Fasting Blood Sugar Levels and Associated Factors among Diabetes Patients in East Shewa, Ethiopia: Bayesian Approach

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ABSTRACT

Introduction: Majority of diabetes patients fail to achieve adequate level of fasting blood sugar. Therefore, the pre Department of Epidemiology & Biostatistics, Collage of Health and Medical Sciences, Haramaya University, Haramaya, Ethiopia sent study uses a Bayesian framework to identify factors associated with level of fasting blood sugar.

Methods: Institution based cross-sectional study was employed. Markov chain Monte Carlo (MCMC) simulation was used to estimate the model parameters. Summary statistic including mean, standard deviation (SD) and 95% credible intervals (CI) of unknown parameters was calculated from stored MCMC samples.

Result: The mean (±SD) fasting blood sugar level was 151.07 (±38.21) mg/dl. Good Diabetic self-care activities (β=-8.78; HPD CI: (-16.63, -0.93)), having chronic illness other than diabetes mellitus (DM) (β=9.89; HPD CI: (1.39- 18.38)), taking insulin (β=16.82; HPD CI: (4.82, 28.83)) and both insulin and oral anti-diabetic medication (β=32.31; HPD CI: (15.20, 49.37)) and having serious psychological distress (β=15.46; HPD CI: (1.70 – 29.17)) were significantly associated with level of fasting blood sugar.

Conclusions: Diabetic self-care activities, chronic illness other than DM, treatment regimen and depression were strong predictors of fasting blood sugar level among DM patients. Therefore, we recommend that integration of screening & treating for depression & comorbidities and give counseling on diabetic self-care activity along with the already existing DM treatment.

Keywords: Bayesian approach; Diabetes mellitus; Fasting blood sugar; MCMC; Adama

OVERVIEW

This study is focused on assessing the determinants of levels of fasting blood sugar among adult diabetic patients at Adama hospital and medical college by applying Bayesian analysis approach. The study revealed that mean levels of fasting blood sugar of the study subjects was 151±38 mg/dl. This finding is lower than the finding from the study in Jimma [1] and Addis Ababa [2] which reported mean levels of fasting blood sugar of 171± 63 and 190±90 respectively. This discrepancy might be explained by a number of FBS measurements taken. In two previous studies more than one FBS measurement was taken on each study subjects, whereas in the current study only single FBS measurement was taken for each patient.

In the present study levels of FBS is decreased by 8.78 (HPD CI: (-16.63, -0.93)) among DM patients who had a good DSA as compared to those with poor DSA. The possible explanation might be self-care activities are crucial in maintaining optimal level of fasting blood sugar [3].

Level of fasting blood sugar is increased by 9.89 (HPD (CI: 1.39, 18.38)) among DM patients who had chronic illness other than DM as compared to those without other chronic illness and this might be due to patients with associated comorbidities are more likely to have impaired fasting sugar because of impairment in insulin secretion or insulin resistance.

Level of fasting blood sugar is higher by 15.46 (HPD CI: (1.70 – 29.17)) among DM patients who had good serious psychological distress as compared to those who are normal. The possible explanation is that the presence of psychiatric disorders may influence treatment adherence and make DM patients susceptible to impaired glucose tolerance. The other explanation is patients

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with psychiatric disorders are less likely to seek treatment and the delays would result in hyperglycemia ([4,5].

The classical linear regression model has been established and consumed to handle data of this type, and traditionally estimated by using Maximum Likelihood Estimation (MLE). This study announces a Bayesian alternative to estimate the linear, as we believe it delivers several benefits when compared to MLE for this model. For example, as interval estimates receive increasing emphasis in health science research, the common sense interpretation of Bayesian intervals (i.e., credible intervals) provides a strong impetus to adopt a Bayesian perspective.

Our simulation studies show that the Bayesian method performs better in the sense of yielding larger coverage probabilities and smaller bias than the classic maximum likelihood approach. The main limitation is this study was conducted only among patients who were on follow up at Adama hospitals and hence may not be representative for the overall diabetic population.

In conclusions the study revealed mean levels of fasting blood sugar is relatively low. Bayesian linear regression analysis showed that Diabetic self-care activities, chronic illness other than DM, treatment regimen and depression were significant & strong predictors of levels of FBS among DM patients. Therefore, we recommend that integration of screening & treating for depression & comorbidities and give counseling on diabetic self-care activity along with the already existing DM treatment.

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