

Risk Factors and Evidence of Neonatal Polycythemia in Duhok Maternity Hospital a Cross-Section Study

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Abstract

Background & objectives: Polycythemia in the newborn is defined as either venous hematocrit or hemoglobin levels above 65% or 22g/dl, respectively. This study aimed to find the prevalence of polycythemia among those newborns who delivered at Duhok maternity hospital.

Methods: A cross-sectional study was conducted from 1st June to 31st December 2019 for those newly delivered neonates at Duhok maternity hospital. The collected data were included: neonates age, sex, birth weight, gestational age, APGAR score, oxygen saturation, type of pregnancy, type of delivery, occipito-frontal circumference, and their relationships to polycythemia, in this study neonates were halved into two groups (with polycythemia and without polycythemia).

Results: Of total 300 randomly selected newborns, 31 (10.33%) had polycythemia from those neonates; males 16 (51.6%) and females 15 (48.38%). The 2 hours or less aged babies were 18 (58.06%) and it was not significant statically from those with age more than 2 hours 13 (41.94). Polycythemia was higher among products of normal vaginal delivery 27 (87.1%) also was statistically significant. Furthermore, polycythemia was highly significant for those with gestational age 37-42 weeks 15 (48.38%), also the same among those babies with birth weight 2.5-4 kg 18 (58.08%). A 23 (74.1%) of polycythemic newborns were asymptomatic followed by respiratory distress 4 (12.9%). Cyanosis comes later with 2 (6.45%) and poor feeding 1 (3.22%).

Conclusion: Polycythemia is more prevalent among Kurdish newborns in comparison to other nationalities; most babies with polycythemia were asymptomatic followed by respiratory distress, cyanosis, and poor feeding.

Keywords: Polycythemia; Newborn; Duhok

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Introduction

Polycythemia in the neonate is present when venous hematocrit is above 65% and a viscosity value >2 standard deviations greater than the normal [1,2]. The circulating red blood cell (RBC) mass, is seen frequently with abnormal elevation in newborns [3]. Its incidence is reported between 1 - 5% [1,4-6]. In newborns, Polycythemia may be a balancing mechanism for intrauterine hypoxia or secondary to fetal transfusions [7,8]. About 50% of polycythemic newborns appeared with one or more symptoms. However, symptoms mostly are non-specific and may be associated to the underlying conditions rather than due to polycythemia [7,9]. The polycythemia's risk is elevated in those born to mothers who live in high altitudes while it is lower among premature less than 34th week of gestational ages [8,10,11]. The abnormal increase in

hematocrit increases the risk of hyperviscosity, microcirculatory hypoperfusion, and multisystem organ dysfunction [3]. Packed cell volume when compared to cord blood levels, hematocrit levels increase to reach at the 2nd hour of life then a plateau at 2-4 hours of life. At the age of 12 to 18 hours it return to levels of cord blood [1,11]. Therefore it is very important to consider post-natal age for screening for polycythemia. When screened at 2nd hour of life, its incidence may reach 20% while if performed at 12 to 18 hours it may be as low as 2% [1,12]. Polycythemia is not reviewed as a benign condition; the abnormal increase in hematocrit increases the risk of hyperviscosity, microcirculatory hypoperfusion [3], and can impair oxygenation and perfusion of tissue causing damages to vital organs such as kidneys, adrenal glands, and cerebral cortex. So an early diagnosis and prompt treatment is lifesaving matter [10,11,13,14]. Maternal factors

like diabetes, hypertension, cyanotic heart disease, and smoking increase the risk of polycythemia. Polycythemia is also seen in newborns of perinatal asphyxia, twin pregnancy, intra uterine growth retardation, delayed cord clamping, trisomy 13,18,21, congenital adrenal hyperplasia and thyrotoxicosis [10,11]. Most affected infants have no clinical signs of the condition [15], symptoms, when present, often appeared by two hours after birth, after fluid shifts have happened and the hematocrit is highest, onset may be delayed to the second or third day [16].

The most common presentation of polycythemia is plethora, feeding problems and hypoglycemia. Other manifestations like hypotonia, sleepiness, irritability, jitteriness, tachycardia and cyanosis may be seen in some babies [10,11]. Screening is recommended for babies who are small for gestational age, infant of diabetic mother, mono-chorionic twins and large for gestational age because of relatively increased risk of polycythemia in these babies. No further screening is needed if hematocrit <65% at 2 hours of age unless there are symptoms of polycythemia [17]. Literature analysis shows its incidence is significantly high in delayed cord clamped newborns which prevents anemia and raises iron stores; it is beneficial for newborns but it also causes sudden rise in hematocrit level which is harmful. This study aimed to evaluate the prevalence and risk factors of neonatal polycythemia in Duhok city to assess the frequency of polycythemia even in asymptomatic newborns in which cord clamping was delayed.

