

Original Research Article

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

Shore title: **Comparative Levels of Creatine Kinase in Cord blood**

Abstract:

Background : Low birth weight and skeletal injuries in the delivery process cause elevated CK levels of cord blood . The aim of this study was comparison of cord blood levels of total Creatine kinase and MB isoenzyme between newborn via vaginally and cesarean section

Method: In this prospective descriptive study 176 pregnant women were enrolled . After delivery total cord blood CK and MB isoenzyme were measured immediately and all data were analyzed using SPSS 16.0 software.

Results : Out of a total of 176 newborns 57.4% were male and 42.6% female .There was no significant relationship between serum levels of total Ck and CK-MB and Apgar score ($p > 0.05$), but the association between serum CK-MB level and type of delivery was significant .($p < 0.05$).

Discussion and conclusions: This study showed that CK and isoenzymes levels in newborns delivered vaginally are higher compared to caesarean section. However, the study can not demonstrate that newborns born with lower apgar score had higher levels of CK compared to newborns with high apgar score.

Keywords : Creatine kinase , isoenzyme MB, Normal Vaginal Delivery , Cesarean Section.

Background : Creatine kinase (CK) is an enzyme with a role in the consumption and saving energy, 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 muscle, kidney, brain and neuronal cells, retina photoreceptor cells , spermatozoa and sensory hair cells of the inner ear.[1-3]

Sometime hyper CKemia is physiological and elevated during muscle activity and exercise. However, myocardial necrosis, acute skeletal muscle atrophy, muscular dystrophy, burns, epilepsy , surgical procedures, and streptococcus (GAS) infection, postpartum sepsis, Streptococcal toxic shock syndrome lead to CK rises.(4-6) During pregnancy, maternal serum CK especially isoenzyme CK-BB, increases about 6 times of the baseline level before pregnancy. Surgical intervention during labor increases the amounts of serum CK. Pharmacological agents such as cocaine, ethanol and halothane are other factors increasing CK levels. [7-10] Brain damage, low birth weight and skeletal injuries in the delivery process can cause elevated CK levels of cord blood, which returns to normal levels after 24 hours. , persistent high levels may indicate rhabdomyolysis and significant brain injuries . [11-15] Creatine kinase levels were evaluated among infants in previous studies, considering recent advances in medical science and changing from general anesthesia to epidural anesthesia in cesarean section and altering in methods of delivery, Investigation of CK in neonates might be beneficial, The aim of this study was to evaluate cord blood levels of CK and its CK-MB isoenzyme during the delivery process and compare its level during Normal Vaginal Delivery (NVD) and Cesarean Section.

Method : This prospective descriptive study was conducted in Zanjan Ayatollah Mousavi hospital during the summer of 2012. 176 pregnant women who had been admitted to hospital for delivery were enrolled . All subjects entered the study with written consent.

Newborns whose mothers had a history of children with neuromuscular disease or abortion and newborns with neurological disease, heart disease and certain traumatic child birth were excluded from the study. After the delivery 1 milliliter of cord blood was obtained and the total CK were measured with Azmoon Pars kit (Teif Azmoon Pars Co.Tehran, Iran) by auto analyzer device (**Biolis24i Premium, Tokyo,Japan**). and MB isoenzyme were measured **by** Kinetic method UV optimized IFCC-DGKC (Minias GLOBE DIAGNOSTICS, Milan Italy). Data about the 5-minute Apgar score, gender and type of delivery normal vaginal delivery (NVD) or cesarean delivery (emergency or elective) were recorded . Statistical analysis was conducted using SPSS (version 16; SPSS Inc., Chicago, IL). Group means were compared using the student's t-test. Data were presented as means $\pm$ standard deviation. and chi-square test was used for qualitative variables.

