

Original Article

Relationship between Delivery Type and Jaundice Severity among Newborns Referred to Hospital

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Abstract

Background and Aim: Neonatal jaundice affects one of two newborns around the World and occurs when a baby has a high level of bilirubin in the blood. In recent decades, the cesarean section has increased, accompanied by higher neonatal jaundice risks compared with vaginal delivery. This study aimed to investigate the relationship between the jaundice severity and the delivery type and gender among newborns referred to a Qamar Bani Hashem Hospital in Khoy city (West Azerbaijan Province, Iran). **Methods:** In this cross-sectional study, we investigated randomly 309 newborns with asymptomatic jaundice, who referred to the hospital, from 2014 to 2018. The results of laboratory tests were recorded for all participating infants. **Results:** 49.19% of newborns with jaundice were born by cesarean section, and 49.19% were born by vaginal delivery. 141 (45.63%) of babies with jaundice were males, and 168 (54.37%) were females. Mean blood sugar (BS) ($p=0.52$), urea ($p=0.48$), creatinine(Cr) ($p=0.69$), Na ($p=0.46$), K ($p=0.69$), Ca ($p=0.29$), TB ($p=0.58$) and neonatal weight ($p=0.14$) within days 3 to 10 were not significantly different between vaginal delivery group and cesarean section group ($p>0.05$), while direct bilirubin showed significant variations ($p<0.05$). Mean serum direct bilirubin was 0.22 ± 0.07 mg/dL in the normal vaginal delivery group and 0.25 ± 0.09 mg/dL in the cesarean section group ($p<0.05$). Also, the level of K ($P=0.04$) was significantly higher in the male group compared to the female group. **Conclusion:** Based on our study, there is no significant relationship between the severity of jaundice and the type of delivery and gender in newborns.

Keywords: Jaundice; Newborn; Normal Vaginal Delivery; Cesarean; Khoy, West Azerbaijan Province, Iran.

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Introduction

Bilirubin is one of the end products in the catabolism pathway of hemoglobin, and its clinical

importance in newborns is due to its deposition in the skin and causing jaundice (1). Today, icterus or neonatal jaundice is the most common reason for pre-term hospitalization (~80%) and term (~60%)

infants during the first week after birth (2). It is defined as an increasing level of total bilirubin in infants above 5 mg/dL or 86 mmol/L, which is characterized by yellow skin (3). On the other hand, some infants have increasing levels of bilirubin (>25 mg/dL), which could deposit in the brain and cause kernicterus or encephalopathy (4). Early diagnosis of infants with severe hyperbilirubinemia plays an essential role in appropriating jaundice prevention within the first days after birth (5, 6). Since severe hyperbilirubinemia may have critical side effects on newborn health, considerations should be given to its related parameters in infants (7). Some studies have reported that the bilirubin serum level of term neonates delivered by cesarean section was slightly higher than that of babies delivered through vaginal delivery (1, 8, 9). In 2010, Geller et al. showed that vaginal delivery is correlated with lower rates of neonatal jaundice (10). On the other hand, Bulbul et al. reported vaginal delivery as a risk factor for severe jaundice (Bilirubin>25 mg/dL) in term and near term neonates in Turkey (11).

This study aimed to investigate the association of serum level of bilirubin and other biochemical parameters with the delivery type and gender among newborns referred to a hospital in Khoy city (West Azerbaijan Province, Iran).

Methods

The present investigation is a part of a research project conducted at Khoy University of Medical Sciences. In this cross-sectional study, we investigated randomly 309 newborns with asymptomatic jaundice, who referred to Qamar Bani Hashem Hospital in Khoy city (West Azerbaijan Province, Iran), between 2014 till 2018. The criteria for entering the study included the onset of jaundice within days 3 to 29 after birth. The clinical diagnosis of jaundice by the neonatologists and exclusion criteria included the newborns with symptoms other than jaundice, such as tachypnea, fever, and restlessness. Before the study, written consent was obtained from the parents of all participating infants. All data were collected by a checklist which included: gender and

birth weight of infants, age of jaundice, history of jaundice in a sister or brother, type of infant treatment, gestational age (presence or absence of prematurity), type of delivery (cesarean section or vaginal delivery), duration of hospitalization, and the paraclinical information including maternal and neonatal blood groups, Na, blood sugar (BS), Ca, K, Creatinine (Cr), Urea, total (TB) and direct (DB) neonatal bilirubin levels. Urea and Cr were checked with Autoanalyzer (Hitachi 917, Japan) and AUDIT kit using an enzymatic and colorimetric method, respectively. BS, TB, and DB were measurement by Autoanalyzer (Hitachi 917, Japan) and Pars Azmoon biochemical Kits (Iran). Na⁺ and K⁺ were evaluated by Electrolyte Analyzer (Convergys® ISE comfort, Germany). Ca²⁺ was checked with Autoanalyzer (Hitachi 917, Japan) and biosystem kit (Spain) using a colorimetric assay.

