**Predictors of Weight Gain in Under Five Children With Severe Acute Malnutrition: An Analysis of the Icddr, B Hospital Dataset**

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**Objectives:** Children admitted to hospital with severe acute malnutrition (SAM) and acute illness can be challenging to nutritionally rehabilitate. There is limited understanding on predictors of weight gain during hospitalization in this vulnerable population. This work aimed to predict the weight gain in children using anthropometric, biochemical, clinical, and socio-demographic variables.

**Methods:** We included 5,044 children aged 0–59 months with SAM hospitalized in the Dhaka Hospital at icddr, b between 2011 and 2019. Surveillance data was collected during hospitalization and analyzed retrospectively. The 15% weight gain from hospital admission to discharge was considered as outcome because it is recommended as the transition criteria from facility to community-based management. We trained a Random Forest classifier to identify the best set of predictors of a 15% weight gain. A total of 78 features were considered. The developed diagnostic model was validated based on the area under the curve (AUC) between the true positive and the false positive rates.

**Results:** The classification of data based on the outcome (weight gain $>$ 15%) created unbalanced classes, a larger group with $<$ 15% changes in weight and a very small group with $>$ 15% weight gain. To balance this data disparity, we finally included 263 children in this analysis. A model including 197 children (75% of the dataset) was identified in the training dataset, while the rest were used as a test dataset. Validation in the test dataset revealed an AUC of 69.05% when considering all 78 predictors. Among the top predictors were mid-upper arm circumference at admission, family income and breastfeeding duration.

**Conclusions:** This analysis revealed the role of socio-economic status as well as the importance of breastfeeding practices in attaining 15% weight gain from hospital admission to discharge in under five children treated for SAM. This finding has important implications for future work regarding childhood feeding practices and community-based detection of children with SAM.

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