

Missing data are frequently encountered in longitudinal clinical trials. To better monitor and understand the progress over time, we must handle the missing data appropriately and thus determine whether the missing data mechanism is ignorable or nonignorable. In this article, we develop a new probit model for longitudinal binary response data. It resolves the well-known weak identifiability issue of the variance of the random effects, and substantially improves the convergence and mixing of the Gibbs sampling algorithm. We further show that when improper uniform priors are specified for the regression coefficients of the joint multinomial model via a sequence of one-dimensional conditional distributions for the missing data indicators under nonignorable missingness, the joint posterior distribution is improper. A variation of Jeffreys's prior is thus established as a remedy for the improper posterior distribution. In addition, an efficient Gibbs sampling algorithm is developed using a collapsing technique. This proposed methodology and the sampling technique are illustrated using real data from an HIV prevention clinical trial. A sensitivity analysis is carried out to assess the robustness of the posterior estimates under different prior specifications and missing data mechanisms. Two model assessment criteria, the deviance information criterion (DIC) and the logarithm of the pseudomarginal likelihood (LPML), are used to examine model fit.