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Research Paper

Polycythemia in Neonatal Nursery in Duhok: Incidence, Risk Factors and Leading Causes of Admission

Medical Science

KEYWORDS : polycythemia, neonate, nursery, hyperviscosity

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ABSTRACT

Background: *Polycythemia is defined as venous hematocrit more than 65%. Its incidence is 1.5- 4% live births. Polycythemia is more common in newborns of IUGR, perinatal asphyxia, trisomy 21,twin pregnancy, delayed cord clamping and congenital adrenal hyperplasia.*

Aim: *To find the incidence of neonatal polycythemia among neonates admitted to the neonatal nursery, the predisposing factors and the leading causes of admission associated with polycythemia.*

Patients and Methods: A retrospective study included all neonates admitted to the neonatal nursery at a maternity hospital in Duhok from June to December 2015. The diagnosis of polycythemia is made when venous hematocrit = or >65%. The data about all patients included : age, sex, birth weight, gestational age, weight for gestational age, APGAR score, Oxygen saturation SPO2. The patients were sent for chest X ray, serum bilirubin, complete blood count and blood culture as indicated by clinical picture .These data were analysed using SPSS 19 to find the clinical significance when P<0.05.

Results: *Among 149 patients 21.47% (n=32) had polycythemia. Most common age is in the first two days of life in both groups of patients with and without polycythemia P=0.278. Sex distribution of patients showed predominance of male sex among both groups P=0.11. The most common birth weight of polycythemic patients 53.12% (n=17) is< 2500 grams and in non polycythemic patients 49.38% (n=80) is 2500- 4000 grams. Among 56.25%(n=18) of polycythemic and 64.19%(n=104) of non polcythemic patients were full term P=0.256. In polycythemic patients, 43.75%(n=14) and in non polycythemic 49.38%(n=80) were small-for-gestational age P=0.269.In 6.25%(n=2) of polcythemic and 7.5% (n=12) of nonpolycythemic had low oxygen saturation P=0.585.In 34.37%(n=11) of polycythemic and 33.9%(n=55) of non polycythemic there was respiratory distress P=0.557. Low apgar score was present in 12.5%(n=4) of polycythemic and 13.6%(n=22) of non polycythemic P=0.566. The leading causes of admission in polycythemic patients were Respiratory distress syndrome 37.5%(n=12), transient tachypnea of newborn 24.87%(n=7) and hyperbilirubinemia 15.62%(n=5).*

Conclusion: *The incidence of polycythemia is higher than in other studies. Male sex and age of first two days predominated in polycythemic neonates. Prematurity, small-for gestational age, low SpO2, respiratory distress and hyperbilirubinemia have higher incidence than other studies. Respiratory distress syndrome, transient tachypnea of newborn and hyperbilirubinemia were the three leading causes of admission of polycythemic patients.*

Introduction

Polycythemia is defined as venous hematocrit more than 65% or a venous hemoglobin concentration in excess of 22gm/dl. Its incidence is 1.5-4% live births. It is less common in preterms. Neonates born at higher altitudes show a higher incidence of polycythemia [1-6].

The hematocrit of newborn undergoes significant changes in the first 24 hours of life. It peaks at first 2 hours to 71% which is normal for this age [7]. These values are due to an increased red cell mass as compared with older infants which is caused by the increased hemoglobin production in fetus in response of to a relatively hypoxic intrauterine environment, vasomotor instability and venous pooling in newborn immediately after birth[8]. Then it declines to 68% at age of 6 hrs and stabilizes at 12 to 24 hours [7]

Polycythemia is a pathologic condition so that hematocrit above 65% may cause impairment of oxygenation and perfusion of tissues causing damage in vital organs like adrenal glands, cerebral cortex and kidneys. So early diagnosis and treatment are mandatory[8-15].

Maternal factors including cyanotic heart disease diabetes, smoking and hypertension increase the risk of polycythemia. Polycythemia is more common in newborns of IUGR, perinatal asphyxia, trisomy 13, 18, 21,twin pregnancy, delayed, delayed cord clamping, congenital adrenal hyperplasia and thyrotoxicosis[1,8,16].

The most common clinical presentation of polycythemia is feeding problems, plethora, hypoglycemia, hypotonia, jitteriness , sleepiness, cyanosis, irritability and tachycardia[2,8,17,18,19].

Screening is recommended for small for gestational age babies, infant of diabetic mother, large for gestational age babies and monchrorionic twin because of relatively increased risk of polycythemia. A normal value at 2 hours of age (hematocrit <65%) does not merit any further screening unless the infant becomes symptomatic.

