Research Article

Incidence of polycythemia in with high risk antenatal and natal history

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Abstract

Introduction: Polycythemia in Newborns is well known now a day to pediatricians. It is not uncommon and is a potentially serious disorder of newborns. By definition, it is an increase in the circulating red blood cells above normal values and corresponding increase occurring in hemoglobin and hematocrit or packed cell volume. Alternatively it is an increase in red cell mass per unit of body weight. Various risk factors such as birth asphyxia, toxemias of pregnancy (preeclampsia/eclampsia), twin pregnancies, hypertension, postmaturity, suspected intrauterine growth relation, maternal diabetes etc have been reported by various authors. **Aims and Objectives:** To study the incidence of polycythemia in newborns with high risk antenatal history and various factors associated with it. **Materials and Methods:** In the present study newborn with various high risk antenatal factors were enrolled. A detailed antenatal (medical and obstetric), intrapartum history of mother was recorded on a prestructured proforma. Complete clinical examination was done in newborns. Cord blood hematocrit determined was done by Wintrobe's hematocrit method from each of the newborns. **Results:** The incidence of polycythemia was found to be 10.5% at sea level. Birth asphyxia, twin pregnancy, toxemias of pregnancy and intrauterine growth retardation are the commenest risk factors which predispore for the development of polycythemia and hyperviscosity syndrome. Polycythemia is more common in small for gestational age babies than appropriate for gestational age babies. Out of total 21 newborn with polycythemia, 19 were delivered by spontaneous vaginal delivery. **Conclusion:** The incidence of polycythemia in newborn with high risk antenatal history was 10.5%. Birth asphyxia, twin pregnancy and IUGR were the most common risk factors associated with polycythemia.
Keywords: polycythemia, incidence, high risk antenatal history.

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INTRODUCTION

Polycythemia in Newborns is well known now a day to pediatricians. It is not uncommon and is a potentially serious disorder of newborns. By definition, it is an increase in the circulating red blood cells above normal values and corresponding increase occurring in hemoglobin and hematocrit or packed cell volume. Alternatively it is an increase in red cell mass per unit of body weight. Incidence of polymethemia in newborn varies according to environmental conditions like altitude, higher the hematocrit values. Stevens and Wirth[1] in 1980 have reported incidence of polycythemia as 1.8% and that of the hyperviscosity as 2.5% at sea level on central venous blood. Wirth in 1979[2] studied polycythemia at 1061 meters height from sea level and found that incidence of polycythemia was 4% and that of hyperviscosity was also present in few infants having hematocrit value of 60-64%. Marchant in 1983[3] reviewed polycythemia. Pildes[4] reported incidence of hyperviscosity 5% at sea level. Various risk factors such as birth asphyxia, toxemias of pregnancy (preeclampsia/eclampsia), twin pregnancies, hypertension, postmaturity, suspected intrauterine growth retardation, maternal diabetes etc have been reported by various authors. Wood[5] in 1959 recognised chronic intrauterine hypoxia as a cause of plethora in newborns and described clinical features of such newborns with

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intrauterine growth retarded babies. Phillips and Collegues[6] explained the mechanism of polycythemia occurring in newborn with fetal distress and asphyxia. In presence of asphyxia pH and PaO_2 concentration in blood of newborn falls while PCO_2 rises. These changes possibly stimulate respiratory movements inutero. This intrauterine respiratory activity could then have facilitated the occurrence of placental transfusion on the basis similar to that which occurs in extrauterine respiration. Hypoxic induction of uterine contraction could cause placental blood to flow into fetus. Asphyxia would cause fetal adrenal gland to secret more catecholamine which if present in large quantity may produce vasoconstriction of umbilical artery more than constriction of umbilical vein. G. Enleson[7] showed increased incidence of polycythemia in post matured infant born after term. Dry parched skin, long nails, less amniotic fluid, advanced ossification of skull, height and weight more, were the signs present in these infants. Humbert[8] reported small for gestational age baby had significantly higher hematocrit values as compared to full term appropriate for date babies. 50% of the full term small for gestational age babies in their group were polycythemic. Recently polycythemia in newborn is attributed as a significantly important casual factor in the immediate mortality and morbidity and also delayed morbidity of infants producing serious and sometimes life threatening condition of brain, heart, kidneys, lungs and intestine including thromobotic phenomenon and hemorrhage. Measurement of viscosity requires a microviscometer which is not available in many laboratories and as both polycythemia or high hematocrit and hyperviscosity are always associated conditions, only hematocrit values are relied upon for the diagnosis of hyperviscosity in our country due to lack of facilities. Long term sequelae of polycythemia are seen after 2-3 years of age in a significant number of patients. They range from mental subnormality, delay in motor development and persistent neurological findings like spastic diplegia and hypotonia. Additional 30% have tremors and myocionic jerks. Thus the present study was undertaken to find the incidence of polycythemia in newborns delivered in the tertiary care institute with high risk antenatal history.

