RESULTS

RESULTS

This work was done in Mostafa Kamel and Benha University Hospitals, exchange transfusion was done for different clinical purpose. Table (I) illustrated that our total cases were 30 cases, 14 of them suffered from severe hyperbilirubinemia and 18 of them suffered from severe septicaemia i.e. there were two cases that suffered from both severe septicaemia and severe hyperbilirubinemia.

According to gestational age in our cases 15 newborn infants were fullterm and other 15 newborn infants were preterm. According to the freshness of the blood used in the exchange in our cases 21 infants received 29 exchanges of fresh blood and 9 infants received 10 exchanges of old blood (>4 days).

In our cases 22 infants received a single exchange transfusion each while 8 infants received 17 exchanges all together. The cases that died before 72 hours of the exchange were 4 in number. The four fatalities were septicaemic, preterm and received old blood. Two of these cases received one exchange transfusion and the other 2 cases received multiple exchange transfusions. The mean values of serum calcium concentration before and after one hour of exchange transfusion shown in table (II) in which all the groups

were hypocalcaemic before E.T., then become normocalcemic after E.T. There were highly significant increase in serum calcium concentrations in all groups with E.T.

The mean values of serum calcium concentration before and after 72 hours of exchange transfusion are shown in table (III), where there was a decrease of serum calcium concentration after 72 hours of E.T. compared to immediately after E.T. in the previous table. However the values were still significantly higher than before E.T.

Figures (1-5) show that mean serum calcium level in all studied cases were initially low then increased with the infusion of 1 ml 10% calcium gluconate during E.T. then they decreased gradually during 72 hours after the E.T.

The mean values of serum potassium level before and after one hour of exchange transfusion were shown in table (IV). There was a significant increase in serum potassium in preterm infants, and also a markedly significant increase in patients receiving old blood (>4 days old). A significant decrease in serum potassium was observed in infants receiving fresh blood for exchange transfusion. The difference in serum potassium between children receiving fresh or old blood for E.T. are clearly demonstrated in figure (6).

From figures (7-9) we detect that serum potassium tends to gradually increase during exchange transfusion until the last 100 cc. where a decrease occurs. At 1 & 2 hours after E.T. serum potassium seems to recover from this sudden decrease. This observation occurs in the mean value of all studied cases (Figure 7), fullterm and preterm (Figure 8), and in cases with either HDN or septicaemia (Figure 9).

The mean values of sodium levels before and after one hour of exchange transfusion were shown in table (VI) in which there is a significant increase in serum sodium level in all groups after the exchange transfusion. The preterm infants group was originally severely hyponatremic. The septicaemic infants group had a low level of serum sodium at the onset which normalized after E.T.

Table (VII) shows that serum sodium renormalized in all cases within 72 hours of E.T.

Preterm infants had low normal level of serum sodium after 72 hours of E.T. Infants who received fresh blood had high normal level of serum sodium during and after 72 hours of E.T. this is also shown in figure 10.

Figure (11) illustrates that the mean serum sodium level gradually increased during E.T. with a tendency to hypernatremia and start to decrease after 2 hours of E.T.

Figure (12) illustrates that serum sodium level in septicaemic infants group was lower than HDN group (before, during and after E.T.).

Figure (13) illustrates that serum sodium level in preterm and fullterm infants group increased gradually during E.T. , then normalized within 72 hours after E.T. However, it is evident that the initial increase in serum sodium was more abrupt in preterm infants as they were severely hyponatremic at the start of the procedure of E.T.

The mean values of serum glucose concentration before and after one hour of exchange transfusion are shown in table (VIII) there was hypoglycemia in septicaemic infants compared to other groups. There was significant increase in serum glucose concentration in 3 groups (septicaemic infants, infants who received old blood and infants with more than one E.T.).

Table (IX) shows that after 72 hours of E.T. blood glucose attained normal concentrations.

Figure (14) shows that was hyperglycemia during exchange transfusion and then reduced after 1 hour of E.T. and then normalized after 72 hours.

Figure (15) shows that in septicaemic infants blood glucose concentration is low initially then increase throughout E.T.

Figure (16) shows that there is no statistical difference between old blood and fresh blood used in exchange transfusion on blood glucose concentration before, during and after E.T.

Figures (16, 17) show that there was hyperglycemia during exchange transfusion, then the blood glucose concentration decreased after one hour of E.T. There was temporary hypoglycemia after 2 hours of E.T. and then normalized after 72 hours of E.T.

Figure (17) shows that blood glucose concentrations in preterm infants were lower than in fullterm infants.

Table (X-A) shows that level of IgG in different studied groups were within the normal range. It is apparent that the preterm infants had lower levels of serum IgG than fullterm infants. There was no significant difference in serum IgG level in all groups after exchange transfusion.

Table (X-B) shows that the mean IgG level in RH incompatibility group was 1304.25 ± 267.09 mg/100 ml (over the mean normal value 1200 mg/100 ml) and there

is highly statistical difference in IgG levels after exchange transfusion and the mean IgG level in ABO incompatibility group was 988.37 $\pm$ 104.39 and these is no statistically difference in IgG levels after exchange transfusion.

Table XI and Figures 22-25 illustrate that there was a significant increase in Ig_M levels at 72 hours after exchange transfusion as compared to before E.T. in all studied groups except infants who had received old blood.

Table (I) : Distribution of cases underwent exchange transfusion according to gestational age, clinical diagnosis, number of exchanges, elderly of the blood used for exchange

	Case No.	%	Exchange No.	%	Died cases	%
Fullterm infants	15	50	17	43.59	-	0.00
Preterm infants	15	50	22	56.4	4	26.67
HDN cases	14	43.75	16	39.02	-	0.00
Cases with septicemia	18	56.25	25	60.98	4	22.22
Infants received fresh blood	21	70	29	74.36	-	0.00
Infants received old blood	9	30	10	25.64	4	44.44
Infants with one E.T.	22	66.7	22	56.41	2	9.10
Infants with more than one E.T.	8	33.3	17	43.59	2	25.0

HDN : Haemolytic disease of neonates

E.T. : Exchange transfusion

Table (II) : Serum calcium (mg/dl) before and after one hour of exchange transfusion

	Case No.	Before exchange		After exchange		Paired t test	P value
		Mean	S.D.	Mean	S.D.		
Fullterm infants	17	8.40	0.46	10.2	0.27	13.80	<0.05
Preterm infants	22	7.50	0.66	9.90	0.32	16.00	<0.05
HDN cases	16	8.00	0.76	10.1	0.33	10.00	<0.05
Cases with septicemia	25	7.80	0.70	10.0	0.32	14.70	<0.05
Infants received fresh blood	29	8.00	0.72	10.1	0.34	10.50	<0.05
Infants received old blood	10	7.70	0.65	9.9	0.23	10.00	<0.05
Infants with one E.T.	22	7.90	0.75	10.1	0.35	12.20	<0.05
Infants with more than one E.T.	17	7.70	0.73	10.0	0.28	11.10	<0.05

HDN : Hemolytic diseases of neonates

E.T. : Exchange transfusion

Table (III) : Serum calcium (mg/dl) before and after 72 hours of exchange transfusion

	Case No.	Before exchange		After exchange		Paired t test	P value
		Mean	S.D.	Mean	S.D.		
Fullterm infants	15	8.40	0.46	8.70	0.48	2.444	<0.05
Preterm infants	11	7.50	0.66	8.70	0.66	3.263	<0.05
HDN cases	14	8.00	0.76	8.80	0.50	3.452	<0.05
Cases with septicemia	14	7.80	0.70	8.60	0.65	2.247	<0.05
Infants received fresh blood	21	8.00	0.72	8.60	0.49	2.902	<0.05
Infants received old blood	5	7.70	0.65	9.30	0.33	4.312	<0.05
Infants with one E.T.	20	7.90	0.75	8.80	0.52	4.319	<0.05
Infants with more than one E.T.	6	7.70	0.73	8.30	0.59	0.121	>0.05

HDN : Hemolytic diseases of neonates

E.T. : Exchange transfusion

Table (IV) : Serum potassium (mmol/L) before and after one hour of exchange transfusion

	Case No.	Before exchange		After exchange		Paired t test	P value
		Mean	S.D.	Mean	S.D.		
Fullterm infants	17	4.40	0.61	4.30	1.10	0.33	>0.05
Preterm infants	22	4.19	0.70	4.95	1.20	2.70	<0.05
HDN cases	16	4.46	0.72	4.83	1.20	1.20	>0.05
Cases with septicemia	25	4.18	0.61	4.68	1.10	1.60	>0.05
Infants received fresh blood	29	4.35	0.69	4.07	0.66	1.40	<0.05
Infants received old blood	10	4.24	0.55	6.40	0.58	8.60	<0.05
Infants with one E.T.	22	4.30	0.62	4.95	1.30	2.20	<0.05
Infants with more than one E.T.	17	4.22	0.74	4.33	1.05	0.37	>0.05

HDN : Hemolytic diseases of neonates

E.T. : Exchange transfusion

Table (V) : Serum potassium (mmol/L) before and after 72 hours of exchange transfusion

	Case No.	Before exchange		After exchange		Paired t test	P value
		Mean	S.D.	Mean	S.D.		
Fullterm infants	15	4.40	0.61	4.47	0.84	0.062	>0.05
Preterm infants	11	4.19	0.70	4.73	0.66	1.880	>0.05
HDN cases	14	4.46	0.72	4.67	0.58	0.976	>0.05
Cases with septicemia	14	4.18	0.61	4.59	0.94	1.015	>0.05
Infants received fresh blood	21	4.35	0.69	4.33	0.61	0.660	>0.05
Infants received old blood	5	4.24	0.55	5.62	0.33	13.290	<0.05
Infants with one E.T.	20	4.30	0.62	4.67	0.77	1.407	>0.05
Infants with more than one E.T.	6	4.22	0.74	4.30	0.72	0.441	>0.05

HDN : Hemolytic diseases of neonates

E.T. : Exchange transfusion

Table(VI) : Serum sodium (mmol/L) before and after one hour of exchange transfusion

	Case No.	Before exchange		After exchange		Paired t test	P value
		Mean	S.D.	Mean	S.D.		
Fullterm infants	17	138.06	10.43	146.24	4.64	2.9	<0.05
Preterm infants	22	127.45	9.85	146.90	5.02	8.1	<0.05
HDN cases	16	141.19	7.09	147.38	4.29	3.1	<0.05
Cases with septicemia	25	133.48	10.34	146.32	5.15	5.58	<0.05
Infants received fresh blood	29	133.50	10.34	147.27	4.39	5.22	<0.05
Infants received old blood	10	137.40	9.76	146.70	5.81	3.9	<0.05
Infants with one E.T.	22	134.05	11.16	146.14	4.61	4.65	<0.05
Infants with more than one E.T.	17	140.47	7.00	147.24	5.13	3.22	<0.05

HDN : Hemolytic diseases of neonates

E.T. : Exchange transfusion

Table (VII) : Serum sodium (mmol/L) before and after 72 hours of exchange transfusion

	Case No.	Before exchange		After exchange		Paired t test	P value
		Mean	S.D.	Mean	S.D.		
Fullterm infants	15	138.06	10.43	140.07	4.96	1.915	>0.05
Preterm infants	11	127.45	9.85	135.55	7.20	2.20	<0.05
HDN cases	14	141.19	7.09	143.79	5.25	1.336	>0.05
Cases with septicemia	14	133.48	10.34	137.64	5.76	2.208	<0.05
Infants received fresh blood	21	133.50	9.76	144.60	7.06	2.455	<0.05
Infants received old blood	5	137.40	10.34	139.76	5.47	1.324	>0.05
Infants with one E.T.	20	134.05	11.16	140.95	6.24	2.887	<0.05
Infants with more than one E.T.	6	140.47	7.00	139.83	5.42	0.841	>0.05

HDN : Hemolytic diseases of neonates

E.T. : Exchange transfusion

Table (VIII) : Serum glucose (mg/dl) before and after one hour of exchange transfusion

	Case No.	Before exchange		After exchange		Paired t test	P value
		Mean	S.D.	Mean	S.D.		
Fullterm infants	17	45.76	27.74	50.41	22.62	0.59	>0.05
Preterm infants	22	31.23	27.04	39.73	13.93	0.84	>0.05
HDN cases	16	57.31	23.68	63.31	18.95	0.79	>0.05
Cases with septicemia	25	28.32	14.23	50.88	14.33	4.70	<0.05
Infants received fresh blood	29	44.45	27.22	59.90	17.30	1.02	>0.05
Infants received old blood	10	38.10	29.10	55.55	19.36	3.46	<0.05
Infants with one E.T.	22	47.00	28.69	52.14	20.74	0.69	>0.05
Infants with more than one E.T.	17	39.59	24.97	62.82	14.49	3.32	<0.05

HDN : Hemolytic diseases of neonates

E.T. : Exchange transfusion

Table (IX) : Serum glucose (mg/dl) before and after 72 hours of exchange transfusion

	Case No.	Before exchange		After exchange		Paired t test	P value
		Mean	S.D.	Mean	S.D.		
Fullterm infants	15	45.76	27.74	57.27	16.06	3.69	<0.05
Preterm infants	11	37.23	27.04	52.64	18.67	2.67	<0.05
HDN cases	14	57.31	23.68	60.71	18.77	1.41	>0.05
Cases with septicemia	14	28.32	14.23	61.71	14.68	6.41	<0.05
Infants received fresh blood	21	44.45	27.22	57.45	16.32	3.38	<0.05
Infants received old blood	5	38.10	29.10	58.00	19.17	4.98	<0.05
Infants with one E.T.	20	47.00	28.69	59.00	18.41	4.02	<0.05
Infants with more than one E.T.	6	39.59	24.97	61.33	12.75	2.01	<0.05