Patients & Methods

This cross sectional study was done by screening 300 randomly selected newborns delivered at Maternity Hospital in Duhok, north of Iraq during 6 months from 1st June to 31st December 2019. All polycythemic neonates were discovered incidentally by measuring hematocrit which is done together with serum bilirubin measurement in apparently jaundiced newborns. Ethical approval was approved by the Research Ethic Committee of the Directorate of Health. Polycythemia was confirmed by measuring venous hematocrit $\geq 65\%$ [18]. The blood was drained into EDTA anticoagulated test tubes. All hematocrits were measured by cell counter method using (CELL-DYN emerald analyzer-09H39-01 device, France). The participants were divided into polycythemic and non-polycythemic groups. The collected data were included: age of neonates, sex, birth weight, gestational age (as assessed from maternal last menstrual period, ultrasound in the first trimester and Dubowitz examination), APGAR score, oxygen saturation, type of pregnancy, type of delivery, occipito-frontal circumference, congenital anomalies, maternal diseases, and maternal smoking. Data were analyzed by SPSS statistics computer software version 19. The statistical importance of the difference of independent samples was found by t-test. Associations between two categorical variables were searched by cross tabulation. The statistical significance of such associations was explored by Chi-square test of homogeneity and any p-value < 0.05 was regarded statistically significant.

Results

A total number of a randomly selected 300 babies born at

maternity hospital in Duhok. Among of them 31 (10.33%) were polycythemic and 269 (89.67%) were non-polycythemic.

Male newborns were more than females but this difference was not statistically significant ($p=0.547$) **Table (1)**.

Polycythemia was statistically not significant in those who are aging less than 2 hours from those more than 2 hours ($p=0.448$) **Table (2)**.

There was a statistically significant difference between normal NVD and C/S ($p=0.036$) **Table (3)**.

There was statistically significant prevalence in premature babies <37 weeks gestational age ($p=0.001$) **Table (4)**.

Those with LBW has statistically significant high prevalence of polycythemia ($p=0.009$) **Table (5)**.

There was a statistically significant prevalence of polycythemia in those with less than 10th centiles for length ($p=0.001$) **Table (6)**.

Table 1 Gender distribution.

Variable	Total no. of babies	No. of polycythemic babies	prevalence	p-value
Total babies	300	31	10.33%	0.547
Male	153	16	51.6%	
Female	147	15	48.38%	

Table 2 Age distribution.

Variable	Total no. of babies	No. of polycythemic babies	prevalence	p-value
Less than 2 hours	182	18	58.06%	0.448
More than 2 hours	118	13	41.94%	

Table 3 Mode of delivery.

Variable	Total no. of babies	No. of polycythemic babies	prevalence	p-value
NVD	217	27	87.1%	0.036
C/S	83	4	12.9%	

Table 4 Gestational age distribution.

Variable	Total no. of babies	No. of polycythemic babies	prevalence	p-value
Less than 37 weeks	63	6	19.35%	0.001
37-42 weeks	211	15	48.38%	
More than 42 weeks	26	10	32.25%	

Table 5 Birth weight distribution.

Variable	Total no. of babies	No. of polycythemic babies	prevalence	p-value
Less than 2.5 kg	49	11	35.48%	0.009
2.5-4 kg	221	18	58.08%	
More than 4 kg	30	2	6.45%	

Those newborns with OFC more than 90th centile had statistically significant ($p=0.012$) **Table (7)**.

Those with single pregnancy had statistically significant high prevalence of polycythemia ($p=0.001$) **Table (8)**.

In which a majority of selected newborns were a symptomatic 75.3%, while 12% with respiratory distress, 4% cyanosis, 3.3% poor feeding (**Figure 1**).

Table 6 Length distribution.

Variable	Total no. of babies	No. of polycythemic babies	prevalence	p-value
Less than 10 th centile	58	16	51.61%	0.001
10 th - 90 th centile	226	13	41.93%	
More than 90 th centile	16	2	6.45%	

Table 7 Occipito-frontal circumference OFC distribution.

