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Modeling Outcome Reporting Bias and Parameter Estimation Using Markov Chain Monte Carlo Method for Meta-analysis on 3 × 2 Tables

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A Meta-analysis, also known as systematic overview, is a statistical procedure in which the results of several independent studies are integrated, with the aim of being able to resolve issues that cannot be concluded from a single study alone. If a comparative binary outcome is being considered, generally it will be possible to construct, a 2 × 2 table, for each study. Methods for analyzing these types of data are well developed. Our interest is to investigate the study results involving two treatments, which can be summarized into 3×2 table. If all outcomes for all 3×2 tables are available, then already available methods of meta-analysis for 2×2 tables can be used to obtain results. However there are some statistical problems in reporting outcomes of 3×2 tables. It has long been accepted that research with statistically significant results is more likely to be published or submitted than non-significant results. This process of publication of outcomes based on their results is called as Outcome Reporting Bias (ORB). This can impact the results of a meta-analysis due to the biasing of the pooled treatment effect estimate. A parametric selection model is proposed to correct the reporting bias in the reporting of outcomes within a study. A Markov Chain Monte Carlo (MCMC) method is proposed to calculate maximum likelihood estimates. Proposed model is applied to an illustrative data set assuming missing data follows missing at random (MAR)[1] mechanism. The computation is done by using WinBUGS, Bayesian software based on Gibbs sampling.

Key words: Meta-analysis, Outcome reporting bias, MCMC, MAR.

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[1] Missingness mechanism does not depend on the unobserved data.