Bayesian hierarchical modeling of the individual hypoglycaemic symptoms' reporting consistency

ABSTRACT

Hypoglycaemia symptoms vary between individual and across episodes making it difficult for the patients to realize if they are having a hypoglycaemia. Therefore, the ability to detect the onset of hypoglycaemia is important for quick corrective action. In this paper, we describe a Bayesian hierarchical model which is able to quantify the consistency of reporting symptoms by individual patient and simultaneously investigate patient-specific covariates affecting the consistency. The model is developed within a Bayesian framework using Markov chain Monte Carlo methodology where the consistency parameter is estimated via Gibbs sampling. The association between patient-specific covariates and consistency is investigated using generalized linear model before implementing the stepwise regression to identify the best predictive model. The results obtained show that symptoms classified as autonomic and neuroglycopenic are prominent in detecting the onset of hypoglycaemia. No patient-specific covariate appears to be significantly affecting patients reporting' consistency. However, the best predictive model obtained contains covariates gender, type of diabetes, retinopathy, serum angiotensin converting enzyme and C-peptide.The hierarchical model developed allows researchers to estimate patient's consistency in reporting symptoms and identify factors affecting it under one setting.