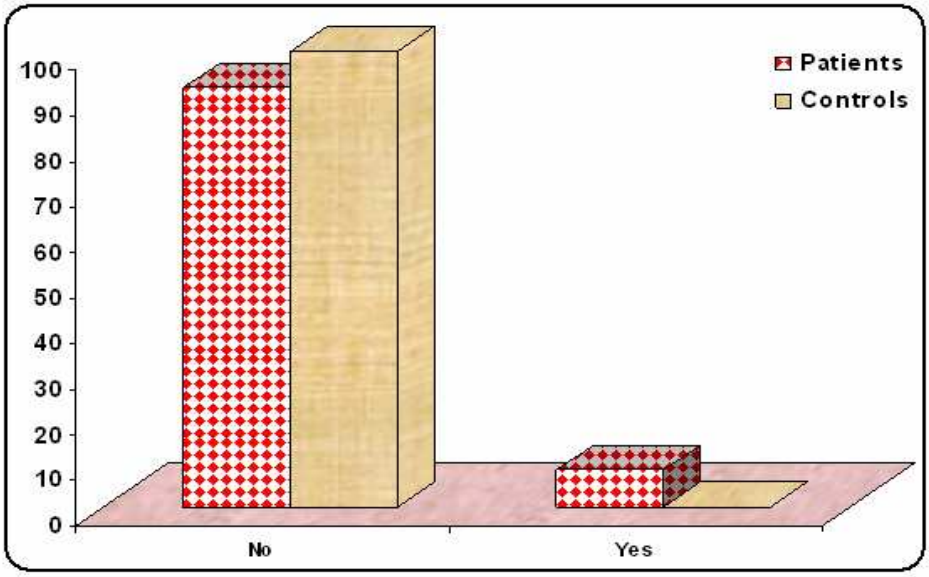


Fig. (27): The percentage of birth injury in macrosomic & control group.

Method of delivery and birth injury:

All the neonates who had birth injury were macrosomic and delivered by normal vaginal delivery (Table 20 & Figure 28).

Method of delivery		Birth injury		
		No	Yes	Total
N.V.D	N	42	4	46
	%	84.00	8.00	92.00
N.V.D. trial then C.S	N	4	0	4
	%	8.00	0.00	8.00
Total	N	46	4	50
	%	92.00	8.00	100.00
Chi-Square	X^2	0.697		
	P-value	0.404		

Table (20): Method of delivery & birth injury in macrosomic group.

