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Comparison of Parametric and Bayesian Survival Regression Models in Simulated and HIV Patient Antiretroviral Therapy Data: Case Study of Alamata Hospital, North Ethiopia

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Abstract : Background: HIV/AIDS remains a major public health problem in Ethiopia and heavily affecting people of productive and reproductive age. We aimed to compare the performance of Parametric Survival Analysis and Bayesian Survival Analysis using simulations and in a real dataset application focused on determining predictors of HIV patient survival. Methods: A Parametric Survival Models - Exponential, Weibull, Log-normal, Log-logistic, Gompertz and Generalized gamma distributions were considered. Simulation study was carried out with two different algorithms that were informative and noninformative priors. A retrospective cohort study was implemented for HIV infected patients under Highly Active Antiretroviral Therapy in Alamata General Hospital, North Ethiopia. Results: A total of 320 HIV patients were included in the study where 52.19% females and 47.81% males. According to Kaplan-Meier survival estimates for the two sex groups, females has shown better survival time in comparison with their male counterparts. The median survival time of HIV patients was 79 months. During the follow-up period 89 (27.81%) deaths and 231 (72.19%) censored individuals registered. The average baseline cluster of differentiation 4 (CD4) cells count for HIV/AIDS patients were 126.01 but after a three-year antiretroviral therapy follow-up the average cluster of differentiation 4 (CD4) cells counts were 305.74, which was quite encouraging. Age, functional status, tuberculosis screen, past opportunistic infection, baseline cluster of differentiation 4 (CD4) cells, World Health Organization clinical stage, sex, marital status, employment status, occupation type, baseline weight were found statistically significant factors for longer survival of HIV patients. The standard error of all covariate in Bayesian log-normal survival model is less than the classical one. Hence, Bayesian survival analysis showed better performance than classical parametric survival analysis, when subjective data analysis was performed by considering expert opinions and historical knowledge about the parameters. Conclusions: Thus, HIV/AIDS patient mortality rate could be reduced through timely antiretroviral therapy with special care on the potential factors. Moreover, Bayesian log-normal survival model was preferable than the classical log-normal survival model for determining predictors of HIV patients survival.

Keywords : antiretroviral therapy (ART), Bayesian analysis, HIV, log-normal, parametric survival models
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