HDN : Hemolytic diseases of neonates

E.T. : Exchange transfusion

Table (X-A) : IgG before and after 72 hours of exchange blood transfusion (mg/100 ml)

	Case No.	Before exchange		After exchange		Paired t test	P value
		Mean	S.D.	Mean	S.D.		
Fullterm infants	15	1176.19	262.09	1099.56	258.53	0.806	>0.05
Preterm infants	15	717.47	232.64	863.20	161.13	2.08	>0.05
HDN cases	14	1193.36	361.94	1021.0	185.72	0.54	>0.05
Cases with septicemia	18	704.33	331.78	821.06	273.17	0.71	>0.05
Infants received fresh blood	29	990.20	385.20	1024.65	251.45	0.33	>0.05
Infants received old blood	10	860.90	287.07	924.0	226.23	0.55	>0.05
Infants with one E.T.	22	981.59	342.88	1067.59	233.69	0.97	>0.05
Infants with more than one E.T.	8	898.13	355.19	798.13	132.26	0.75	>0.05

HDN : Hemolytic diseases of neonates

E.T. : Exchange transfusion

Table (X-B) : IgG before and after exchange blood transfusion (mg/100 ml)

	Case No.	Before exchange		After exchange		Paired t test	P value
		Mean	S.D.	Mean	S.D.		
Rh-incompitability	4	1304.25	267.09	1112.71	167.15	0.910	<0.05
ABO incompitability	8	988.37	109.39	974.73	132.13	1.200	>0.05

Table (XI) : IgM (mg/100 ml) before and 72 hours after exchange blood transfusion

	Case No.	Before exchange		After exchange		Paired t test	P value
		Mean	S.D.	Mean	S.D.		
Fullterm infants	15	85.69	59.47	147.25	74.49	2.5	<0.05
Preterm infants	15	44.2	49.83	129.53	83.85	3.4	<0.05
HDN cases	14	37.57	34.04	102.36	51.41	6.8	<0.05
Cases with septicemia	18	81.2	63.28	151.10	80.37	2.9	<0.05
Infants received fresh blood	29	66.55	51.02	146.0	71.79	4.9	<0.05
Infants received old blood	10	68.40	72.80	119.0	70.91	1.58	>0.05
Infants with one E.T.	22	69.55	61.38	123.09	67.37	2.8	<0.05
Infants with more than one E.T.	8	47.0	46.31	161.13	86.79	3.28	<0.05

HDN : Hemolytic diseases of neonates

E.T. : Exchange transfusion

Fig. (1) : Changes in serum calcium level according to gestational age of the studied cases

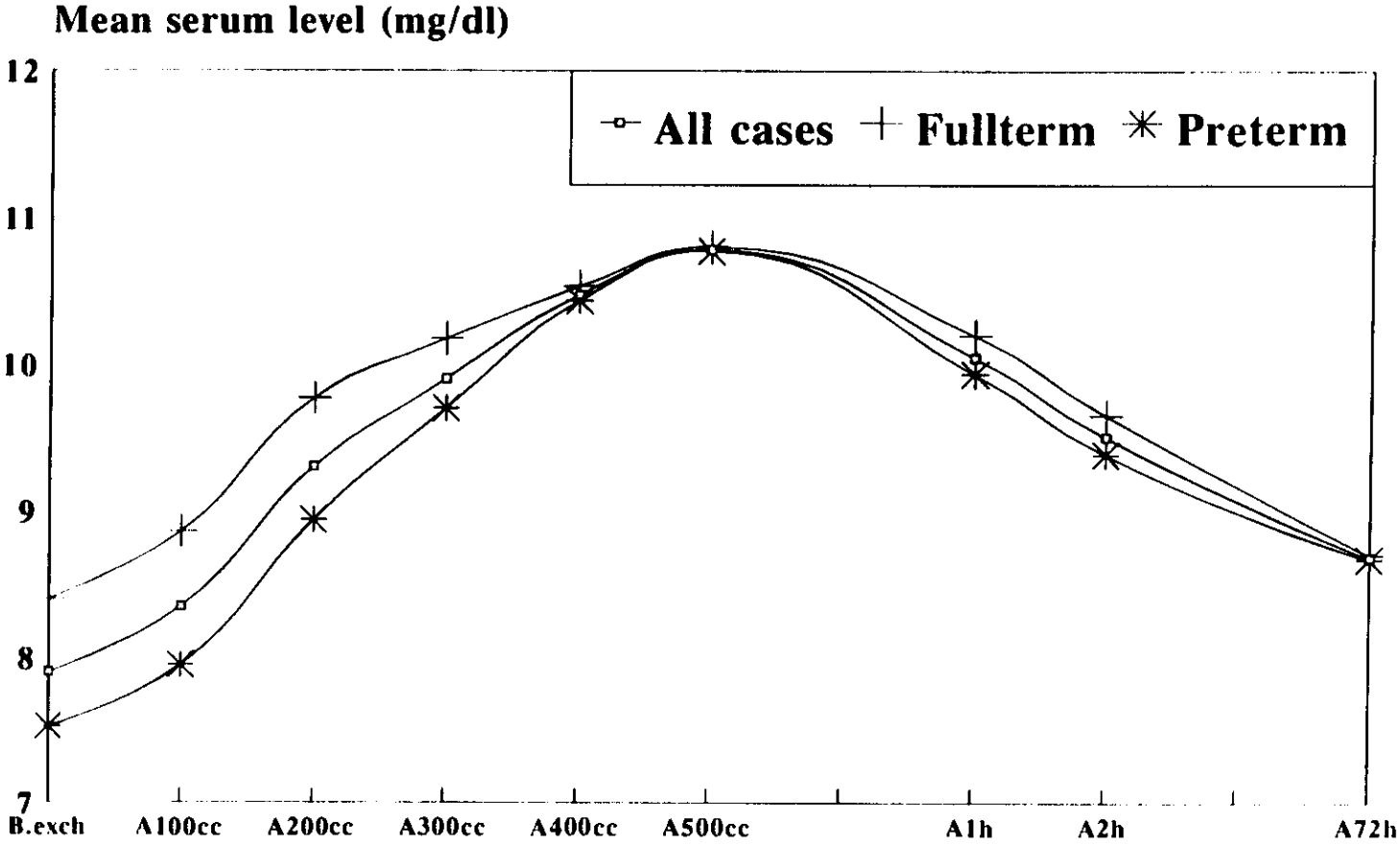

Fig. (2) : Changes in serum calcium level in cases with HDN and septicaemia

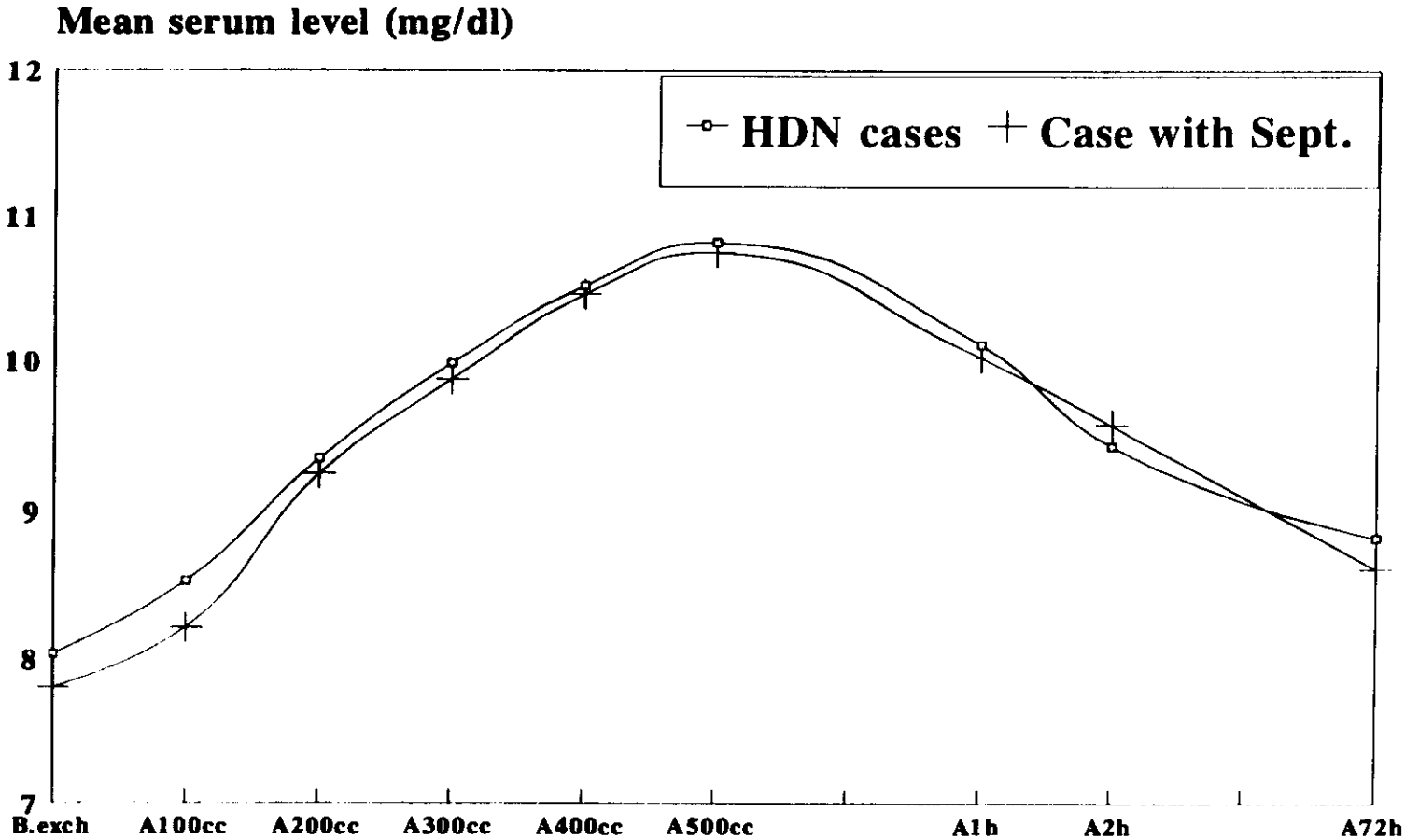

Fig. (3) : Changes in serum calcium level according to the age (freshness) of the blood used in exchange transfusion

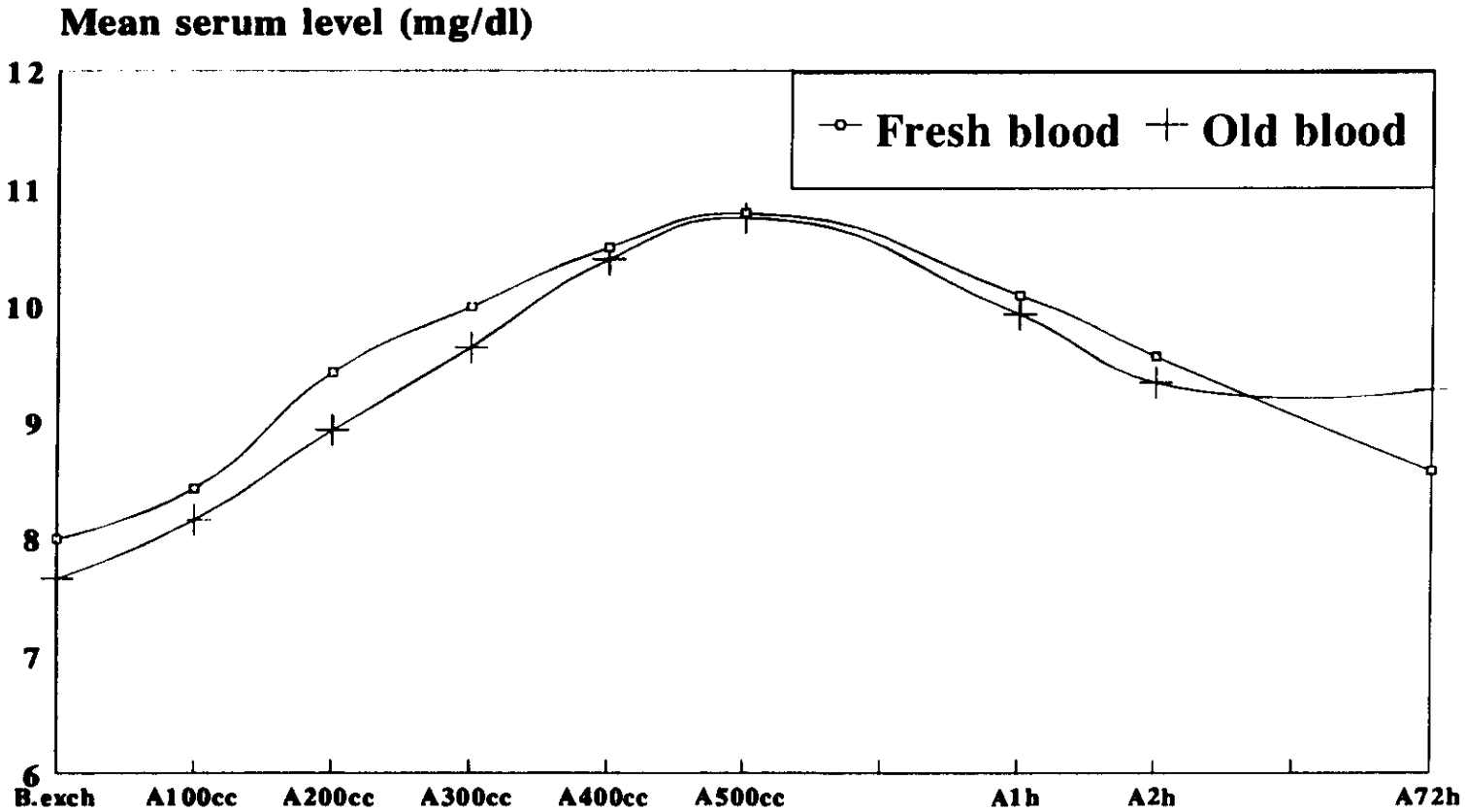

Fig. (4) : Changes in serum calcium level according to the number of exchanges performed for each case