AIMS AND OBJECTIVES

To study the incidence of polycythemia in newborns with high risk antenatal history and various factors associated with it.

MATERIALS AND METHODS

The present study was conducted in a tertiary care institute situated in South Mumbai for one year. All the newborn delivered in the study duration with one or more antenatal and natal risk factors mentioned below were enrolled in the study.

- Birth asphyxia
- Toxemias of pregnancy (Preeclampsia/eclampsia)
- Twin pregnancies
- Hypertension
- Postmaturity
- Suspected intrauterine growth relation
- Maternal diabetes

Thus total 179 pregnant women were enrolled in the study. Out of 179 cases 22 were twin pregnancies. One newborn of one pair of twin was still born hence only 200 newborns were available for study. In all cases umbilical cord was calmed immediately after birth or up to 5 to 10 seconds of birth. Therefore, every infant must have received some degree of placental transfusion invariably. However, babies were held at the level of mother's introitus. A detailed antenatal (medical and obstetric), intrapartum history of mother was recorded on a prestructured proforma. Mode of delivery was also recorded. Gestational age of each newborn was determined from mother's menstrual history and confirmed by physical examination of the newborn. Small for date, appropriate for date and large for date infants were determined by birth weights less than 10^{th} percentile, 10^{th} to 90^{th} percentile and more than 90^{th} percentile respectively for gestational age and sex. Neonates were examined in detail clinically by self and other doctors working in the ward and findings were recorded in the proforma. Placenta and cord were examined in most cases. Cord blood hematocrit determined was done by Wintrbe's hematocrit method from each of the newborns. Hemoglobin determination was also made from the same blood sample. Subsequent clinical manifestations, progression and relevant treatment given were also noted.

RESULTS

Table 1: Incidence of polycythemia

	No. of neonates (n=200)	Percentage
Polycythemia present	21	10.50%
Polycythemia absent	179	89.50%

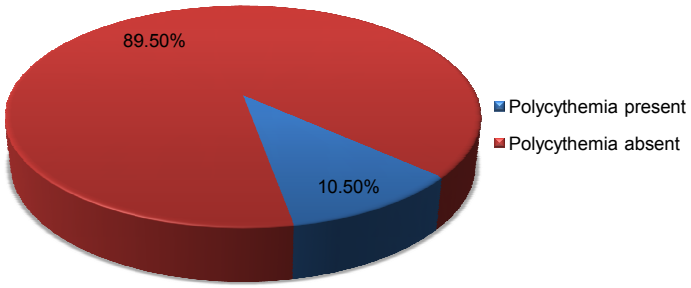

Figure 1: Incidence of polycythemia

In the present study incidence of polycythemia among the newborns with high risk antenatal history was 10.5%.

Table 2: Risk factor wise incidence of polycythemia

Risk factors present during antenatal/natal period	No. of neonates	Newborns having polycythemia
Birth asphyxia	93	9 (9.68%)
Twin pregnancy (22 pairs)	43	5 (11.63%)
Pre-eclampsia/ eclampsia	31	4 (12.90%)
Hypertension	16	0
Postmaturity	6	0
Maternal diabetes	1	0
IUGR	10	3 (30.00%)
Total	**200**	**21 (10.50%)**

It was observed that, most common high risk factor observed in the present study was birth asphyxia. And out of these 93 cases polycythemia was diagnosed in 9 newborns. Total 22 twin pregnancies were screened. One newborn of one pair of twin was still born thus total 43 live birth were recorded and in 5 polycythemia was diagnosed. Out of 10 cases of intrauterine growth retardation in 3 cases polycythemia was diagnosed.

Table 3: Distribution of newborns according various factors

Variable		Polycythemia	No polycythemia	Total	P value
Sex	Male	13	94	107	0.414
	Female	8	85	93	
Gestational age	Small for gestational age	14	66	80	0.028*
	Appropriate for gestational age	7	109	116	
	Large for gestational age	0	4	4	
Mode of delivery	Spontaneous Vaginal delivery	19	113	132	0.012*
	Assisted delivery	2	66	68	

* Statistically Significant

It was observed that out of total 107 male newborn, 13 were suffering from polycythemia. Whereas out of 93 female newborns, 8 were diagnosed to be polycythemic. The male to female ratio in the study was 1.62: 1. Majority of the polycythemic newborn were small for date. Out of total 21 newborn with polycythemia, 19 were delivered by spontaneous vaginal delivery.

