Transient newborn hypoglycemia and fourth-grade achievement test proficiency: Association and nomograms

Shasha Bai[1], Nahed O El Hassan[1] and **Jeffrey R Kaiser[2]**
[1]University of Arkansas for Medical Sciences, USA
[2]Baylor College of Medicine, USA

Introduction: Prolonged neonatal hypoglycemia is associated with poor long-term neurocognitive function. However, it is unclear if early transient newborn hypoglycemia is associated with cognitive impairment.

Objective: The purpose of the study was to determine if early transient hypoglycemia (a single initial low glucose concentration, followed by a second value above a cutoff) is associated with subsequent poor academic performance.

Methods: The population consists of a single-center cohort of 1,395 infants born between January 1 and December 31, 1998, at the University of Arkansas for Medical Sciences, who had at least 1 recorded glucose concentration (a universal newborn glucose screening policy was in effect). Medical record data from newborns with normoglycemia or transient hypoglycemia were matched with their student achievement test scores in 2008 from the Arkansas Department of Education and anonymized. Logistic models predicting fourth-grade literacy and math proficiency were developed using initial glucose levels, after controlling for perinatal factors, socioeconomic status and maternal education. We examined the relationship using common hypoglycemia cutoffs (35, 40, and 45 mg/dL). Nomograms, which are graphical representations of logistic regression models, were then developed.

Results & Conclusion: After controlling for gestational age group, race, sex, multi-fetal gestation, socioeconomic status, maternal educational level and gravidity, transient hypoglycemia was significantly associated with decreased probability of proficiency on literacy and mathematics fourth-grade achievement tests. We will also demonstrate the easiness and usefulness of nomograms in facilitating the clinical prediction of an outcome based on the independent contribution of covariates.

SBai@uams.edu

Implementing non-parametric residual bootstrap multilevel logit model with small number of level-2 units

Yunfei Wang and Jichuan Wang
The George Washington University School of Medicine, USA

It is a challenge to model hierarchically structured data with a small number of groups (e.g., level 2 units). When the number of groups is small, standard errors of parameter estimates in multilevel modeling tend to be biased downward, thus inflating the test statistics and the type I error. Although both parametric and non-parametric residual bootstrap approaches have been developed to deal with small number of groups in multilevel modeling with continuous response variables, there are limited approaches available with binary response variables. Here, we have developed a SAS macro by implementing nonparametric residual bootstrap multilevel logit model to analyze binary response variables. Using simulated data, our results show explicit advantage of the nonparametric residual bootstrap approach compared to the default estimator -- Residual Pseudo-likelihood (RSPL) – in SAS Proc GLIMIX with respect to modeling binary response variables in multilevel data with a small number of groups.

yfwang@cnmc.org

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