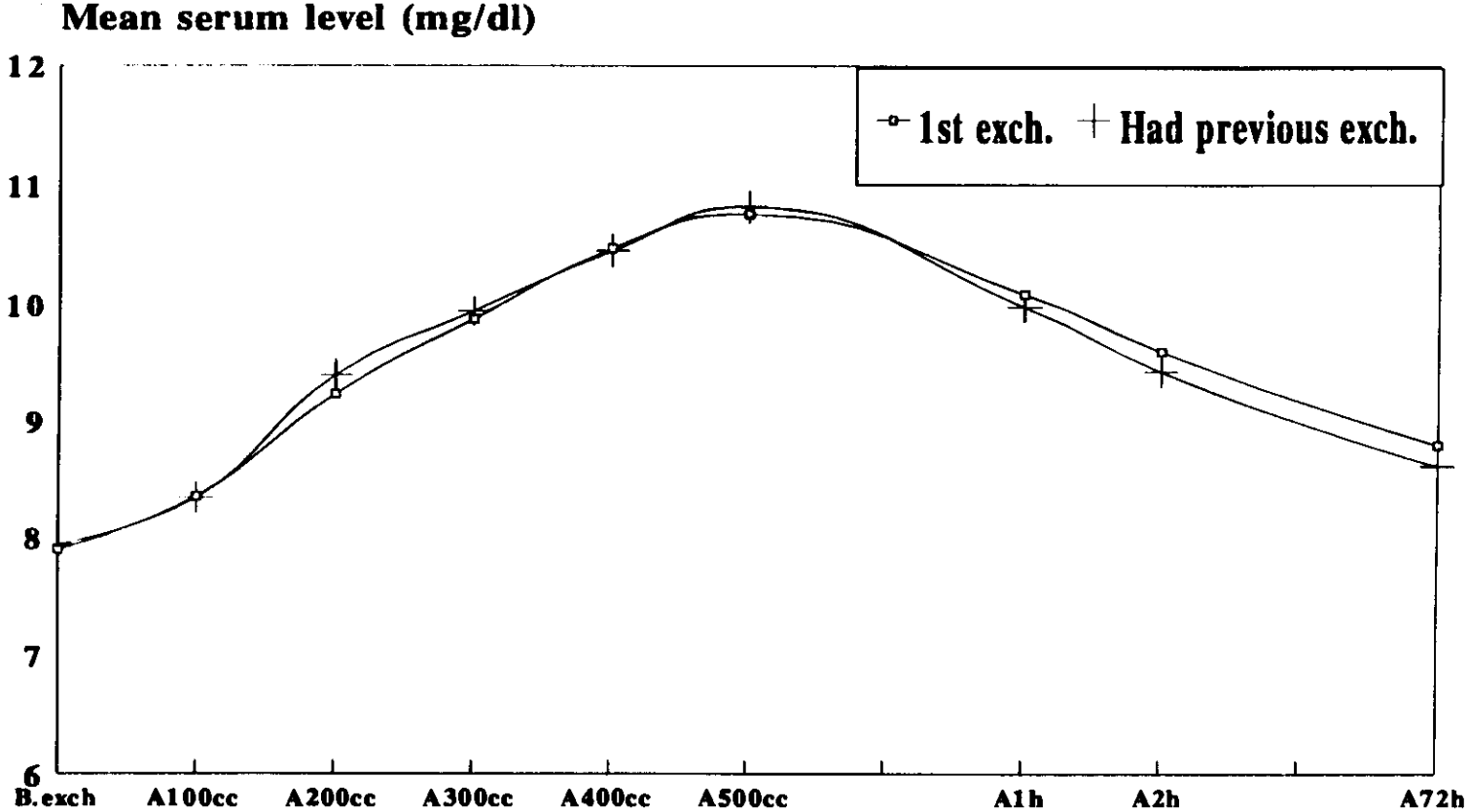

Fig. (5) : Bar-chart showing changes in serum calcium level in all the studied cases

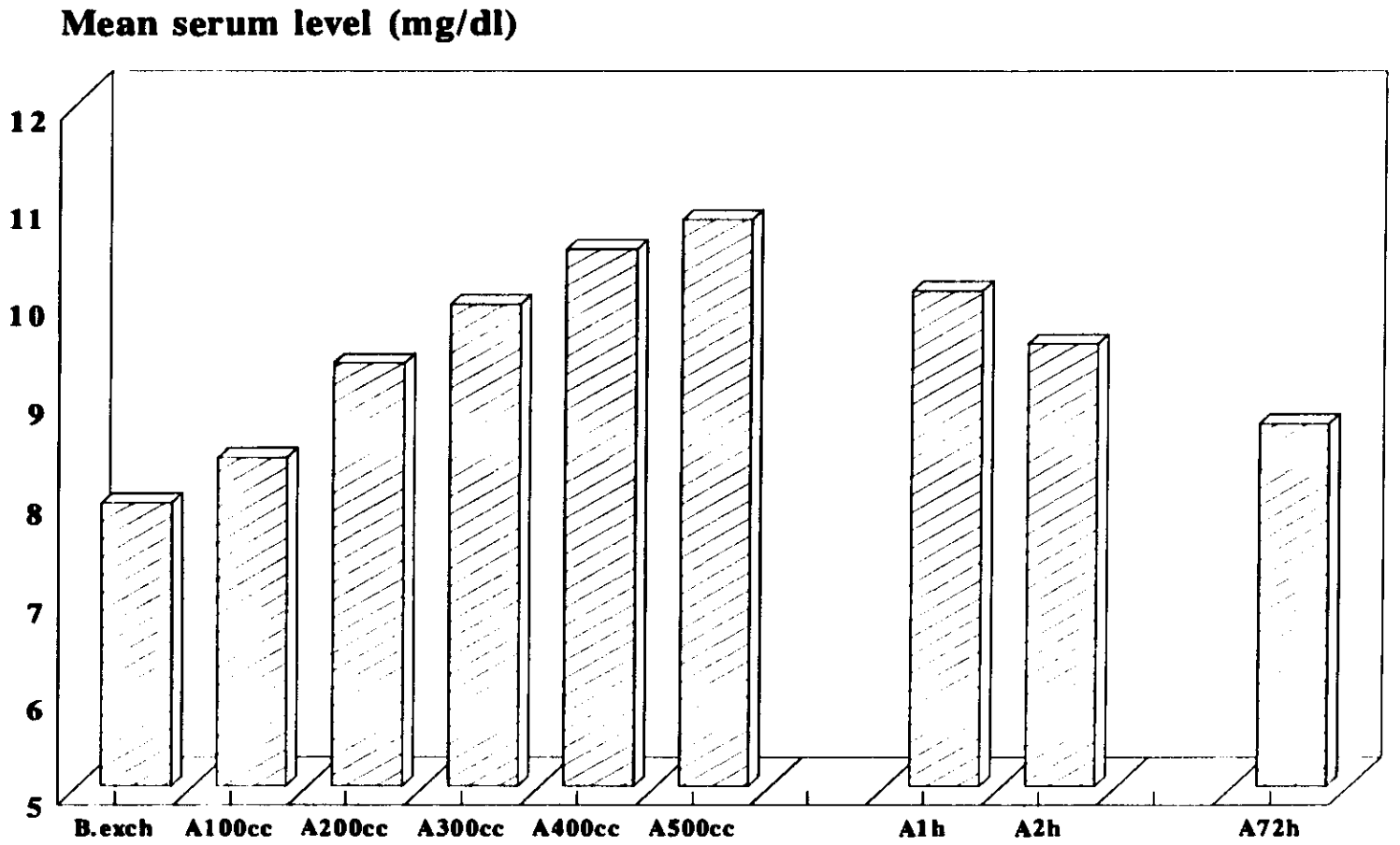

Fig. (6) : Changes in serum potassium level according to the age (freshness) of the blood used in exchange transfusion

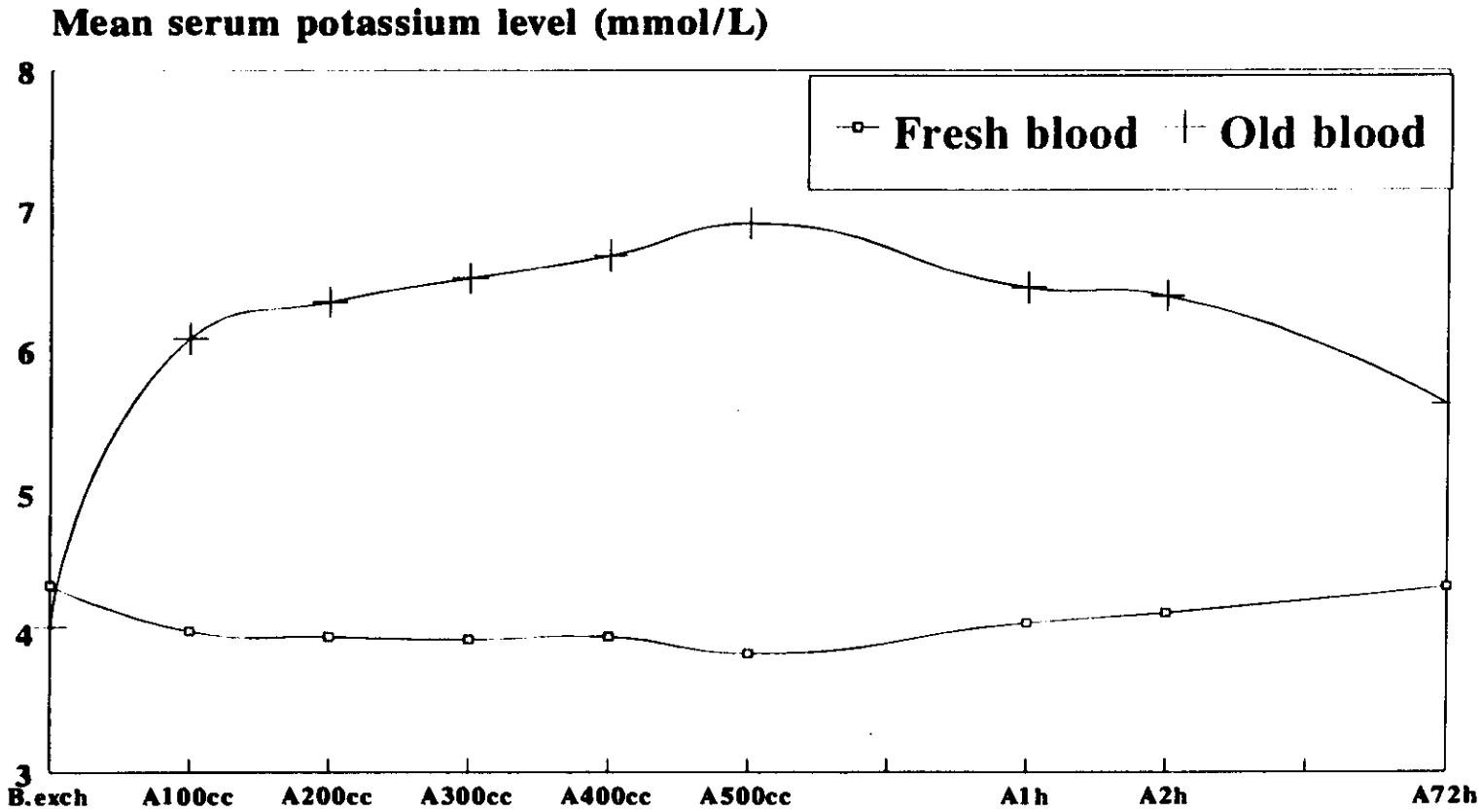

Fig. (7) : Bar-chart showing changes in serum potassium level in all the studied cases