Literature analysis shows significantly high incidence of polycythemia among full term newborns with delayed cord clamping, small for gestational age (15%) and infants of diabetic mother. About 50% newborns remain asymptomatic and other show nonspecific symptoms like jitteriness, reluctant to feed, plethora and hypoglycemia [2,7].

All polycythemic infants should be closely observed for neurologic and cardiovascular symptoms and monitored for common complications, such as hyperbilirubinemia and hypoglycemia. Once the clinician makes the diagnosis of polycythemia, careful monitoring of blood glucose should be undertaken; if hypoglycemia is discovered, adequate glucose supplementation should be given [21,22]

The aim of this study is to find the incidence of neonatal polycythemia among neonates admitted to the neonatal nursery in maternity Hospital in Duhok, the predisposing factors and the leading causes of admission that are associated with polycythemia.

Patients and Methods

A retrospective study done by screening all neonates admitted to the neonatal nursery at a maternity hospital in Duhok , north of Iraq during 6 months from June to December 2015. All polycythemic neonates were discovered incidentally by measuring hematocrit which is done together with serum bilirubin measurement in apparently jaundiced neonates. Ethical approval was given by the Research and Ethic Committee of the Directorate Of Health.

The diagnosis oh polycythemia is made when venous hematocrit = or >65%. Blood is drawn into EDTA anticoagulated test tubes. All hematocrits were measured by cell counter method using (CELL-DYN emerald analyze r–09H39–01 device, France).

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The data about all patients included :age, sex, birth weight, gestational age(as assessed from maternal last menstrual period , ultrasound in the first trimester and Dubowitz examination), weight for gestational age(according to the Canadian Perinatal Surveillance System), APGAR score, Oxygen saturation SPO2.

The patients were sent for chest X ray, serum bilirubin, complete blood count and blood culture as indicated by clinical picture. These data were analysed using SPSS 19 to find the clinical significance when *P<0.05*.

Results

Among 194 patients 21.47% (n=32) had polycythemia. Age distribution shows that most patients are in the first two days of life in both groups of patients with and without polycythemia but no significant relation is found. Sex distribution of patients showed predominance of male sex among both groups of but no significant difference as shown in table -1-

Table-1- The relation of polycythemia to the age and sex

	With polycythemia	Without polycythemia	Total	P
Age days				
1-2	19 (59.3%)	66 (40.7%)	85	
3-4	7 (21.7%)	57 (35%)	64	
5-6	2 (6.25%)	26 (16.2%)	28	
7 and more	4 (12.5%)	13 (8.1%)	17	0.278
Total	32 (100%)	162 (100%)	162	
Sex				
Male	20 (62.5%)	89 (54.9%)	109	
Female	12 (37.5%)	73 (45.1%)	85	0.11
Total	32 (100%)	162 (100%)	194	

The birth weights of patients showed that among patients with polycythemia 53.12% (n=17) had birth weight less than 2500 grams while the remaining 46.88% (n=15) had birth weights between 2500 and 4000 grams. Among patients without polycythemia, 45.67% (n=74) had birth weights less than 2500 grams, 49.38% (n=80) between 2500 and 4000 grams and 4.95% (n=8) had weight more than 4000 grams.

Distribution of patients according gestational age as shown in table-2- shows that most patients were full term in both groups of patients with and without polycythemia but no significant relation was found.

Likewise, weight for gestational age of patients with polycythemia shows normal- for- gestational age as most frequent while in patients without polycythemia, both normal- and small-for- gestational age were equal. No significant relation was found.

Table-2-The relation of Polycythemia to gestational age and weight-for-gestational age

	With Polycythemia No. %	Without Polycythemia No. %	Total	P
Maturity				
Term	18 (56.25%)	104 (64.19%)	122	
Preterm	14 (43.75%)	58 (35.81%)	72	0.256
Total	32 (100%)	162 (100%)	194	
Weight-for-gestational age				
Normal for gestational age	18 (56.25%)	80 (49.38%)	98	
Small for gestational age	14 (43.75%)	80 (49.38%)	94	
Large for gestational age	0 (0%)	2 (1.24%)	2	0.269
Total	32 (100%)	162 (100%)	194	

Oxygen saturation (SpO2) of all patients was measured and majority of patients in both groups had normal SpO2 and there was no significant relation between low SpO2 and polycythemia. Most patients of both groups of patients had normal Apgar score at birth and low Apgar score was not significantly related to polycythemia.

About two thirds of patients in both groups did not have respiratory distress. No significant relation is found between respiratory distress and polycythemia. These results are shown in Table-3-.

