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## Comparative Levels of Total Creatine Kinase and MB-isoenzyme in Cord Blood between Vaginal Delivery and Cesarean Section

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### Authors' contributions

Author ZT performed study design, managing and writing the first draft of manuscript. Author RS helped in data collection and writing the manuscript. Author AF performed the study and statistical analysis. Author AA helped in literature research and writing the manuscript.

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### ABSTRACT

**Aim:** Comparing cord blood levels of total Creatine kinase (CK) and Creatine kinase MB isoenzyme (CK-MB) in newborns delivered by vaginal delivery and cesarean section.

**Study Design:** Descriptive prospective study.

**Place and Duration of Study:** All neonates delivered from September to October 2012 at the obstetric ward of Mousavi hospital. (Zanjan, Iran).

**Methodology:** Total cord blood CK (CK) and MB isoenzyme (CK-MB) was measured immediately after delivery. Rout of delivery and APGAR (Appearance, Pulse, Grimace, Activity, and Respiration) Score were also assessed and all data were analyzed by using SPSS 16.0 software.

**Results:** One hundred and seventy six newborns were recruited (57.4% male and 42.6% female). We found significant association between serum CK-MB level and rout of delivery. There was no significant association between serum levels of total Ck and

CK-MB and APGAR score ( $p>0.05$ ).

**Discussion and conclusions:** This study showed that newborns who were vaginally delivered had elevated CK-MB levels.

*Keywords: Creatine kinase (CK); creatine kinase isoenzyme MB (CK-MB); normal vaginal Delivery (NVD); cesarean section (SC).*

## 1. INTRODUCTION

Creatine Kinase (CK) is an enzyme with important role in energy consumption and saving, especially in muscle tissue. CK has two polypeptide chains of M and B and three isomers of CK-MM, CK-MB and CK-BB. B chain is specific for brain tissue and M chain is specific for muscle tissue. CK is present in the blood in small amounts and it exists at high levels in cells with high energy requirements such as skeletal, cardiac and smooth muscles, it is also found in kidney, brain, neuronal, retinal photoreceptor cells, spermatozoa and sensory hair cells of the inner ear [1-3].

Sometimes CK rising is physiologic and appears during muscle activity and exercise. However some disorders such as myocardial necrosis, acute skeletal muscle atrophy, muscular dystrophy, burns, epilepsy, surgical procedures, streptococcus postpartum infection, Streptococcal toxic shock syndrome lead to CK elevation [4-6].

During pregnancy, maternal serum CK especially isoenzyme CK-BB, increases about 6 times from its baseline levels. Surgical intervention during labor increases the amounts of serum CK. Pharmacological agents such as cocaine, ethanol and halothane are other factors for CK rising [7-10]. Brain damage, low birth weight and skeletal injuries during delivery could be related to higher CK levels in cord blood that returns to normal limits within 24 hours. Persistent high levels may implicate some conditions such as rhabdomyolysis and significant brain injuries [11-16]. Several studies demonstrated different changes in Ck levels during labor and its association with the type of delivery [8, 9,17]. Considering the switching from general anesthesia to epidural anesthesia in cesarean section and altering in methods of delivery, investigate measurement of CK in neonates might be beneficial, The aim of this study was to evaluate cord blood levels of CK and CK-MB during delivery process and compare its levels between Normal Vaginal Delivery (NVD) and Cesarean Section (CS).

## 2. MATERIALS AND METHODS

This study was conducted cross sectionally on 176 pregnant women who were admitted for delivery at Obstetric ward of Ayatollah Mousavi hospital (Zanjan, Iran) from September to October 2012. All patients assigned agreement consent before enrollment in the study. Newborns whose mothers had a history of children with neuromuscular diseases or abortion and newborns with neurological or heart disease and birth trauma were excluded from the study. After delivery 1 milliliter of cord blood was obtained and the total CK was measured with Azmoon Pars kit (Teif Azmoon Pars Co.Tehran, Iran) by auto analyzer device ( Biolis24i Premium, Tokyo Japan) and MB isoenzyme was measured by Kinetic method UV optimized IFCC-DGKC (Minias GLOBE DIAGNOSTICS, Milan, Italy). APGAR score, gender and rout of delivery (CS or NVD) were recorded. Statistical analysis was conducted using SPSS (version 16; SPSS Inc., Chicago, IL). Data

were presented as means  $\pm$  standard deviation and group means were compared by using the student's t-test. The chi-square test was used for qualitative variables.

### 3. RESULTS AND DISCUSSION

According to the results, out of a total of 176 newborns, 57.4% were male and 42.6% were female. All newborns had a gestational age between 38 to 40 week. Four newborns (3.2%) had 5-minute APGAR score 7, and 172 (97.7%) cases had APGAR score 9. Ninety-five (54%), 12(6.8%) and 69(39.2%) newborns underwent Normal Vaginal Delivery (NVD), Elective Cesarean Section (ELCS) and Emergency Cesarean Section (EMCS), respectively. Overall, the mean of total CK enzyme level was  $235.91 \pm 107.03$  U/l and CK-MB was  $54.414 \pm 50.71$  U/l. No significant difference was found in serum levels of total CK and CK-MB between both sexes (0.822).