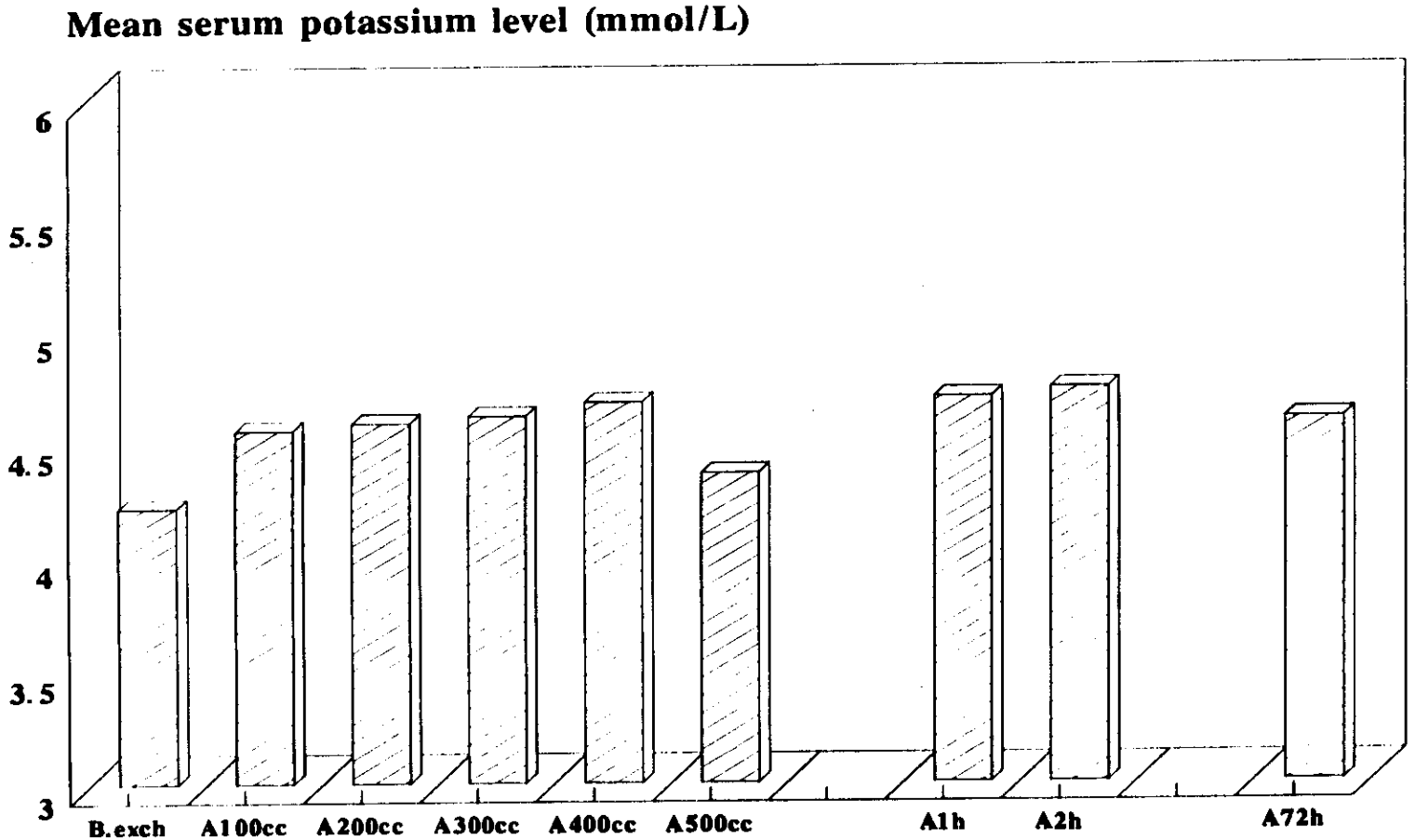

Fig. (8) : Changes in serum potassium level according to gestational age of the studied cases

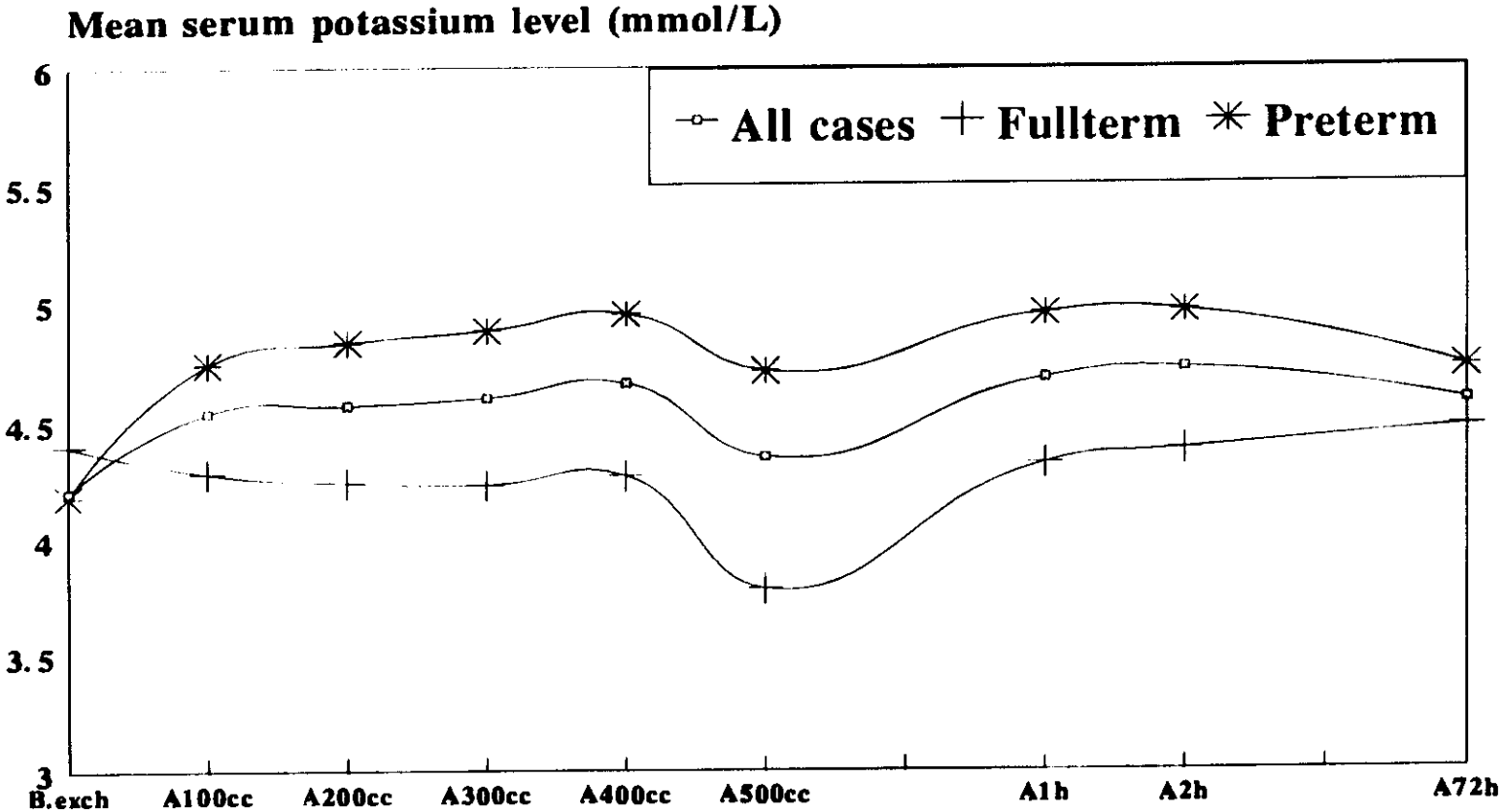

Fig. (9) : Changes in serum potassium level in cases of HDN and septicaemia

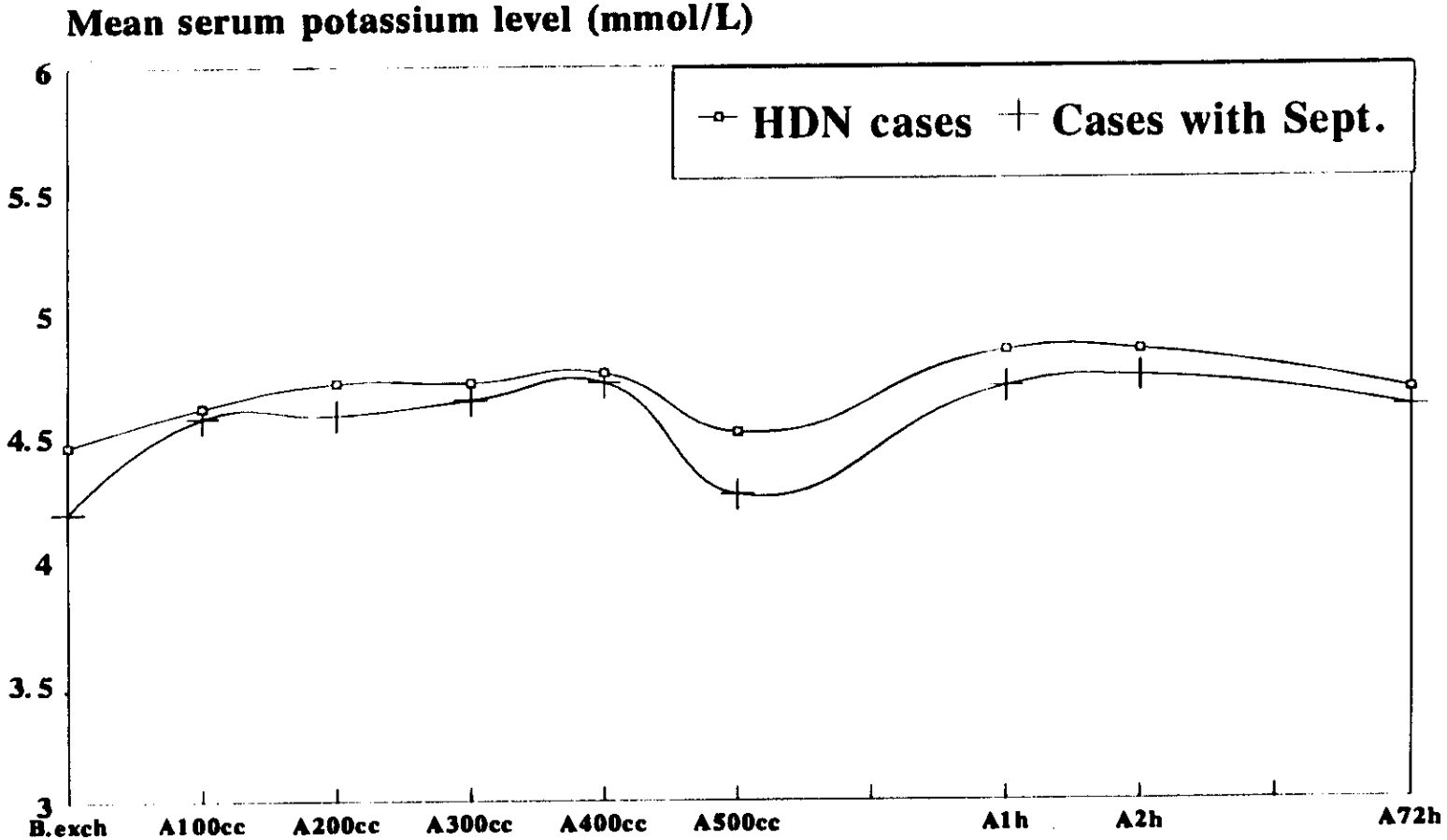

Fig. (10) : Changes in serum sodium level according to the age (freshness) of the blood used in exchange transfusion

