Prediction Model for Low Birth Weight Neonates

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Introduction

Despite the enormous role of LBW in neonatal mortality and morbidity as well as adolescent and adult morbidity, no clinical attempt is made to predict the possibility of a LBW neonate. A study conducted in Cleveland, Ohio, U.S.A proposed a Four factor scale (low family functioning, stressful events, Quetelet's Index, and cigarette smoking) which predicted the low birthweight with 65% sensitivity, 84% specificity and 42% positive predictive value. The need for such a scale in the Indian context was strongly felt and the present study undertaken with the objective of coming up with a scale to predict LBW in the Indian scenario.

Objectives

To assess the factors associated with LBW and formulate a scale to predict the probability of having a LBW infant.

Methods

Cases were defined as all live neonates weighing <2500g at birth and controls as those e"2500g. Maternal and neonatal data for various risk factors for LBW was collected by personal interview through a structured questionnaire and from hospital records. Data for a total of 250 cases and 250 controls were gathered out of which 200 cases and 200 controls were selected using a table of random numbers and were used to study the risk factors and to arrive upon a prediction model. Validation of the prediction model was then done on the rest of 50 cases and 50 controls. Various statistical tests were employed including Goodness-of-fit test and ROC curve obtained for the prediction model.

Results

Mean weight of cases was 1.99±.41kg vs. controls 3.03±.39kg. 39.6% of the cases were preterm and 63.2% SGA. Factors significantly associated with LBW by multivariate analysis were: weight gained by the mother during pregnancy <8.9 kg (OR, 6.1 [95% CI, 1.3 -27.8]; P=0.019), inadequate proteins in diet (<47 g/ day) (OR, 6.1 [95% CI, 1.2 -36.1]; P=0.044), female sex of the baby (OR, 4.2 [95% CI, 1.1 -16.4]; P=0.039), anaemic mother (Hb<11.0g/dL) (OR, 20.0 [95% CI, 1.6 -246.5]; P=0.020), passive smoking (smoking by father) (more than 5 cig/ bidi per week) (OR, 5.6 [95% CI, 1.1 -29.4]; P=0.043), previous preterm baby (OR, 6.9 [95% CI, 1.4 -33.8]; P=0.017) and previous LBW baby (OR, 6.2 [95% CI, 1.7 -23.3]; P=0.006).On univariate analysis: primigravida, nulliparity, pre-pregnancy BMI <20.621, mother's height <1.5324 metre, inadequate calories (<1667.1 kcal/ day), Educational Status (less than or equal to intermediate), ANC visits <4, pre-pregnancy weight <45 kg, multiple births (twins), hypertension (chronic/ gestational), proteinuria, acute serious infections, recurrent UTI, inadequate spacing (<24 months) and inadequate calories in diet (<1667.1 kcal/day) were also found significant. Having a single live issue appeared protective. Previous abortion did not increase the risk for LBW neonate. Using the above data, a prediction model was then formulated and scores were given to each of the factors: weight gain by the mother during pregnancy <8.9 kg, proteins in diet <47 g/day, previous preterm baby, previous LBW baby, Hb <11.0g/dl in mother and smoking e"5 cig/bidi by father. A cut-off score was then chosen which gave this model a sensitivity of 71.58% and specificity of 66.98%. Validation of the model was done and it revealed a sensitivity of 72.0% and specificity of 64%.

Conclusions

Prevalence of LBW can be reduced by addressing the specific risk factors many of which are preventable. Based on above results, a simplified scale has been developed and validated as a prediction model for LBW.