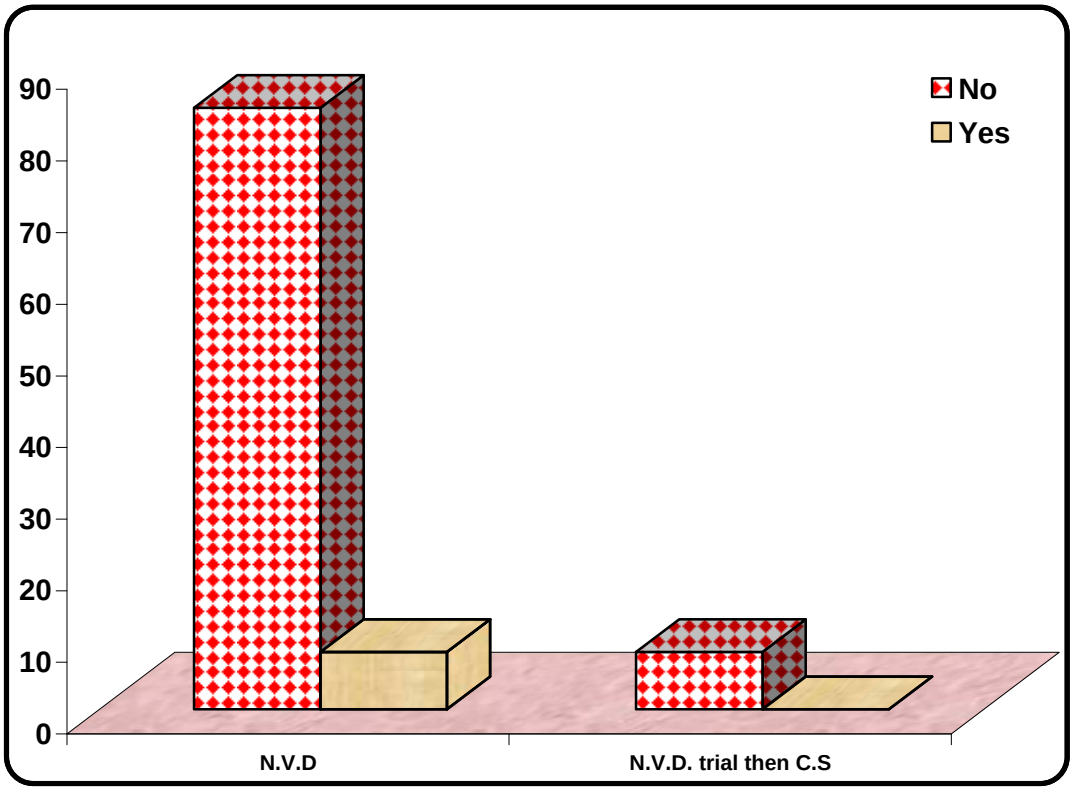


Fig. (28): Percentage of method of delivery & birth injury in macrosomic group.

Moro reflex and birth injury:

One of the 4 neonates who had birth injuries had Erb's palsy (Asymmetric Moro reflex), and the other 3 had shoulder dystocia (Positive Moro reflex), P-value = 0.021(Table 21 & Figure 29, 30).

Moro reflex		Birth injury		
		No	Yes	Total
Asymmetric	N	0	1	1
	%	0.00	2.00	2.00
Positive	N	46	3	49
	%	92.00	6.00	98.00
Total	N	46	4	50
	%	92.00	8.00	100.00
Chi-Square	X^2	5.305		
	P-value	0.021*		

Table (21): Moro reflex & birth injury in macrosomic group.