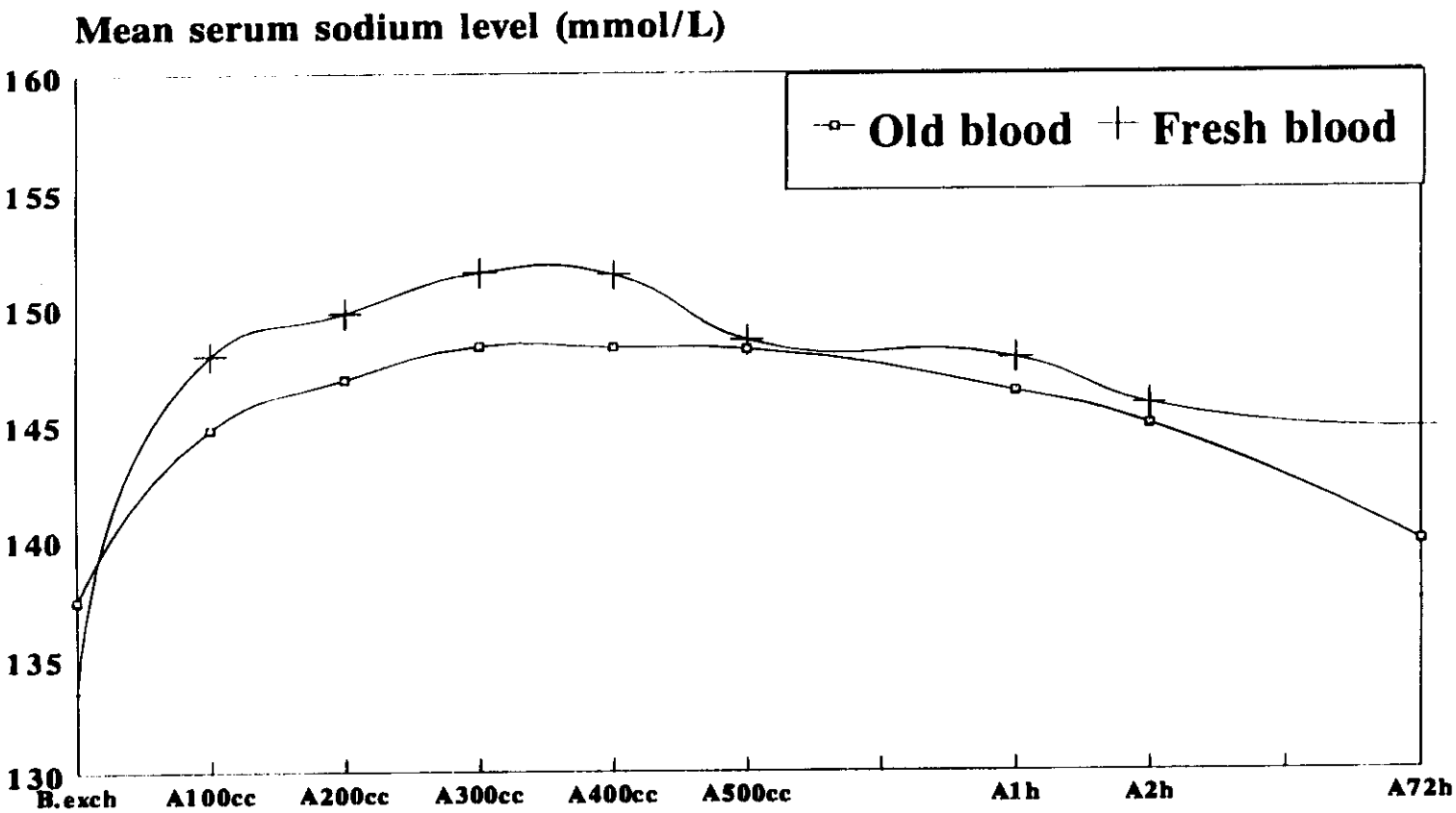

Fig. (11) : Changes in serum sodium level in all the studied cases

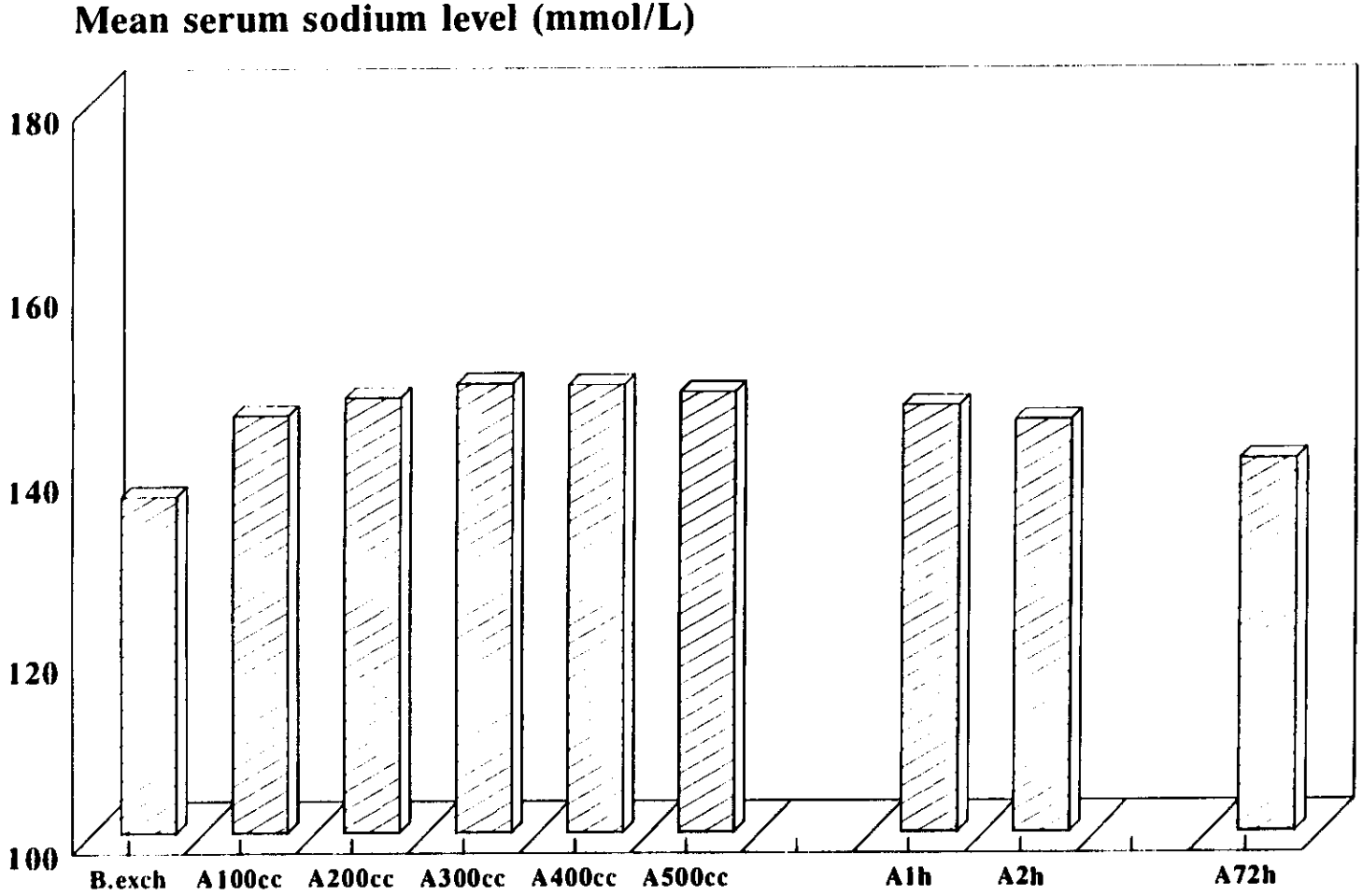

Fig. (12) : Changes in serum sodium level in cases with HDN and septicaemia

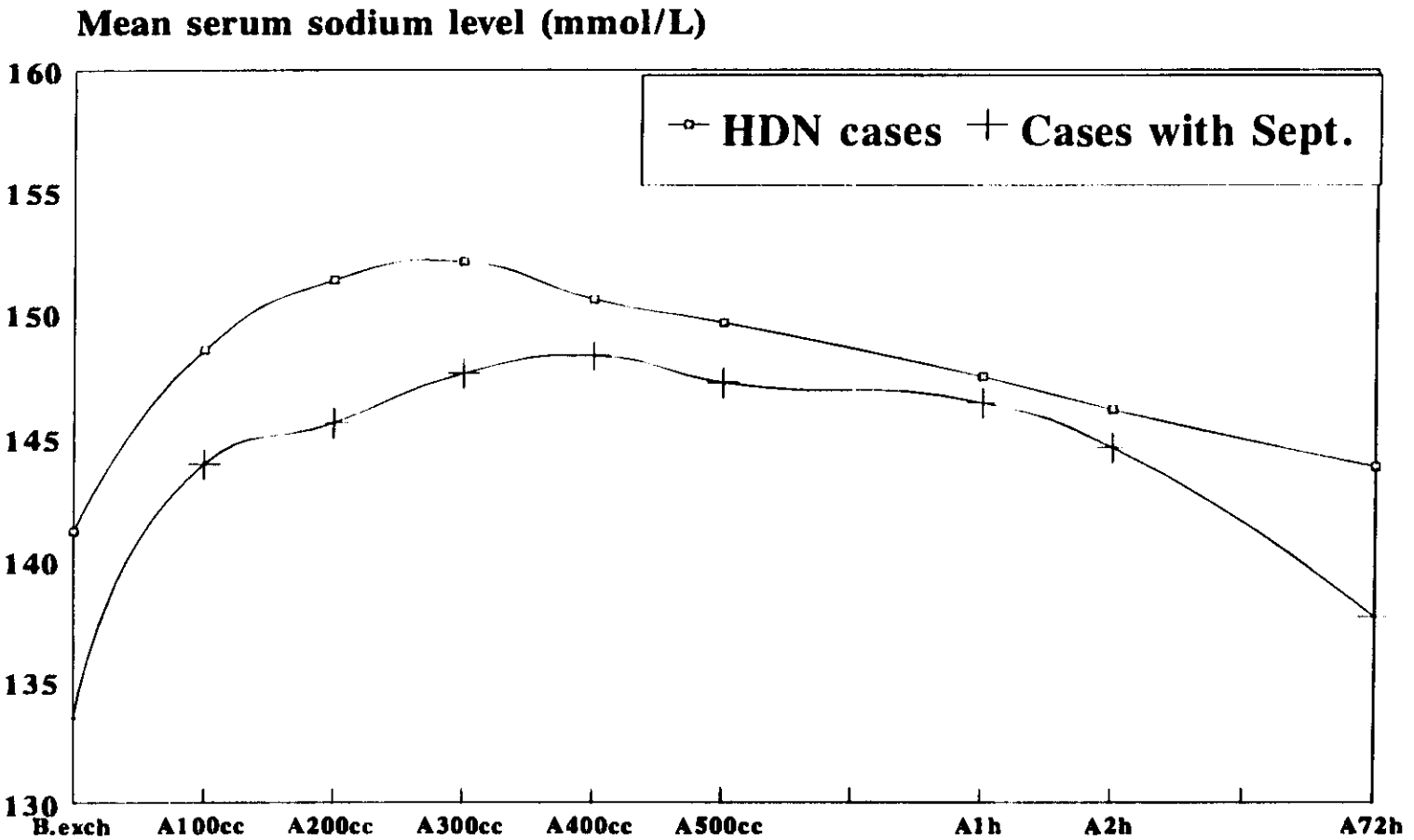

Fig. (13) : Changes in serum sodium level according to gestatioal age of the studied cases

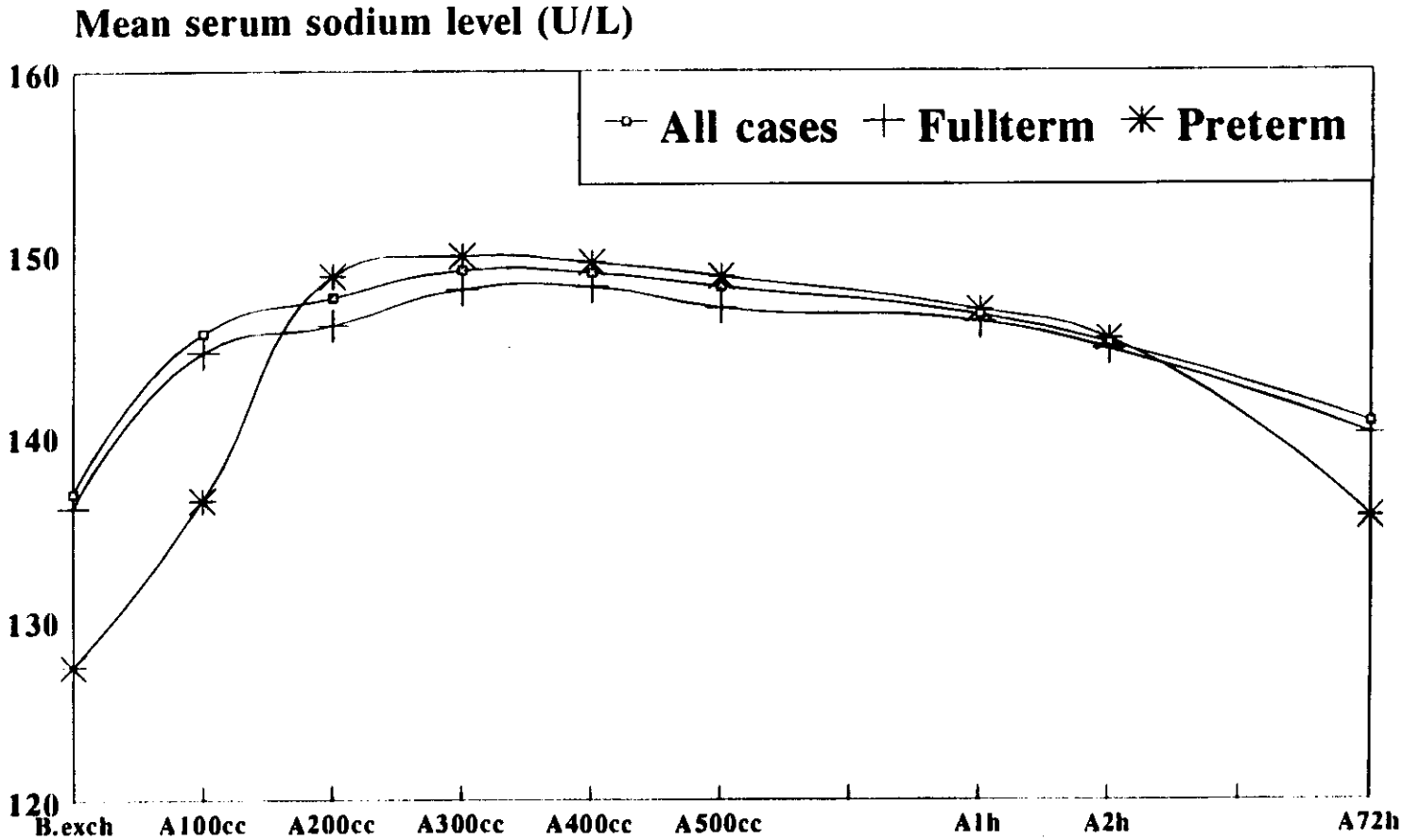

Fig. (14) : Bar-chart showing changes in blood glucose level in all the studied cases