Table-3- The relation of polycythemia to Oxygen saturation, APGAR score and respiratory distress

	With Polycythemia No. %	Without Polycythemia No. %	Total	P
Oxygen Saturation				
Low	2 (6.25%)	12 (7.5%)	14	
Normal	30 (93.75%)	150 (92.6%)	180	0.585
Total	32	162	194	
APGAR score				
Low	4 (12.5%)	22 (13.6%)	26	
Normal	28 (87.5%)	140 (86.4%)	168	0.566
Total	32	162	194	
Respiratory distress				
Yes	11 (34.37%)	55 (33.9%)	66	0.557
No	21 (65.63%)	107 (66.1%)	128	
Total	32	162	194	

Serum bilirubin level in both groups of patients shows that most polcythemic patients do not have a high bilirubin level neither do the patients without polycythemia but the relation between hyperbilirubinemia and polycythemia is significant as shown in Table-4-.

Table-4- The relation of Polycythemia to serum bilirubin level

TSB mg/dl	With polycythemia n.%	Without Polycythemia n. %	Total	p
<6	5 (15.6%)	23 (14.2%)	28	
6-10.99	22 (68.8%)	60 (37%)	82	
11-15.99	5 (15.6%)	57 (35.23%)	62	
16-20.99	0 (0%)	10 (6.17%)	10	0.002
21 and more	0 (0%)	12 (7.45)	12	
Total	32 (100%)	162 (100%)	194	

The most common causes of admission of patients with polycythemia were respiratory distress syndrome followed by transient tachypnea of newborn then hyperbilirubinemia while among patients without polycythemia the leading causes were transient tachypnea of newborn followed by hyperbilirubinemia then respiratory distress syndrome. No significant relation was found between polycythemia and the causes of admission as shown in table-5-.

Table-5- The Disease in the neonate and its relation with Polycythemia

DISEASE	With Polycythemia No. %	Without Polycythemia No. %	Total	p
Transient tachypnea of newborn	7 (21.87%)	51 (31.845)	58	0.42
Hyperbilirubinemia	5 (15.62%)	46 (28.39%)	51	
Respiratory distress syndrome	12 (37.5%)	40 (24.69%)	52	
Hypoxic ischemic encephalopathy	2 (6.25%)	12 (7.4%)	14	
Infant of diabetic mother	2 (6.25%)	2 (1.53%)	4	
Sepsis	4 (12.5%)	4 (2.46%)	8	
Meconium aspiration	0 (0%)	1 (0.61%)	1	
Congenital heart disease with heart failure	0 (0%)	2 (1.53%)	2	
Esophageal atresia	0 (0%)	2 (1.53%)	2	
Total	32	162	194	

Discussion

The incidence of polycythemia in this study is found higher than what was found in other studies in different areas of world. In one study the incidence of polycythemia in neonatal nursery was 14.5% [3] which is lower than in our study possibly because of more risk factors while in other studies the incidence of polycythemia among neonatal population was 5.8%, 8.4%, 3.8% in different studies [1,17,23]

The age of most patients in both polycythemic and normal neonates was in the first two days of life. This agrees with another study that showed that most patients were aged 1-2 days [1] and also other studies that show predominance of polycythemia in the first day of life[8]. The hematocrit increases to reach maximum in the first day and especially in the first two hours of life [8,19].

Most of patients included in this study were male (62.5%). This is close to the results in other studies where male were 55.2% in one study [1] and 57.4% in another one [3].

Although in this study the majority of polycythemic patients neonates were term, the percentage of preterm neonates with polycythemia is significant (43.75%) which is higher than in other studies where it was 15% in one study[17] and 24.8% in another[3] indicating that polycythemia is not uncommon among late preterm neonates.

In this study,43.75% of polycythemic neonates were small-for-gestational age. Although this is lower than in one study where it was 55.5% [17] it is higher than another study where it was 34.6%[3]. This can be explained by that placental insufficiency that causes intrauterine growth retardation leads to in utero hypoxemia and stimulation of erythropoiesis resulting in polycythemia.

Among polycythemic patients, 6.25% had low SpO2 and 34.37% had respiratory distress. This is higher than in other studies where it was 5% in one study, 15% in two other studies [8,20] and 24% in another[3]. This is mostly because polycythemia causes hyperviscosity that leads to decreased pulmonary blood flow resulting in hypoxia and respiratory distress.

A significant percentage of polycythemic neonates in this study(84.4%) had hyperbilirubinemia. This much higher than in other studies where it was 33% [8,18,24] and was 46% in another[3]. This is because the increased breakdown of excess red blood cells produces more bilirubin.

Conclusion

The incidence of polycythemia is higher than in other studies. Male sex and age of first two days predominated in polycythemic neonates. Each of prematurity, small-for gestational age, low SpO2, respiratory distress and hyperbilirubinemia have higher incidence than other studies. Respiratory distress syndrome, transient tachypnea of newborn and hyperbilirubinemia were the three leading causes of admission of polycythemic patients.

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