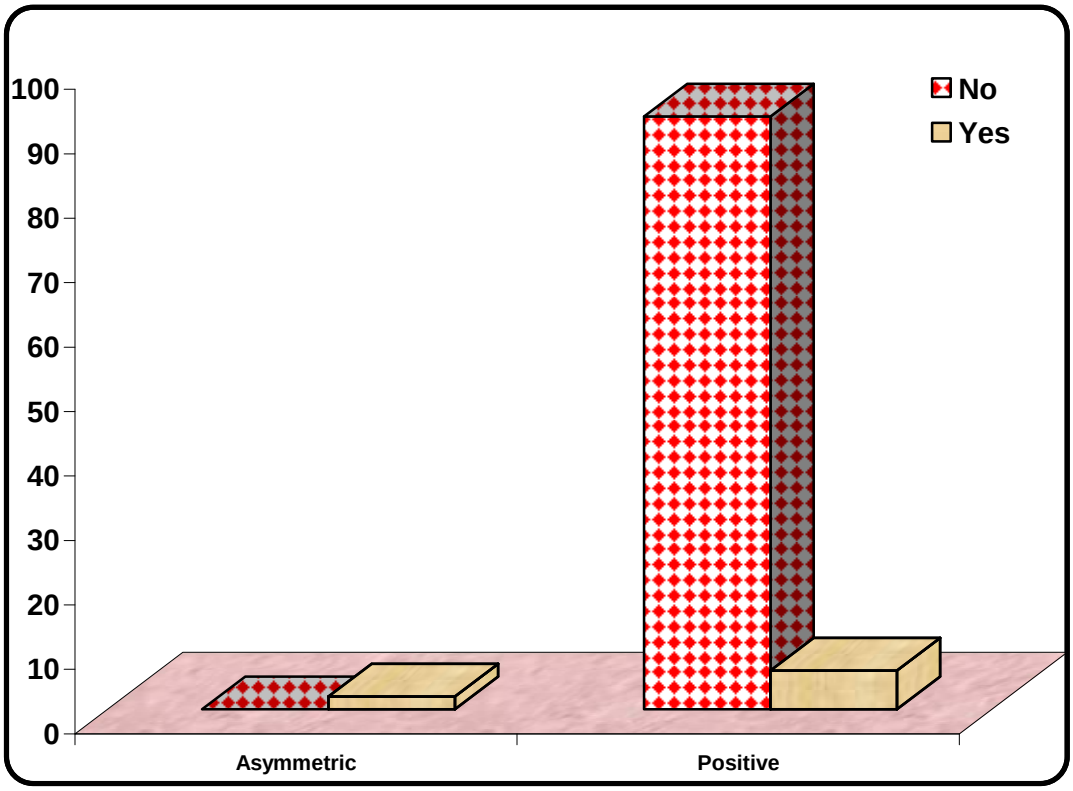


Fig. (29): Percentage of Moro reflex & birth injury in macrosomic group.

Fig. (30): Erb's palsy in a macrosomic baby with skin erythema complicating phototherapy.

Neonatal Jaundice:

In the macrosomic group; 5 out of 50 neonates (10%) had jaundice while in control group; 6 out of 50 neonates (12%) had jaundice, P-value =1.0 (Table 22 & Figure 31, 33).

Jaundice		Groups		
		Patients	Control	Total
No	N	45	44	89
	%	90.00	88.00	89.00
Yes	N	5	6	11
	%	10.00	12.00	11.00
Total	N	50	50	100
	%	100.00	100.00	100.00
Chi-Square	X^2	0.00		
	P-value	1.000		

Table (22): Neonatal jaundice in macrosomic & control group.

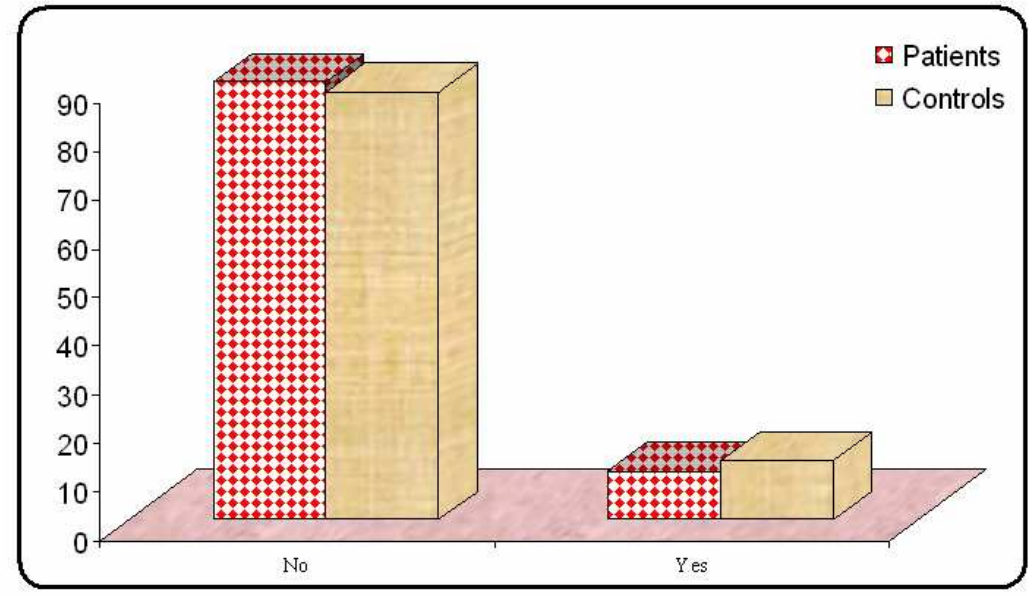


Fig.(31): Percentage of neonatal jaundice in macrosomic & control group.

The range of total serum bilirubin ranged from 7.7 to 16.4 in macrosomic group with mean 12.3 while in control group it ranged from 13.4 to 20.4 with mean 16.583, P-value = 0.031(Table 23 & Figure 32).

Groups	TSB mg/dl		T-Test	
	Range	Mean ± SD	t	P-value
Patients	7.700 - 16.400	12.300 ± 3.533	-2.478	0.031*
Control	13.400 - 20.400	16.583 ± 2.502		

Table (23): The range of total serum bilirubin in macrosomic & control group.