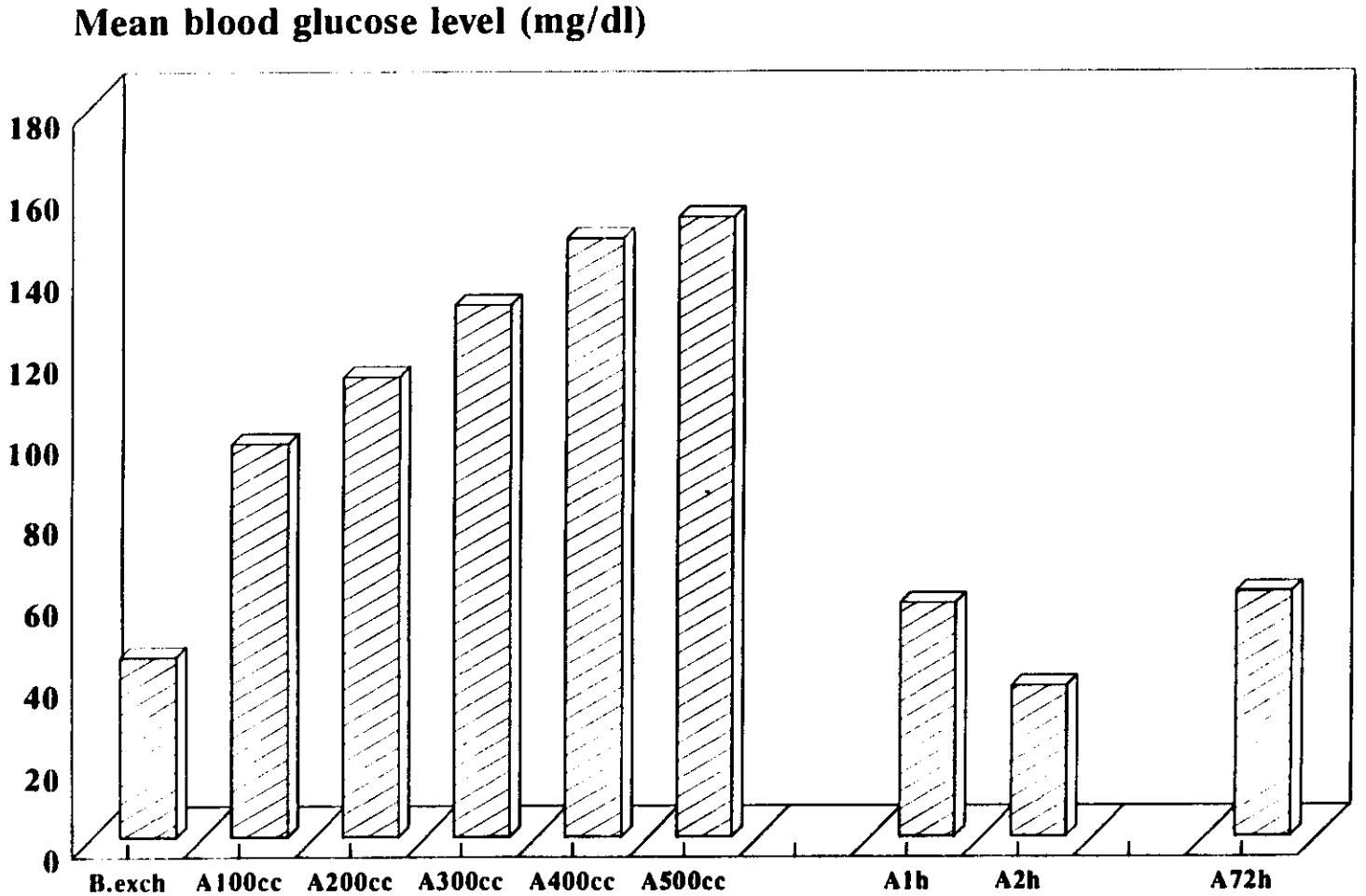

Fig. (15) : Changes in blood glucose level in cases with HDN and septicaemia

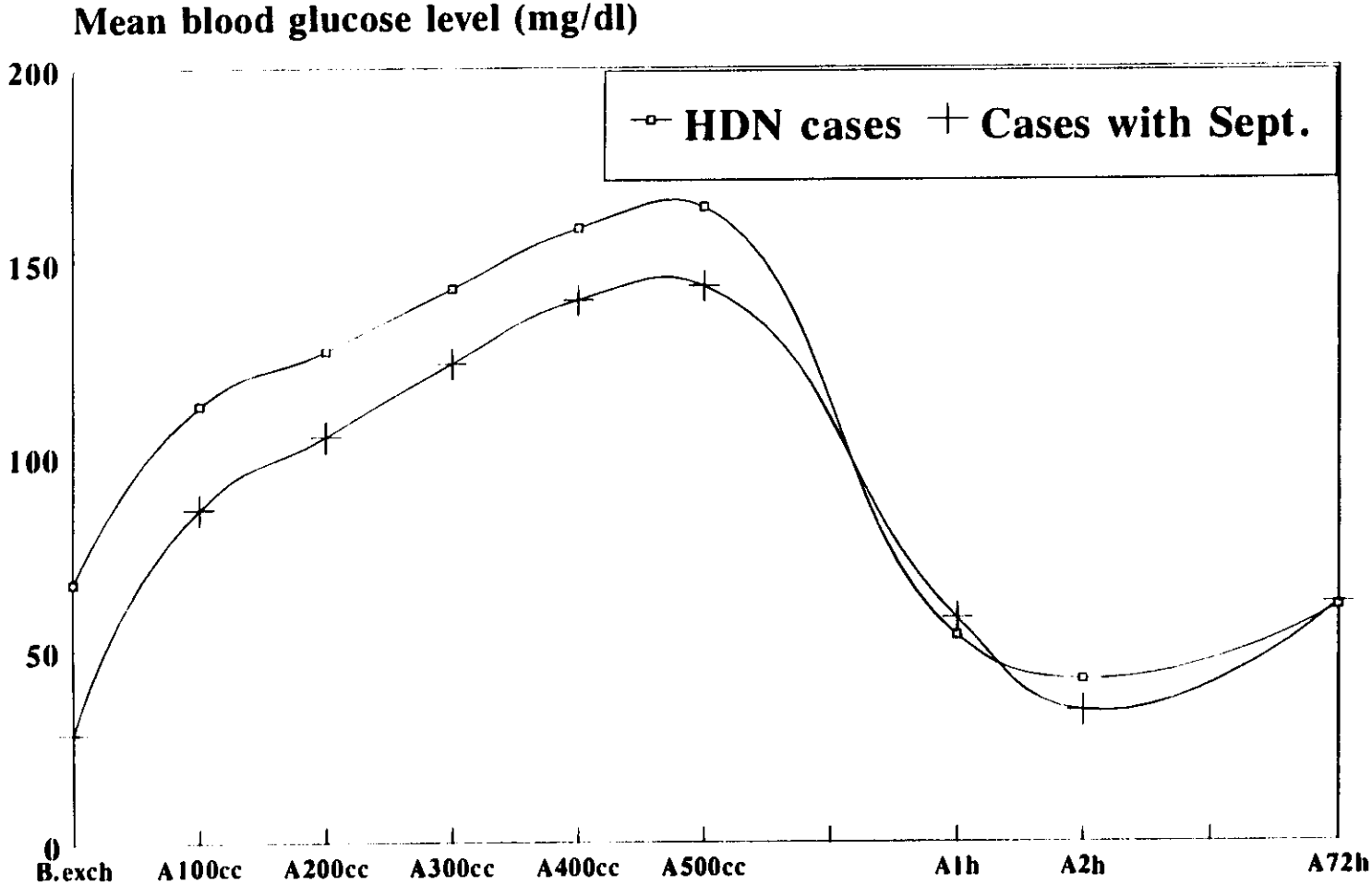

Fig. (16) : Changes in blood glucose level according to the age (freshness) of the blood used in exchange transfusion

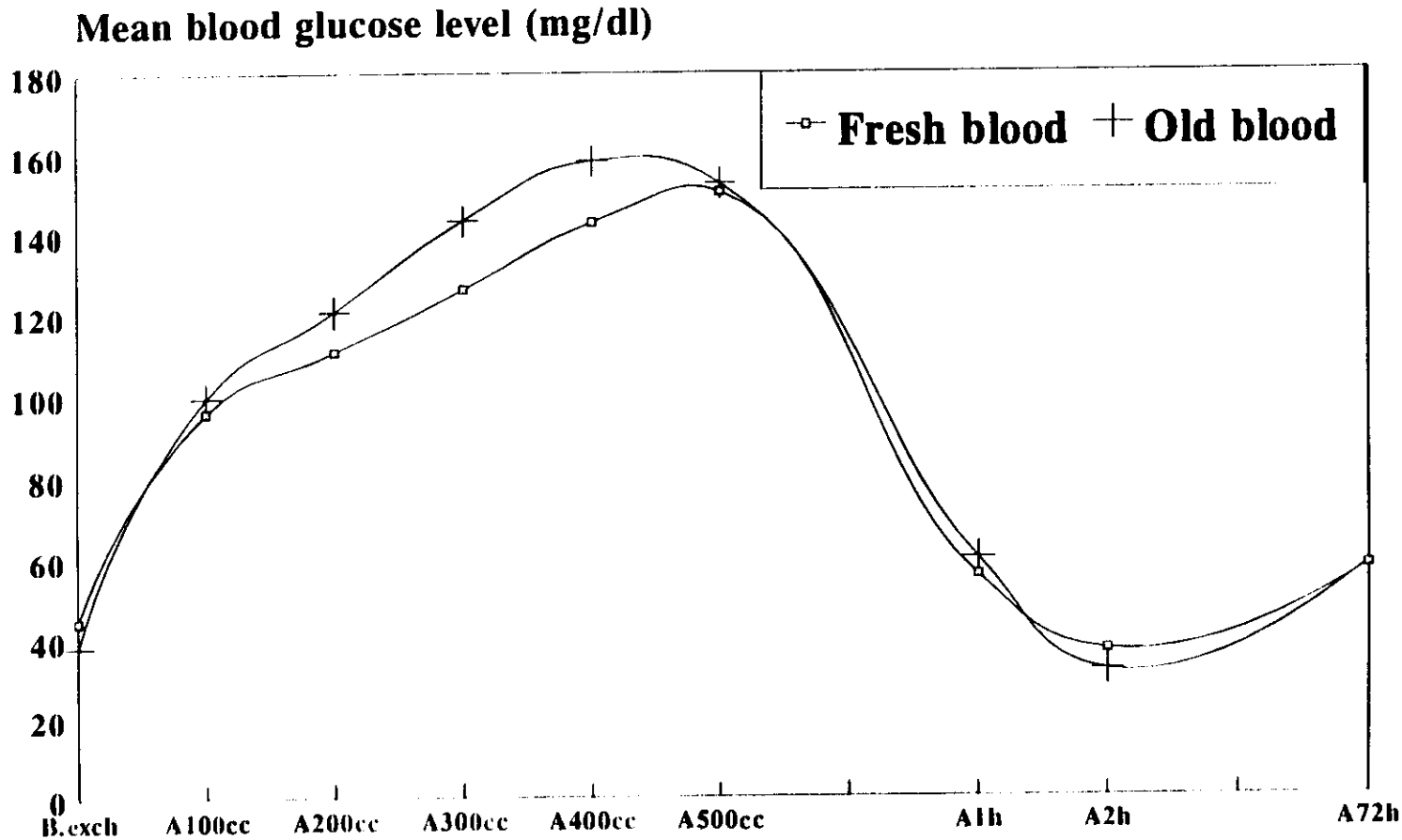

Fig. (17) : Changes in blood glucose level according to gestational age of the studied cases

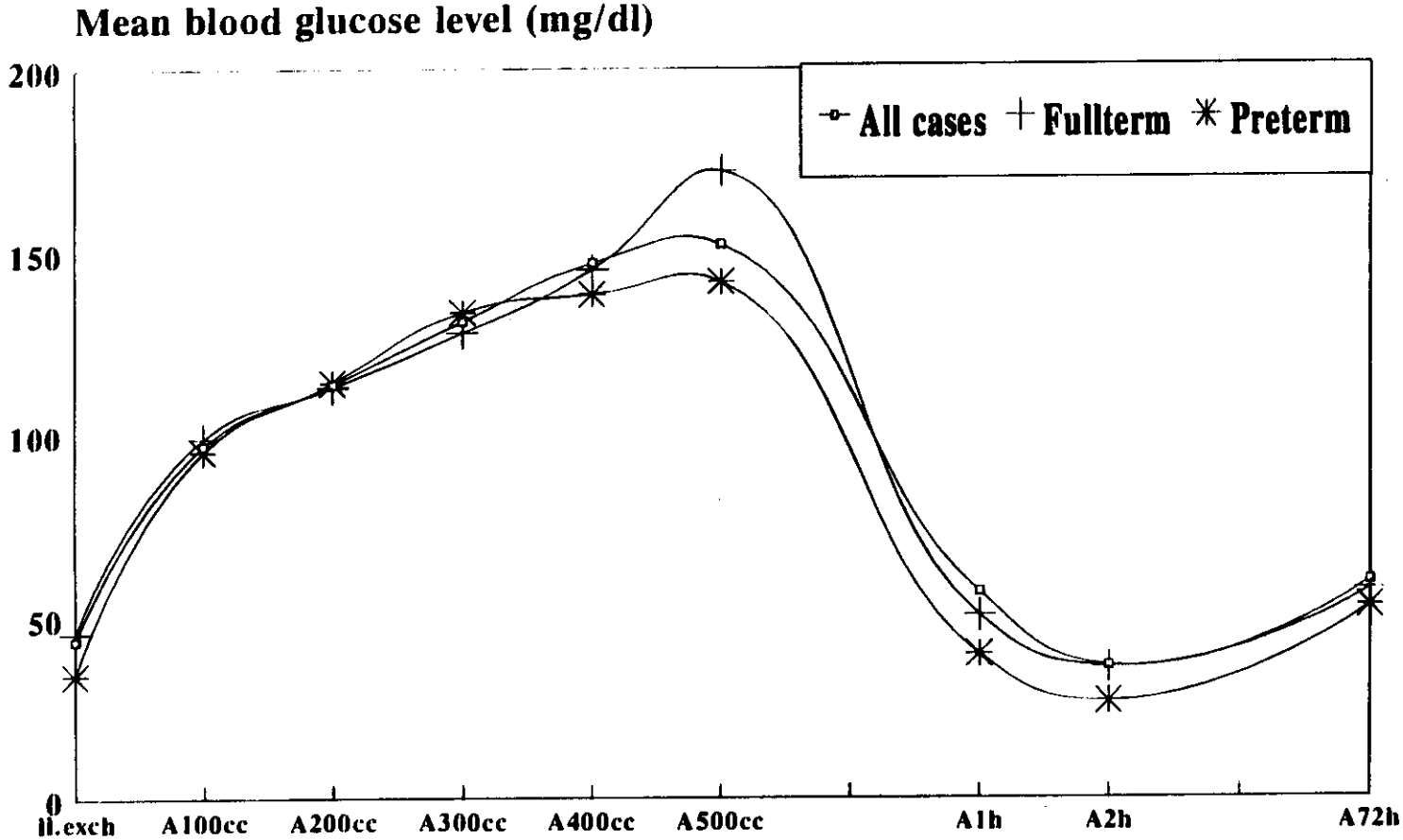

Fig. (18) : Bar-chart showing changes in the level of IgG before and 72 hours after exchange transfusion according to gestational age