Variable	Total no. of babies	No. of polycythemic babies	prevalence	p-value
Less than 10 th centile	60	12	38.70%	0.012
10 th - 90 th centile	229	17	54.83%	
More than 90 th centile	11	2	6.45%	

Table 8 Type of pregnancy.

Variable	Total no. of babies	No. of polycythemic babies	prevalence	p-value
Single	288	23	74.20%	0.001
Multiple	12	8	25.80%	

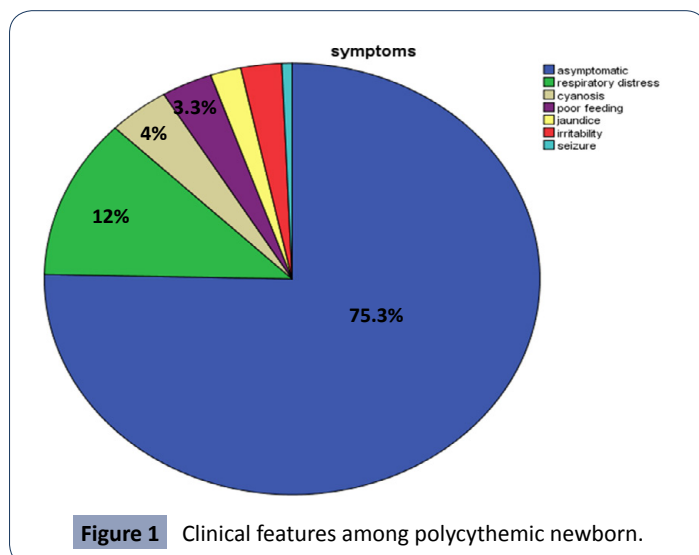


Figure 1 Clinical features among polycythemic newborn.

Discussion

Ten percent of selected newborns has polycythemia which was also observed by Chalabi study (11.85%) [19], but it's higher in comparison with Reisner and Shohat [20] (2%) and much lower incidence had been reported by Mohan (2.28%) [21], some others like Krishnan and Rahim reported somewhat high incidence an incidence of (5.8%, 5.19%) respectively [13,21]. While comparing these results to others seems to be higher may be due to different screening techniques, sample sites (capillary versus peripheral or central venous), mode of delivery, methodology of measuring (coulter counter or centrifuged capillary blood) and sample timing. This compatible result with Chalabi, study may be due to racial relation because both studies were done in Iraqi Kurdish region where most the people are of Kurdish ethnicity, may be due to high altitude geographically, same racial ethnicity, genetic and environmental factors [19]. Significant correlation was found between polycythemia and age of newborns, which was also observed by Shohat [20]. Those babies of cesarean deliveries were at lower risk for polycythemia in comparison to those born by NVD which was also reported by Abbas [9]. There was no significant gender difference as risk factor for polycythemia (male 51.61% and female 48.37%), while Mohan found more females than males [21]. Both small for gestational age and large for gestational age newborns had high incidence in comparison to appropriate for gestational age and significant incidence for those >42 weeks gestational age. This was observed by Hajduczenia [22], Jahazi and by de Waal [23,24]. Premature and postdates newborns were at high risk of developing polycythemia (19.35%, 32.25%) respectively, which was also documented by Abbas[9]. The majority of polycythemic newborns were asymptomatic (75.3%) followed by respiratory distress (12%) cyanosis (4%) poor feeding (3.3%) while Mohan found that the most common presentation was lethargy (61.30%) poor feeding and plethora by (38.70%) cyanosis (22.60%) icterus (19.30%) tachypnea (6.50%) and convulsion (3.20%). Also it wasn't in agreement with Chalabi study who found jaundice (26.4%) [13] jitteriness (20.7%) [16], plethora (13.2%) [25] and respiratory distress (13.2%) [25]. There was partial agreement with study by Singh, who showed lethargy, respiratory distress and jitteriness (11.1%, 14.8%, 25.9%) respectively [26].

Finally, this study will aware pediatrician/obstetrician about most common clinical presentation of polycythemia which will further enable us to intervene earlier to save babies from detrimental effects of hyper viscosity and this will let to know as if delayed clamping should be done or not and will determine various presentations of polycythemia.

Conclusion

Polycythemia is more prevalent among Kurdish newborns in comparison to other nationalities. This study showed neonatal risk factors for polycythemia are who are products of NVD, postdates, and those products of twin pregnancy but with no gender differences. Most babies with polycythemia were asymptomatic followed by respiratory distress, cyanosis and poor feeding.

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