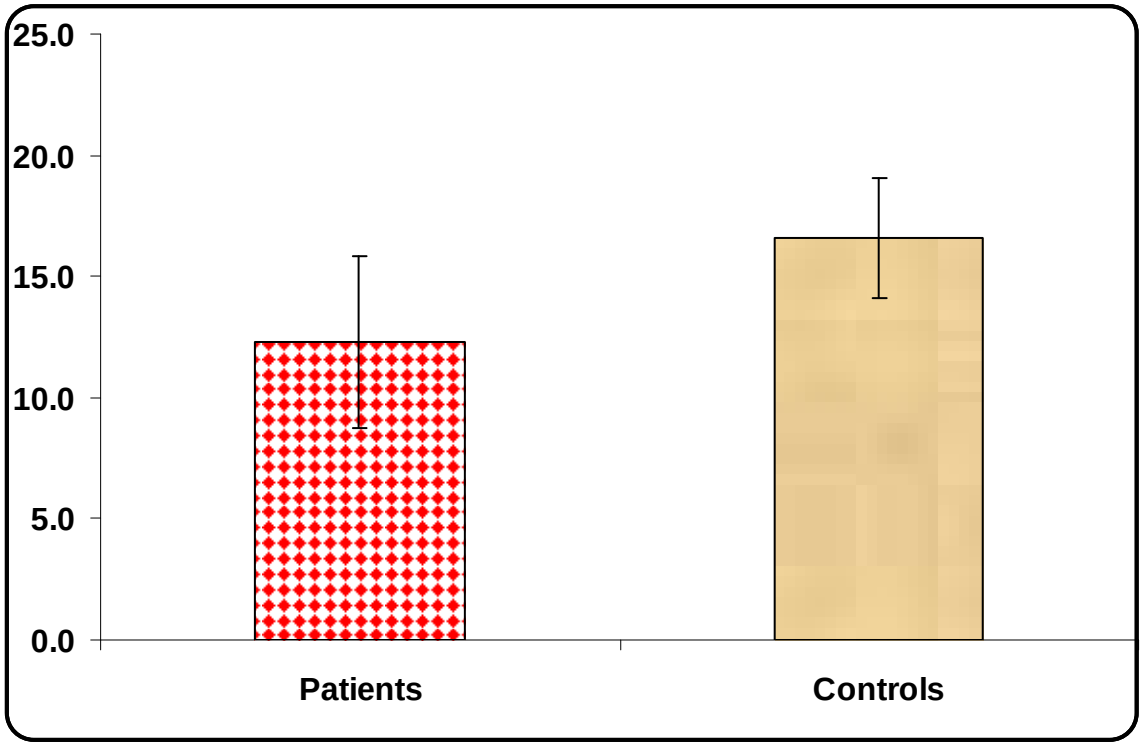


Fig. (32): Mean of range of total serum bilirubin in macrosomic & control group.

Fig. (33): Neonatal jaundice in a macrosomic baby.

- **Neonatal Hypoglycemia**:

In the macrosomic group 3out of 50 neonates (6%) had hypoglycemia while in control group one out of 50 neonate (2%) had hypoglycemia. Hypoglycemia in the macrosomic group was 3 folds but this difference was statistically non significant, P-value = 0.6098(Table 24 & Figure 34).

Hypoglycemia		Groups		
		Patients	Controls	Total
No	N	47	49	96
	%	94.00	98.00	96.00
Yes	N	3	1	4
	%	6.00	2.00	4.00
Total	N	50	50	100
	%	100.00	100.00	100.00
Chi-Square	X^2	0.260		
	P-value	0.6098		

Table (24): Hypoglycemia in macrosomic & control group.