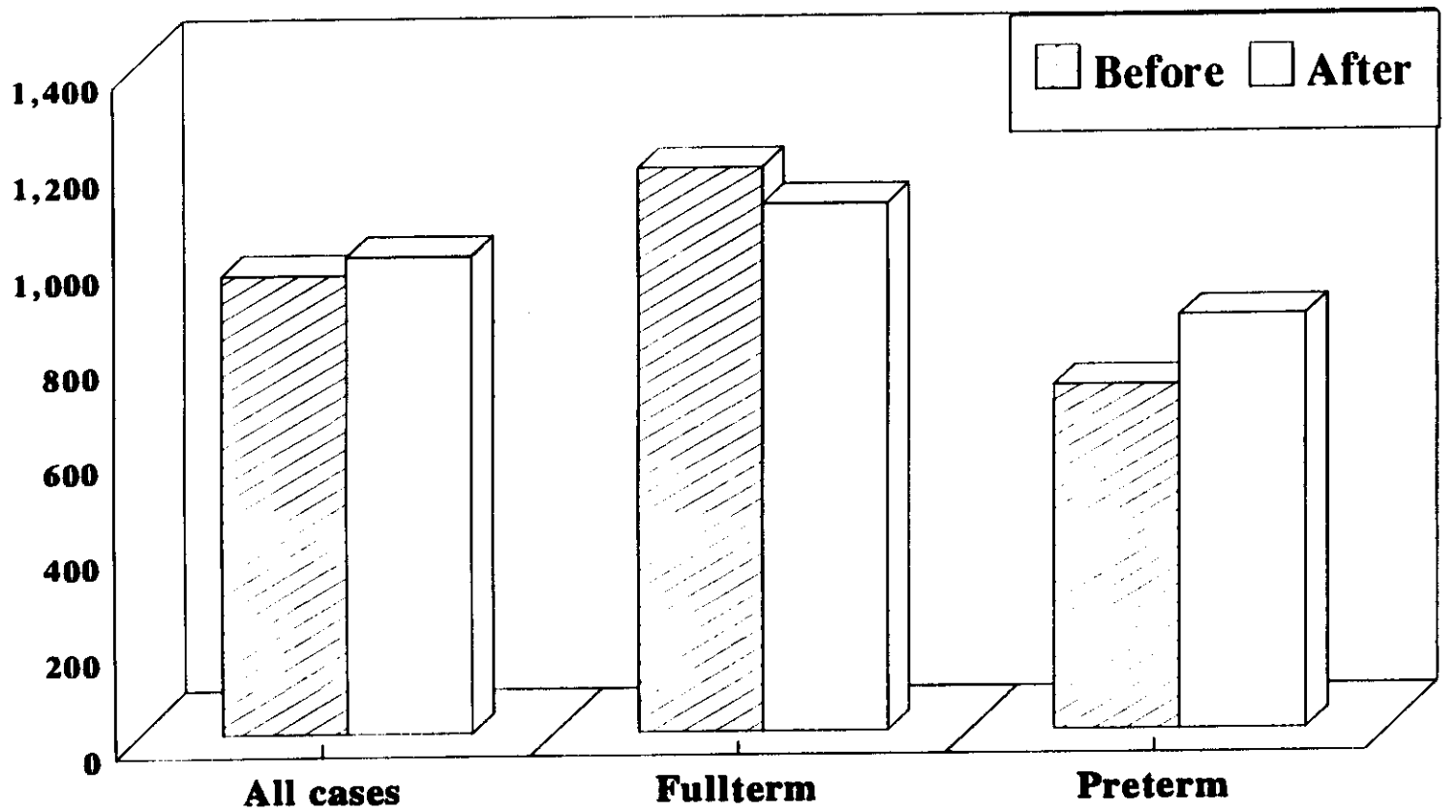

Fig. (19) : Bar-chart showing changes in the level of IgG before and 72 hours after exchange transfusion in cases with septicaemia and HDN

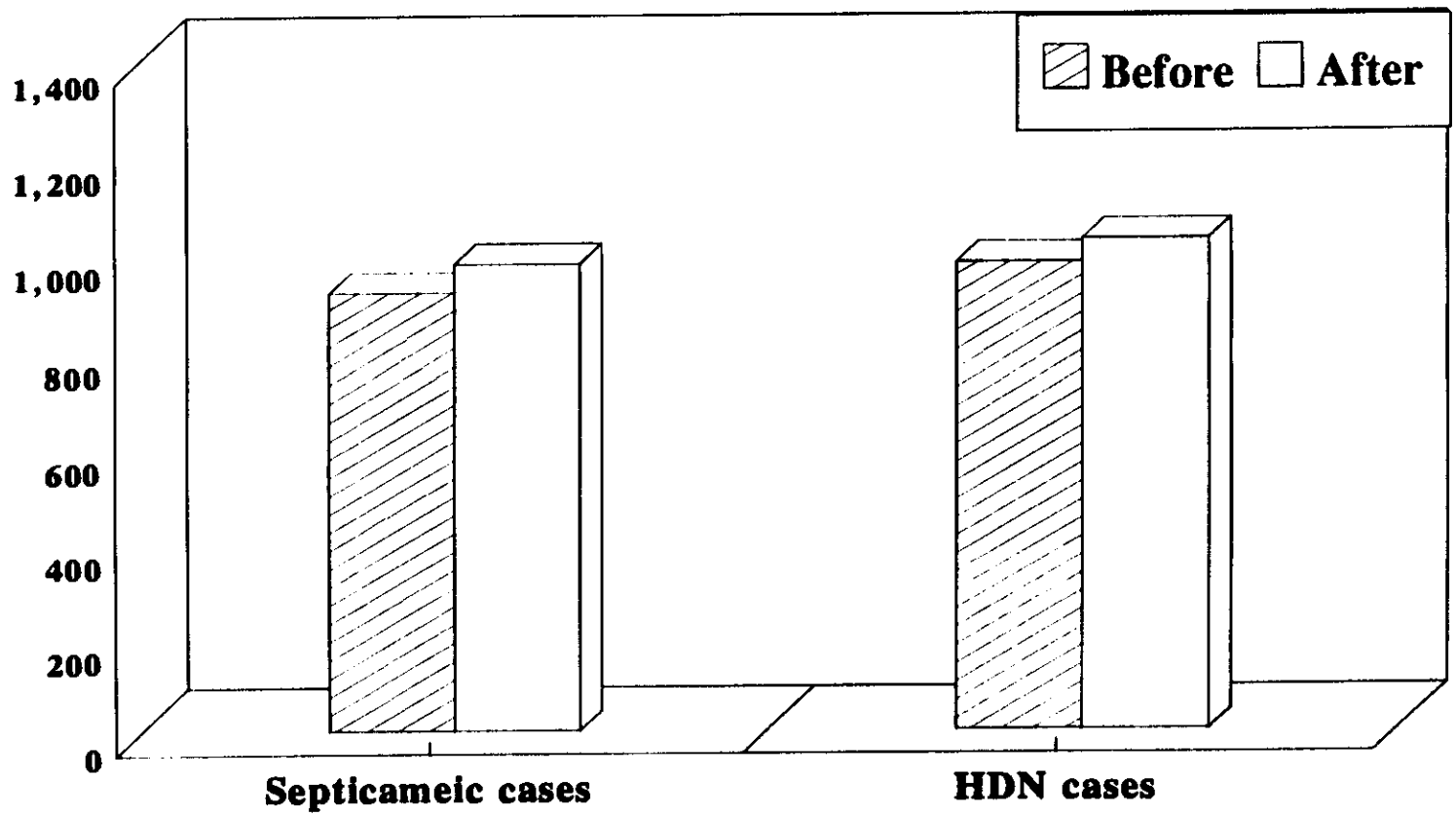

Fig. (20) : Bar-chart showing changes in the level of IgG before and 72 hours after exchange transfusion according to the number of exchanges performed for each case

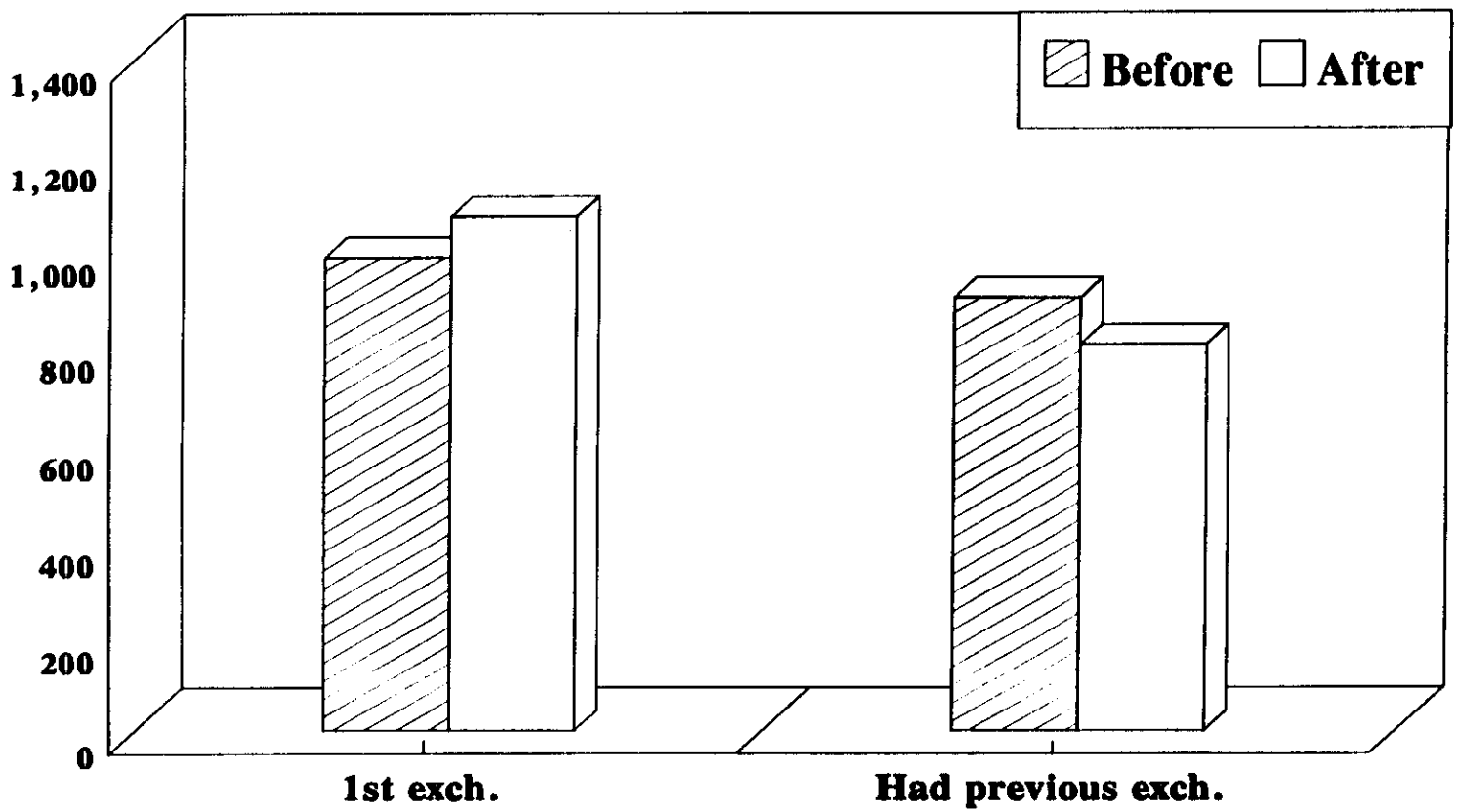

Fig. (21) : Bar-Chart showing changes in the level of IgG before and 72 hours after exchange transfusion according to the age (freshness) of blood used

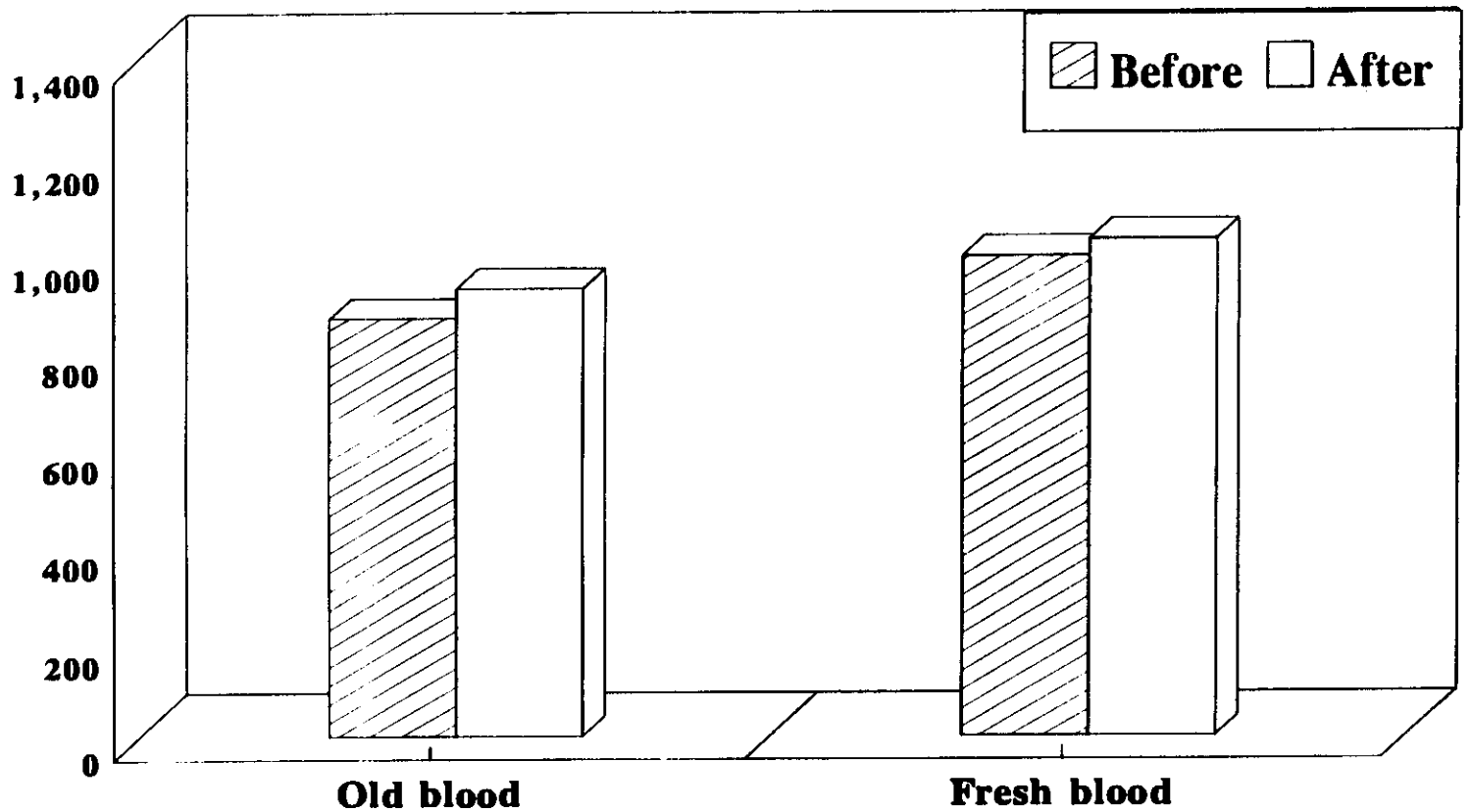

Fig. (22) : **Bar-chart showing changes in the level of IgM before and 72 hours after exchange transfusion according to age (freshness) of the blood used**