Statistical Analysis: All statistical analysis was performed using SPSS software (SPSS Inc., Chicago, IL). Kolmogorov-Smirnov test was used for the detection of data normality. Due to the normality of the data, parametric tests were used. The student's t-test was used to compare quantitative variables between the two groups. Pearson's correlation coefficient (r) test was used to measure the correlation between the two quantitative variables.

Results

In this study, 309 newborns with jaundice were investigated. 147 and 152 of newborns with jaundice were born by cesarean section and vaginal delivery, respectively. The mean ± SD of BS, Urea, Cr, Na⁺, K⁺, Ca²⁺, total bilirubin, direct bilirubin, and weight in both vaginal delivery and cesarean section are shown in Table 1.

As shown in Table 1, there was a statistically significant association between mean direct bilirubin in the cesarean section and vaginal delivery group.

Direct bilirubin levels (P=0.01) were significantly higher in the cesarean section group compared to the vaginal delivery group. Also, the results of Table 1 showed that there was no significant difference in BS (P=0.52), Urea (P=0.48), Cr

($P=0.69$), Na^+ ($P=0.46$), K^+ ($P=0.69$), Ca^{2+} ($P=0.29$), TB ($P=0.58$), and weight ($P=0.14$) between the two groups.

Table 1. The comparison between the mean levels of BS, urea, Cr, Na, K, Ca, TB, DB, and weight in both cesarean section and vaginal delivery groups

Biochemical factors	Vaginal delivery (n=152)	Cesarean section (n=157)	p-Value
	mean±SD	mean±SD	
BS (mg/dL)	67.58±52.13	72.64±61.94	0.52
Urea (mg/dL)	21.65±7.59	22.42±8.14	0.48
Cr (mg/dL)	0.76±0.17	0.75±0.19	0.69
Na^+ (mmol/L)	139.36±4.46	138.54±10.29	0.46
K^+ (mmol/L)	4.53±0.51	4.56±0.49	0.69
Ca^{2+} (mg/dL)	9.67±0.67	9.57±0.71	0.29
TB (mg/dL)	9.23±2.87	9.84±2.73	0.058
DB (mg/dL)	0.22±0.07	0.25±0.09	0.01
Weight (gram)	3362±734.08	3344±793.92	0.14

BS: blood sugar, Cr: creatinine, Ca^{2+} : calcium ions, K^+ : potassium ions, Na^+ : sodium ions, TB: total bilirubin, DB: direct bilirubin.

As shown in Table 2, 141 (45.63 percent) of newborns with jaundice were boys, and 168 (54.37 percent) of newborns with jaundice were girls. The results of Table 2 showed that there was no significant difference in BS ($P=0.18$), urea

($P=0.12$), Cr ($P=0.52$), K ($P=0.07$), Ca ($P=0.36$), DB ($P=0.19$), TB ($P=0.97$) and weight ($P=0.15$) between the two groups. Also, the level of K ($P=0.04$) was significantly higher in the boy group compared to the girl group.

Table 2. The comparison between the mean levels of Na, K, Ca, TB, DB, BS, urea, Cr, and weight in both female gender and male gender groups

Biochemical factors	Female (n=168)	Male (n=141)	p
	Mean±SD	Mean±SD	
BS (mg/dL)	65.32±42.44	76.39±71.51	0.18
Urea (mg/dL)	22.81±9.05	21.20±6.15	0.12
Cr (mg/dL)	0.75±0.18	0.76±0.18	0.52
Na^+ (mmol/L)	140.01±4.74	137.5±10.85	0.04
K^+ (mmol/L)	4.49±0.48	4.61±0.51	0.07
Ca^{2+} (mg/dL)	9.66±0.68	9.57±0.72	0.36
TB (mg/dL)	10.76±2.19	10.77±2.93	0.97
DB (mg/dL)	0.26±0.1	0.24±0.09	0.19
Weight (gram)	3362.2±734.08	3344±793.92	0.15

BS: blood sugar, Cr: creatinine, Ca^{2+} : calcium ions, Na^+ : sodium ions, K^+ : potassium ions, TB: total bilirubin, DB: direct bilirubin.