Results : According to the observed 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 weeks. . Four newborns (3.2 %) had 5-minute Apgar score 7, and 172 (97.7%) cases had 9 Apgar score. Ninety-five (54%), 12(6.8 %) and 65 (39.2%) delivered by natural vaginal delivery (NVD), elective cesarean section (ELCS) and emergency cesarean section (EMCS), respectively. Overall , the mean and standard deviation (mean $\pm$ SD)of total CK enzymes level was 235.91 ± 107.03 u/l and CK - MB was 54.414 ± 50.71 u/l. No significant difference was found in serum levels of total CK and CK-MB between the sexes ($p > 0.05$). Mean $\pm$ SD total CK. in newborns with Apgar scores of 7 for total CK and CK-MB was 257.73 ± 195.84 u/l and 63.255 ± 46.089 u/l, respectively. IN newborns with Apgar scores of 9, Mean $\pm$ SD of total CK was 235.44 ± 105.10 and CK - MB was 54.209 ± 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 ± 103.361 u/l , 233.75 ± 113.817 u/l and 209.62 ± 100.279 u/l respectively, Total CK levels had no significant relationship with the mode of delivery ($p > 0.05$) .in addition, mean $\pm$ SD total CK-MB in NVD, ELCS and EMCS were 68.631 ± 62.512 u/l , 38.087 ± 23.440 u/l and 23.440 ± 18.321 u/l

respectively , There was a significant relationship between serum CK-MB levels and type of delivery($p < 0.05$).(table 1)

Discussion: In our study the Total ck levels was not significantly different 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. However, Ck

level on average (209 ± 91) u/l is considered normal on the first day, that is compatible to our study. This rate was declining thereafter to almost half by day 10. [17,18] Several factor could be altered these results. Wu J, 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 were also reported higher total creatine kinase level in neonates with cardiac defects or growth restriction. [20,21] Our study population did not have sepsis or any neuromascular disorders that interfere on results. We found lower CK-MB in EMCS than ELCS and NVD. It seems that the cause of high CK in NVD is that these newborns suffer from more muscle strain. In study of Malamitsi et al , CK levels of neonates during Normal Vaginal Delivery were higher than SC, in which the increase was due to the increase of CK-MM isoenzyme .[18] although several studies showed higher CK in vaginal delivery [22,23]. However some studies did not show Significant relationship between the level of CK and type of delivery . [8,24,25] In study of Sakha and coworkers, mean CK level in neonates delivered via cesarean section was higher than neonates who were born vaginally . However, there was no significant increase in CK among neonates delivered via ELCS Compared to neonates delivered via EMCS.[26] Differences in study design, sample size, method of delivery, and race might be explained these discrepancies. In our study no significant relationship between serum levels of total CK and CK-MB and Apgar score were seen. Barberi et al. showed that neonatal apgar is inversely associated with CK elevation, and the newborns who had higher CK showed electrocardiographic evidence of myocardial ischemia. [27] The results of several other studies also have indicated an elevated CK in newborns with low Apgar score and perinatal asphyxia[14, 27-29] lower Apgar in our study was 7 and approximately near to normal range. Therefore it couldn't have significantly effect on CK levels.

Conclusions: 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 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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Table 1: Relationship between creatine kinase and some variables

Variable		N (%)	Total CK	Mean ±SD ^a	p- value	CK-MB Mean ±SD ^a	p- value
Sex	boy	101 (57.4)	244.90 ± 106.67		0.196	53.00± 46.81	0.822
	girl	75 (46.2)	223.53 ± 107.04			56.32± 55.81	
Apgar scores	7	4 (2.3)	257.73 ±195.84		0.682	63.255 ±46.089	0.743
	9	172 (97.7)	235.44 ±105.10			54.209 ±50.925	
Type of delivery	NVD ^b	95 (54)	240. 9 ± 103. 361		0.622	68.631 ± 62.512	0.0001
	ELCS ^c	12 (6.8)	233.75 ± 113.817			38.087 ± 23.440	
	EMCS ^d	62 (39.2)	209.62 ± 100.279			23.440 ± 18.321	

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

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