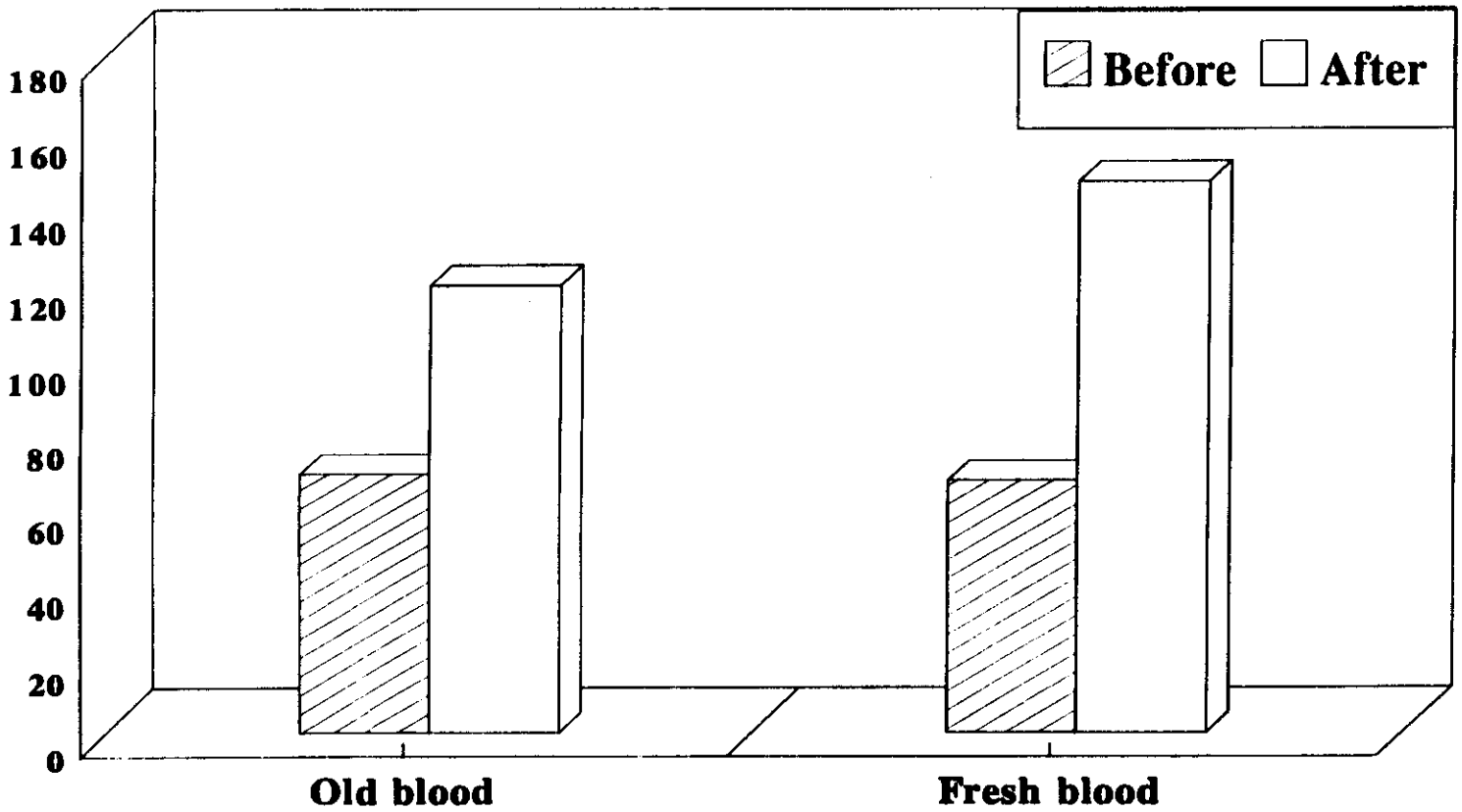

Fig. (23) : Bar-chart showing changes in the level of IgM before and 72 hours after exchange transfusion in cases with septicaemia and HDN

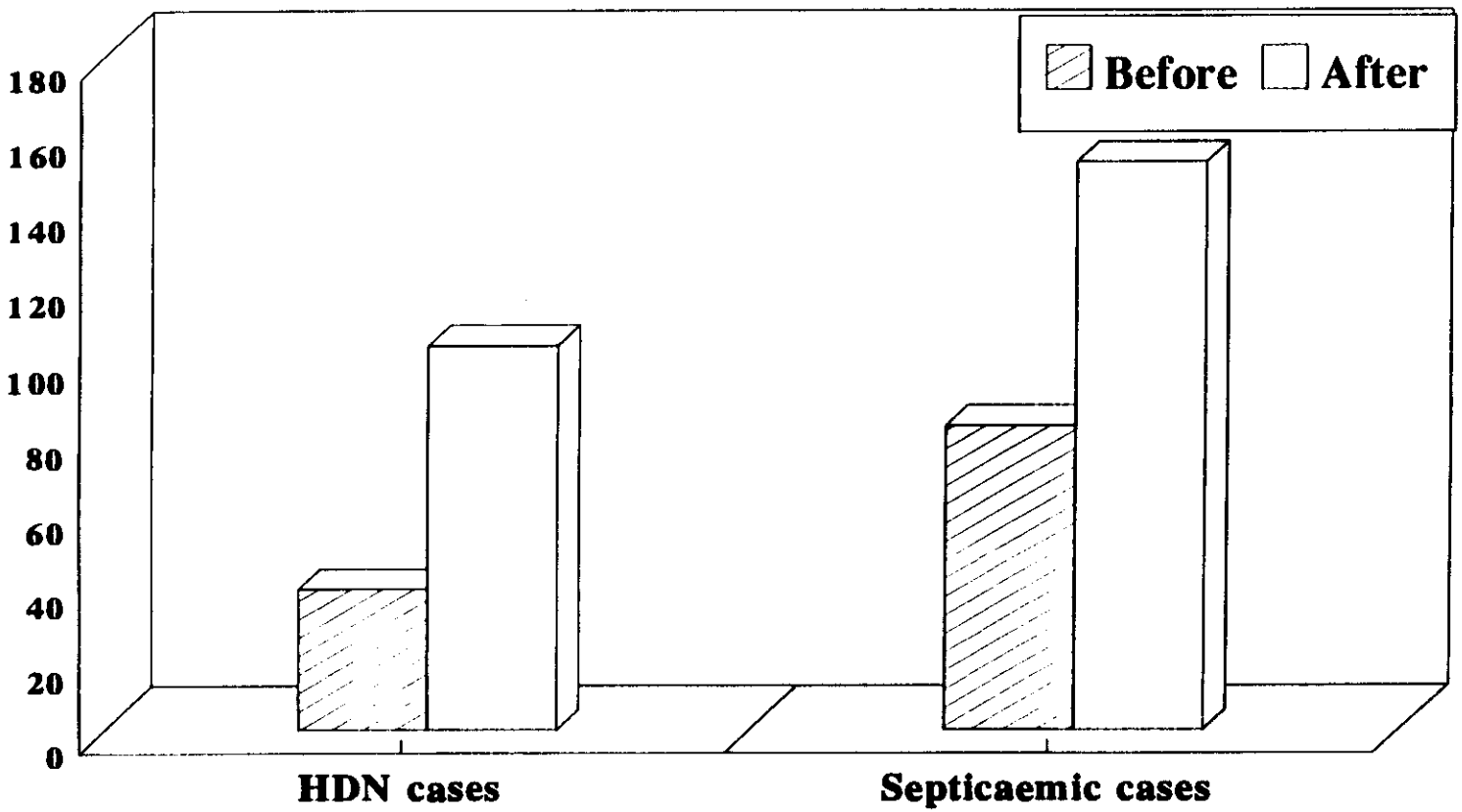

Fig. (24) : Bar-chart showing changes in the level of IgM before and 72 hours after exchange transfusion according to gestational age of the studied cases

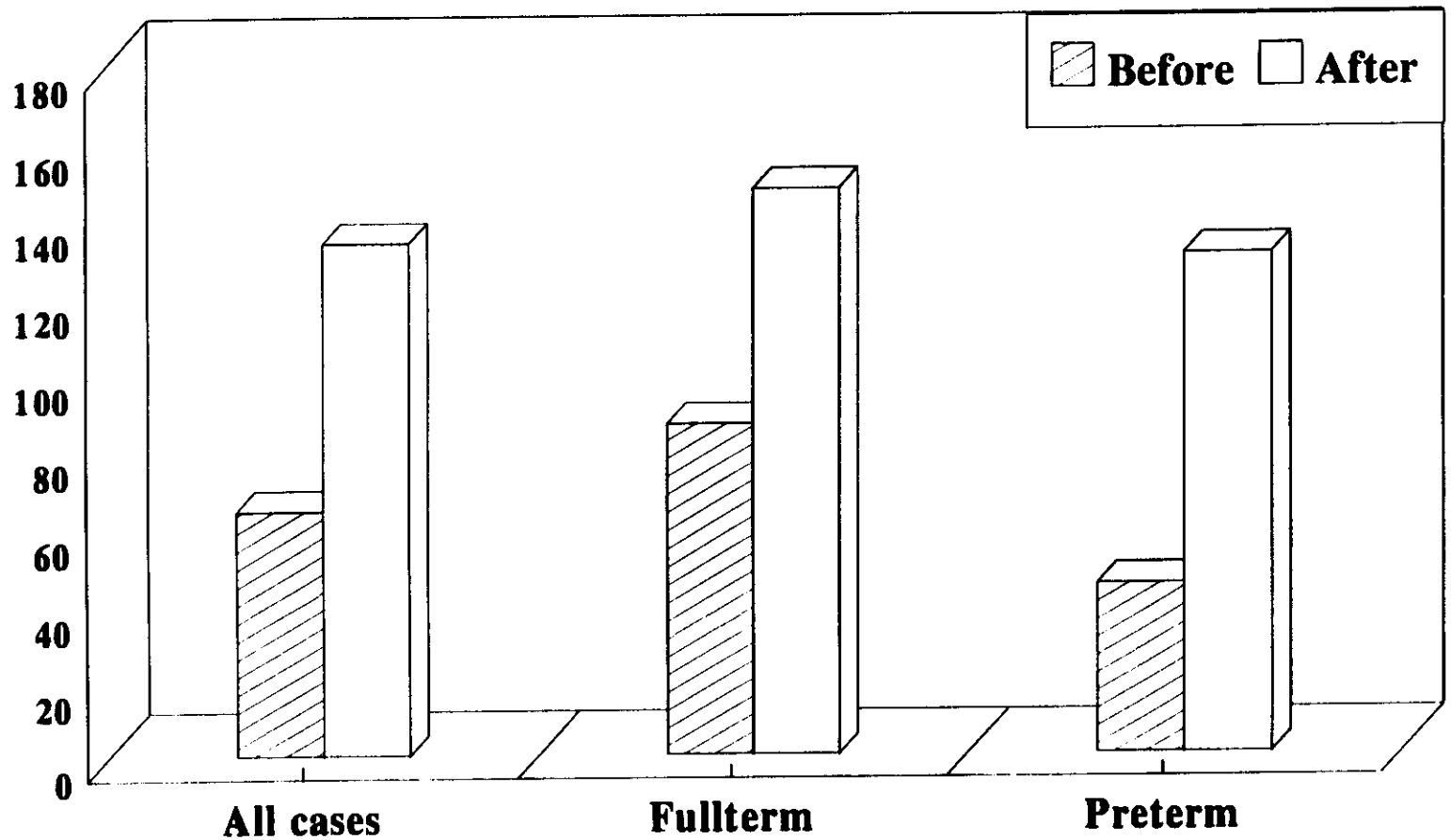

Fig. (25) : Bar-chart showing changes in the level of IgM before and 72 hours after exchange transfusion according to the number of exchanges for each case