In Table 3, in the study population, there was significant positive correlation between Cr and Urea ($p=0.000$, $r=0.351$), Na and urea ($P=0.001$, $r=0.217$), Cr and Na ($P=0.038$, $r=0.142$), Ca and

K ($P=0.034$, $r=0.145$), DB and TB ($P=0.000$, $r=0.338$). Also, there were significant negative correlations between Na and BS ($p=0.04$, $r=-0.141$), Ca and BS ($p=0.007$, $r=-0.185$), TB and Cr

($p=0.014$, $r=-0.168$), DB and Cr ($P=0.028$, $r=-0.151$), weight and Cr ($p=0.005$, $r=-0.219$).

Table 3. Correlations among biochemical factors in the entire studied populations

	BS	Ure	Cr	Na	K	Ca	TB	DB	
Bs(mg/dL)	r	1	-.052	-.030	-.141*	-.034	-.185**	-.054	-.052
	P		.449	.659	.040	.618	.007	.431	.448
urea(mg/dL)	r	-.052	1	.351**	.217**	-.019	.039	.071	.027
	P	.449		.000	.001	.786	.572	.304	.695
Cr(mg/dL)	r	-.030	.351**	1	.142*	-.038	-.053	-.168*	-.151*
	p	.659	.000		.038	.577	.441	.014	.028
Na(mmol/L)	r	-.141*	.217**	.142*	1	-.003	-.015	.037	.055
	p	.040	.001	.038		.971	.824	.590	.424
K(mmol/L)	r	-.034	-.019	-.038	-.003	1	.145*	.062	.064
	p	.618	.786	.577	.971		.034	.366	.349
Ca(mg/dL)	r	-.185**	.039	-.053	-.015	.145*	1	.075	.109
	p	.007	.572	.441	.824	.034		.279	.114
TB(mg/dL)	r	-.054	.071	-.168*	.037	.062	.075	1	.338**
	P	.431	.304	.014	.590	.366	.279		.000
DB(mg/dL)	r	-.052	.027	-.151*	.055	.064	.109	.338**	1
	P	.448	.695	.028	.424	.349	.114	.000	

BS: blood sugar, Cr: creatinine, Ca: calcium, Na: sodium, K: potassium, TB: total bilirubin, DB: direct bilirubin.

*Correlation is significant at the 0.05 level (2-tailed). **Correlation is significant at the 0.01 level (2-tailed).

Discussion

In the present manuscript, the bilirubin level of term infants delivered by cesarean section was slightly higher than that of infants delivered through vaginal delivery. We found no statistically significant difference between neonatal bilirubin levels in term infants based on gender (female or male). Our study results also revealed that most neonates with jaundice were female (54.37% vs. 45.63%), which is in contrast with the results of some similar studies. The study of Hasan Boskabadi and his colleagues in Mashhad in 2011 showed that most

neonates with jaundice were male (58.7%) (12). In 2014, Boskabadi et al. investigated that the mean bilirubin level was higher among males compared to the female gender (13). In our study, investigation of the association between gender and bilirubin level revealed that no difference was noted regarding newborns' gender within days 3 to 29 after birth. Also, 147 cases of newborns were born by cesarean delivery (47.57%) and 152 cases by vaginal delivery (49.19%). In the study of Rakhshaneh Goodarzi and his colleagues in an epidemiologic Study in newborns with jaundice reported that most neonates with jaundice were

born by natural delivery (66.1%) (2). Some studies reported that the bilirubin level in neonates before the second day of birth in the cesarean section is lower than natural delivery, which then reverses this ratio. The reason is the use of oxytocin in labor induction, which could increase neonatal jaundice, causing the activity of glucuronyl transferase (14). In the present study, the mean of bilirubin was significantly higher in the cesarean section group compared to the vaginal delivery group and in the boys compared to the girls. This conclusion is consistent with the results of other similar studies. In 2015, Resende et al. reported a higher risk of hyperbilirubinemia among infants delivered by caesarian section, while Bulbul et al. reported vaginal delivery as a risk factor for bilirubin >25 mg/dL (15). We also investigate other biochemical parameters in newborns with jaundice in different groups. We proclaimed that there was no significant difference in BS, urea, Cr, K⁺, Ca²⁺, direct bilirubin, total bilirubin, and weight between the groups of cesarean section and vaginal delivery. We also explored the correlations between biochemical parameters in all studied patients referred to as Qamar Bani Hashem Hospital in Khoy (West Azerbaijan Province, Iran). There was a significant positive correlation between serum direct bilirubin and total bilirubin, but there was a significant negative correlation between serum total bilirubin and creatinine ($r = -0.168$), direct bilirubin, and creatinine ($r = -0.151$).

Conclusion

In the current manuscript, neonatal bilirubin level was significantly higher among newborns in the cesarean section compared to the vaginal delivery. We found no significant association between neonatal bilirubin levels in term infants based on gender (female or male). However, conducting other researches with larger sample sizes is recommended to achieve more reliable data.

Conflict of Interest

The authors declared no conflict of interest.

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