Total CK and CK-MB In newborns with APGAR scores of 7, was  $257.73 \pm 195.84$  U/l and  $63.255 \pm 46.089$  U/l, respectively. In newborns with APGAR scores of 9, Mean  $\pm$ SD of total CK was  $235.44 \pm 105.10$  and CK-MB was  $54.209 \pm 50.925$ . There was no significant relationship between serum levels of total Ck and CK-MB and APGAR score ( $p > 0.05$ ). Mean  $\pm$ SD total CK in NVD, ELCS and EMCS were  $240.9 \pm 103.361$  U/l,  $233.75 \pm 113.817$  U/l and  $209.62 \pm 100.279$  U/l respectively. Total CK levels had no significant association with mode of delivery ( $P = 0.622$ ). In addition, mean  $\pm$ SD total CK-MB in NVD, ELCS and EMCS were  $68.631 \pm 62.512$  U/l,  $38.087 \pm 23.440$  U/l and  $23.440 \pm 18.321$  U/l respectively. There was a significant relationship between serum CK-MB levels and type of delivery ( $P = 0.0001$ ) Table 1.

**Table 1. Relationship between CK, CK-MB and other variables**

Variable	N (%)	Total CK Mean $\pm$ SD <sup>a</sup>	p- value	CK-MB Mean $\pm$ SD <sup>a</sup>	p- value
Sex	Boy	101 (57.4)	0.196	53.00 $\pm$ 46.81	0.822
	Girl	75 (46.2)		56.32 $\pm$ 55.81	
APGAR scores	7	4 (2.3)	0.682	63.255 $\pm$ 46.089	0.743
	9	172 (97.7)		54.209 $\pm$ 50.925	
Type of delivery	NVD <sup>b</sup>	95 (54)	0.622	68.631 $\pm$ 62.512	0.0001
	ELCS <sup>c</sup>	12 (6.8)		38.087 $\pm$ 23.440	
	EMCS <sup>d</sup>	69 (39.2)		23.440 $\pm$ 18.321	

a: Unit / liter; b: Natural Vaginal Delivery; c: Elective Cesarean Section; d: Emergency Cesarean Section

In our study the Total CK levels had no significant difference in cord blood of neonates during different delivery processes. So far different values for the mean cord CK have been reported based on several factors, including race and muscle mass. On the first day of life  $209 \pm 91$  U/l for Ck considered normal and that is similar to our study. This rate was declining thereafter to almost half by day 10 [17,18]. Ck levels may be affected by other causes; Wu et al. demonstrated that during normal vaginal delivery CK levels of newborns with premature rupture of membranes were significantly higher than healthy control newborns [19]. Some investigations also reported higher total Creatine Kinase level in neonates with cardiac defects or growth restriction [20,21]. In our study we have no sepsis or any neuromuscular disorders that interfered on results. We found lower CK-MB in cesarean section than NVD. It seems more musculoskeletal strain during NVD than CS is the important causal factor in our cases. In compatible to our study Malamitsi and colleagues showed that, CK levels of neonates during NVD were higher than cesarean section which

was mainly attributed to a rise in the CK-MM activity. CK-MB level was also positively correlated with NVD [17]. Although several studies demonstrated higher CK in NVD [22,23]. Other studies did not show any significant relationship between the level of CK and rout of delivery [8,24,25]. According to Sakha and coworkers; CK levels in neonates delivered by cesarean section was higher than those who were born vaginally. There was not any significant rising in CK among neonates delivered by ELCS Compared to neonates delivered by EMCS [26]. Polo-Kantola et al. showed increased risk of Autism and other pervasive developmental disorders during SC [27]. The differences in study design, sample size, method of delivery, and race might be explain these discrepancies. Our study didn't show any significant relationship between serum levels of total CK and CK-MB and APGAR score. Barberi et al. showed that neonatal APGAR is inversely associated with CK elevation and the newborns that had higher CK showed electrocardiographic evidence of myocardial ischemia [28]. The results of several other studies also have indicated an elevated CK in newborns with low APGAR score and prenatal asphyxia [14,28-30]. Lower APGAR in our study was 7 and approximately near to normal range. Therefore, it could not have a significantly effect on CK levels.

#### **4. CONCLUSION**

This study showed that CK-MB isoenzymes levels in newborns delivered vaginally were higher than elective cesarean section. Furthermore, we did not find any association between CK levels and APGAR score. Considering the importance of estimation of brain injury during the first minutes of birth, another study with larger sample size and considering lower APGAR score newborns could help us to clarify this issue.

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#### **COMPETING INTERESTS**

Authors have declared that no competing interests exist.

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