The liver helps to fight infections and cleans blood. It also helps to digest food and stores a form of sugar in a body uses for energy. Cirrhosis is special state of liver to be get trapped within the sea of scar and struggle to regenerate. It influences the gradual shrinkage of the size of the liver. Liver transplantation is surgery to remove a diseased or injured liver and replace it with a healthy one from another person, called a donor. Orthopedic (solid or whole organ) liver transplantation (OLT) has significantly improved the prognosis in patients with end-stage liver disease and metabolic liver diseases. However, the number of patients requiring OLT far exceeds the number of solid livers available for transplant and the risks and complications of OLT in chronically debilitated, often malnourished, patients are considerable and the financial costs are high during the first year following OLT. Transplantation of hepatocytes into the spleen or liver has been shown to correct inherited defects in metabolism in numerous animal models, to almost completely repopulate a host liver under conditions where the host liver cells have a reduced life-span (as in the FAH-deficient mouse model), to provide hepatic function during acute liver failure induced by a variety of insults and to improve liver function and prolong survival in carbon tetrachloride-induced models of cirrhosis. In liver cirrhosis problem, the duration between transplantation to recover is crucial period for patients. Patients are generally measured through follow up periods with liver functioning effects. The disease severity in patient with liver cirrhosis is measured through the model for end stage liver disease (MELD). It is continuous disease severities scale with highly predictive of the risk of dying from liver. The score is adopted by UNOS (the United Network for Organ Sharing) for use in allocating livers to patients on the liver transplantation waiting list. Set of respondent are divided into two parts as cured and non-cured. The main goal of this work is to look on the cure and non-cured rate among
liver cirrhosis patients through MELD score. The patients alive at any point of times are defined as cured otherwise non-cured. The mixture distribution is useful to formulate the cure rate model. The deep consideration is important on patients’ treatment effects through long term observations. The model is ultimate choice for treatment effect comparison. It is widely applied in the field of economic, reliability and criminology. Recently, Cure rate model in medical research is elaborated and extended. It is applied for AIDs in HIV positive patients. The survival experience is defined with cure rate model. It is also used in the recidivism time among the prisoners in Western Australia. The product of log-normal survival function is appropriate for non-cured portion of patients. The simple log-normal distribution as a choice of mixture model is elaborated. It provides stratified results in drug treatment effect of lymphoma patients. The MELD is useful tool to detect the liver status in patients. It is widely used method for organ allocation in liver transplantation. The score function is formulated with consideration of liver and renal functions. Several studies have concluded that the liver transplanted patients having low MELD score can be influenced for death. There is different biochemical parameters used to calculate the MELD score. Present thesis tries to compare the developed longitudinal and survival techniques to assess the effectiveness of surgical procedures for liver transplantation.

Outline of the work under different chapters of the thesis are given below:

Chapter 1: This chapter serves as an introduction and review of literature of the study. In Chapter 2: we focused on cure rate model, with particular focus on Bayesian counterpart. In cure rate modeling, the group of patients can be directly stratified into cured and non-cured strata. The mixture models are natural choice for estimation of cure and non-cure rate estimation. The estimation of cure rate is an important parameter of success of any new intervention. The cure rate model is illustrated to compare the surgery of liver cirrhosis patients with consenting for
participation HFLPC (Human Fatal Liver Progenitor Cells) Infusion vs. consenting for participation alone group. The MELD (Model for End-Stage Liver Disease) score is considered as response of interest for cured and non-cured group. The primary efficacy of surgery is considered as covariates of interest. Distributional assumptions of the cure rate are solved with Markov Chain Monte Carlo (MCMC) techniques. The risk of death due to liver transplantation in liver cirrhosis patients including time dependent effect terms has also been explored. Finally, this chapter ends by summarizing the result of application. In chapter 3, the effectiveness of treatment is assessed after adjustment of heterogeneity factor. The approach mention in chapter 2 could not account for heterogeneity factor into the model. Hence, this factor has been addressed with the help of shared frailty model. The frailty model consists of two components firstly baseline hazard. If Baseline hazard is known in advance then, the parametric estimation approach can be used advantageously. The second component of frailty model is frailty distribution. In this chapter, we compare the different parametric frailty models namely (Gamma, Inverse Gaussian, Positive stable & Lognormal) with respect to AIC and BIC values on liver transplantation patients. Lastly, the chapter ends up with a discussion of the findings. 4: In Chapter 4, we examine criterion of quasi-likelihood information criterion (QIC) for selecting a working correlation structure, and have compared with the performance of the correlation information criteria (CIC) of the correlation structures on liver cirrhosis patients. The performance of both information criteria are compared by fitting generalized estimating equations (GEE) model, which is popular for analyzing correlated responses. It is important to select a proper working correlation matrix because an inappropriate choice will lead to inefficient parameter estimation. The covariates like therapy and visit are used to predict Meld scores (It is continuous disease severities scale with highly predictive of the risk of dying from liver cirrhosis) in GEE model.
The computation code for CIC is performed into open source software R. The study indicates that the CIC is useful for selecting appropriate correlation structures for liver cirrhosis data from phase III clinical trial. Discussion and conclusions are drawn from the comparison.

Chapter 5: This chapter focuses on technique that is based on selection modeling approach to analyze missing observations. Data setting and necessary notation in terms of the missing assumptions are introduced. The data setting and modeling framework with the emphasis on dropout mechanisms are described. A background to the selection model is provided, followed by descriptions of the selection model and detailed discussion of the linear mixed model and dropout model. An application example including a description of liver cirrhosis data set in the form of a multi-centre clinical trial data used in the analysis is presented. In the current application, the MCMC approach has been used to fit selection model. The results of the estimation of the selection model are then described. In conclusion, a discussion of the results is given. Chapter 6 deals with assessment of agreement between two raters for continuous responses carried out by concordance correlation coefficient. This chapter carries out the Bayesian counterpart to compute concordance correlation coefficient estimator and established the performance of proposed estimator. The methodology is illustrated on Liver Cirrhosis marker data. It is found handy to compute concordance correlation coefficient through application of prior information. In Chapter 7: we give a synthesis of the study. The findings are summarized and conclusions are derived from the preceding chapters. For future work on the applications, relevant recommendations are made. A reference list is given at the end of the thesis.