DISCUSSION

Out of the 200 newborns studied, 21 newborns were having hematocrit values of 65% or more. Thus the incidence of polycythemia in the present study done at sea level was 10.5%. Different incidence rates were stated by different authors. Stevens and Wirth[1] observed the incidence of polycythemia and hyperviscosity as 1.8% and 2.9% respectively at sea level. Pilde's *et al*[4] reported incidence of hyperviscosity to be 5% at sea level. Wirth *et al*[2] studied 790 infants at height of 1061 meters from sea level and noted incidence of polycythemia and hyperviscosity as 4% and 5% respectively and high altitude was thought to be cause for high incidence. Thus high altitude can be considered as a causal factor for higher incidence of polycythemia. As compared to above workers the incidence in the present study was much higher (10.5%). In the present study the incidence was calculated in the newborn with high risk antenatal history.

However the above mentioned authors have included newborns born to all mothers without any specific risk factors. The most common high risk factor observed in the present study was birth asphyxia. And out of these 93 cases polycythemia was diagnosed in 9 newborns. Fetal distress and asphyxia lead to fall in pH and PO_2 and rise of PCO_2. These changes possibly induce respiratory movements in utero which facilitate the placental transfusion to babies, similar to extra uterine respiration. Fetal distress also leads to increased secretion of catecholamineswhich causes constriction of umbilical artery more than umbilical vein. Saigal and Usher[9], Fold and Ackerman[10] also observed raised hamatocrit values of more than 65% with perinatal asphyxia. Total 22 twin pregnancies were screened. One newborn of one pair of twin was still born thus total 43 live birth were recorded and in 5 polycythemia was diagnosed. Thus the incidence of polytheminia in twin pregnancies was found to be 22.72%. Out of 31 cases of preeclampsia and eclampsia 4 (12.9%) newborn showed evidence of polycythemia. Black and Lubchenco[11] found incidence of polythemia amongst newborn of preeclampsic mothers to be 20.7%. According to Black and lubhenco[11] reduced blood supply to fetus inutero leads to chronic hypoxemia in fetus, and give rise to increased erythropoiesis and increased hematocrit value. Asali's *et al*[12] showed upto 50% reduction in blood flow during preeclampsia in their study. Out of 10 cases of intrauterine growth retardation in 3 cases polycythemia was diagnosed. It was observed that risk of developing polycyhtemia was higher in male infants. Incidence in male infants was found to be 12.14% (13 out of 107) and in female infants it was found to be 8.60% (8 out of 93). But the sexwise difference in incidence of polycythemia was not statistically significant. Humbert *et al*[8] also found that male infants were at greater risk for development of polycythemia than females. Gatti *et al*[13] showed that male infants are at particular risk for development of polycythemia and also observed that male polycythemic infants are more prone to develop symptoms than female polycythemic infants. Out of 21 polycythemic newborns 14 were small for gestational age and 7 were appropriate for gestational age. Risk of polycythemia was 17.5% in small for gestational age group and 6.03% in appropriate for gestational age group. Out of 4 large for gestational age newborns, in our study, not a single baby had polycythemia. Results of our study were well correlating with that of Wirth *et al*[2] who reported incidence of polycythemia as 16% in small for gestational age group and 4.6% in appropriate for gestational age group babies. Humbert and Battalgia[8] and Howith[14] also observed high incidence of polycythemia in small for gestational age babies. Risk of polycythemia in large for gestational age babies was found to be 8% by Humbert[8]. In our study only 4 newborn babies were found to be large for gestational age which was a very small sample and hence no incidence of polycythemia could be found. Gestational ages in our studies ranged from 28 weeks to 42 weeks and in polycythemic infants ranged from 34 weeks to 42 weeks. As in other studies reported no neonates with polycythemia had gestational age less than 34 weeks. According to Black and Lubchenco[11] hematocrit value in neonates was knows to rise with increasing gestational age. In our study out of 200 newborns 43 were delivered by cesarean section and remaining delivered vaginally, out of which 14 cases were breech presentations. In 24 cases forceps were used. Out of 21 polycythemic neonates in our study only 2 were delivered by cesarean section. There was no significant increase in incidents of polycythemia in babies delivered through assisted labour i.e. cesarean section or forceps application. Indications for cesarean section/forceps applied were prolonged labour, birth asphyxia, obstructed labours. This suggests that placental transfusion interrupted only due to adverse conditions present during pregnancy and mode of delivery does not affect hematocrit values significantly.

CONCLUSION

The incidence of polycythemia in newborn with high risk antenatal history was 10.5%. Birth asphyxia, twin pregnancy and IUGR were the most common risk factors associated with polycythemia.

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