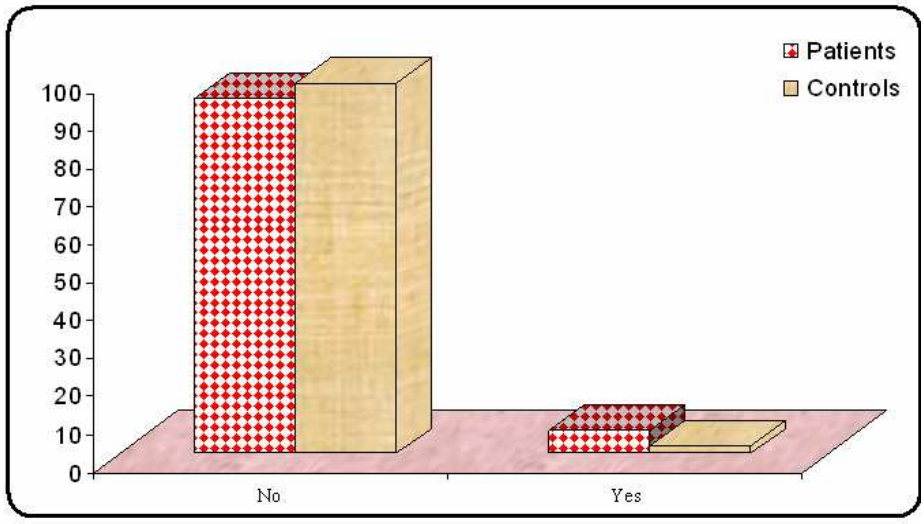


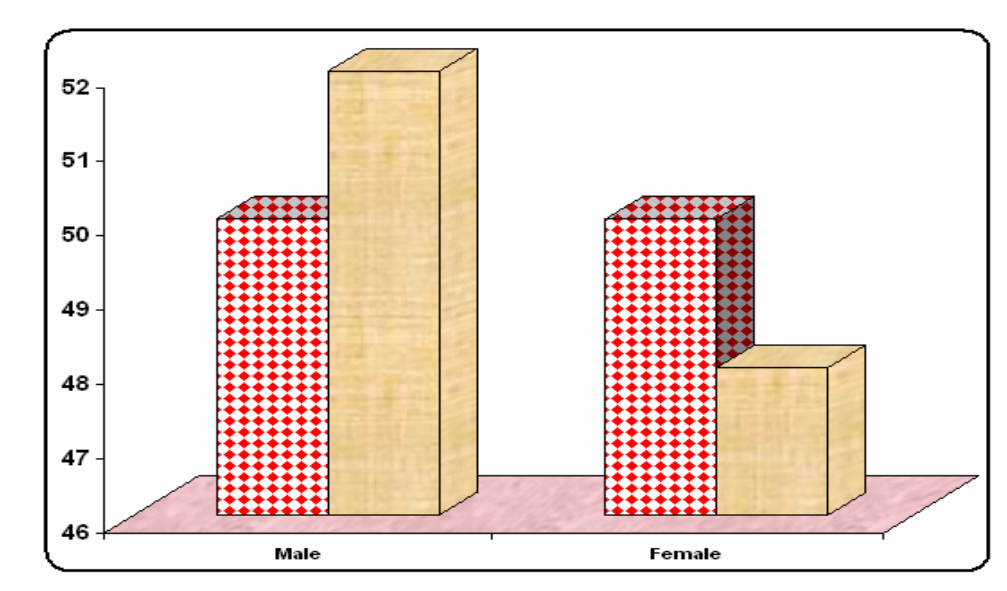
Fig. (34): Percentage of hypoglycemia in macrosomic & control group.

- **Neonatal sex:**

In the macrosomic group 25 newborn (50%) was male and 25 (50%) was female, while in control group 26 was male (52%) and 24 (48%) was female, P-value =0.841(Table 25 & Figure 35).

Sex		Groups		
		Patients	Control	Total
Male	N	25	26	51
	%	50.00	52.00	51.00
Female	N	25	24	49
	%	50.00	48.00	49.00
Total	N	50	50	100
	%	100.00	100.00	100.00
Chi-Square	X^2	0.040		
	P-value	0.841		

Table (25): Neonatal sex in macrosomic & control group.



Fg. (35): Percentage of neonatal sex in macrosomic & control group.