

Factors associated with chronic kidney disease of unknown aetiology in Sri Lanka

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Chronic Kidney Disease of Unknown Aetiology (CKDu) is a growing public health challenge in Sri Lanka, particularly in the North Central Province. This study aimed to identify risk factors associated with incident CKDu status (yes/no) using data from a longitudinal cohort study in Anuradhapura, conducted between 2018 and 2023. A cohort of 729 participants aged 20–60 years with normal renal function was recruited in 2018 from a 2017 cross-sectional survey. Individuals with diabetes, hypertension, pregnancy, or undergoing cancer treatment were excluded. Data on socio-demographic factors, lifestyle habits, and clinical parameters were collected annually via structured interviews, physical examinations, and laboratory investigations. This is the first longitudinal cohort study in Sri Lanka to assess CKDu risk using advanced statistical methods such as Generalized Linear Mixed Models (GLMM) and balancing of data with Synthetic Minority Oversampling Techniques (SMOTE). Descriptive statistics summarized baseline characteristics. Associations between categorical variables and CKDu were explored using chi-square and Fisher's exact tests. Year-wise logistic regressions identified potential predictors. To address class imbalance, SMOTE was applied in Python. GLMM with a logit link function were used to account for repeated measures and intra-individual variability, making them more appropriate than standard logistic regression in this longitudinal setting. In this cohort, the follow-up rate declined over time, while the cumulative CKDu prevalence rose from 3.8% to 12.4%. GLMM analysis showed that elevated blood pressure (odds ratio (OR) = 10.44, p -value (p) < 0.001; reference: normal blood pressure), hypertension (OR = 2.39, p < 0.001; reference: no hypertension), family history of CKDu (OR = 2.33, p < 0.001; reference: no family history), and family history of diabetes (OR = 2.16, p < 0.001; reference: no family history) were positively associated with CKDu risk. Protective factors included higher education (OR = 0.64, p < 0.001; reference: no formal education), underweight (OR = 0.41, p < 0.001; reference: normal BMI) and overweight/obesity (OR = 0.50, p < 0.001; reference: normal BMI), which were negatively associated with CKDu risk.

Keywords: CKDu, Cohort study, Risk factors, GLMM, SMOTE