Conclusion and Future Scope of Work

9.1 Conclusion

Major Depressive Disorder (MDD) is a serious illness responsible for many loss of life in suicides in the population and are lifelong recurrent problem in most of the cases. The remission between episodes is often not complete increasing the risk of recurrence. In major depressive episodes each new episode is a function of previous episodes with an evolving course and treatment response (Post 1992b). As of 2012, there is no permanent cure for depression but the disease can be controlled with medicines (antidepressant) and psychosocial treatment.

Traditionally however, mental illness has received very little attention in comparison to other serious physical diseases. It is hoped that if the appropriate level of research is made in major depressive disorder leading to establishing the exact cause of the illness and eventually leading to a complete cure would evolve to be a feasible goal for the near future.

In this thesis, an endeavour has been made to study some aspects of depression from a statistical point of view and come up with results which would prove beneficial in proper understanding and planning of modules. Discussions with psychiatrists have been maintained all along while conducting this study.

In Chapter 1, a detailed discussion of the type of MDD, its course and dimensions were dealt in length. Research carried out on the various concepts and theories of Major Depressive Disorder has been applied in this thesis, followed by definition of mathematical tools used.

In Chapter 2, it is observed that the occurrence rate of depressive episodes in the patients is shown to be increasing over the years. The collected data shows a sharp increase in the
occurrence rate of depression since last six years, which is actually an alarming situation for the state of Assam (North East India).

In Chapter 3, the results of multiple linear regression models revealed that sex, socioeconomic status, family history and education contribute significantly to the prediction of the patients suffering from depression. Age, marital status and occupation do not show any significant effect on the occurrence of depression.

The results of ordinal logistic regression models revealed that socioeconomic status and occupation are negatively associated with severity of MDD i.e., for low socioeconomic status and for the unemployed patients the degree of severity is higher. There is no statistically significant affect of age, sex, family history, education and marital status on severity of MDD.

In Chapter 4, the estimation of odds and indices of diagnostic tests in depression are calculated by applying Bays’ theorem.

The prior and posterior odds of the socio-demographic variables of the data collected for ten years from GMCH reveal the following –

- Severe and moderate depression in female is observed to be more whereas mild depression in female is less in comparison to male.
- Severe depression is more likely to occur for those patients who have positive family history.
- Married people suffer more from depression than the unmarried people irrespective of status of depression.
- Educated people suffer from depression irrespective of status of depression.
- There is a substantial increase of employed people suffering more from mild depression than moderate and severe depression.
- People belonging to middle class suffer less than those of lower middle class people for all status of depression.
Large number of patients suffers from depression in the age group less than 45 years.

Bayesian theory is used for computing diagnostic values such as sensitivity, specificity and accuracy for a certain diagnostic test and predictive values are obtained to make decisions.

The relevant data collected from 2000 to 2009 for this study reveals the following:

- **Sensitivity** = 67.6%. This is percentage of patients remitted with good prognostic factors.
- **Specificity** = 82.1%. This is percentage of patients not remitted with bad prognostic factors.
- **Accuracy** = 71.3%. This is percentage of patients correctly assessed and diagnosed.

The time between occurrences of two successive depressive episodes plays an important role. In Chapter 5, the expected number of episodes \( M(t) \) is an increasing function of time \( t \), if time to occurrence follows increasing hazard rate (IHR) or constant hazard rate distribution. The expected number of renewals \( M(t) \) can be arranged in ascending order, viz. Exponential, Uniform, Weibull and Rayleigh distribution. That is the behaviour of random variables between two successive depressive episodes shows that the expected number of episodes is least when \( t \) follows exponential distribution and maximum when \( t \) follows Rayleigh distribution.

In Chapter 6, the occurrence and recovery of a depressive episode follows alternating renewal process. The resulting process tends to Poisson process as time between occurrences of two successive depressive become large.

Chapter 7 and 8 are dealt with cause specific depression. Here two specific causes are considered. Different situations have been elaborately studied when the specific causes affect the patients with different hazard rates. The pattern of the depressive episodes may be of help to the psychiatrists to predict the time to occurrence of depressive episodes and act accordingly.
The efforts were made to form a mathematical concept of the different aspects of MDD and the possible consequences of this work have been presented. The results obtained by analyzing the collected data have been found to be in conformity with the available literature. It is hoped that the present study may be of help to the doctors and researchers in giving a new direction to the study of MDD and in framing treatment strategies for depressive patients.

9.2 Future scope of work

While carrying out this research work, it has been felt that there is perhaps immense scope for further research on MDD. However, it is not possible to incorporate all aspects in one thesis and therefore following areas of possible future research work on this topic have been suggested.

- The collected real life data provides limited information, so the study could not be extended to various directions. However for detailed study in future the data can be simulated by using R language.
- Instead of socio-demographic variables, symptom variables can be used to study their impact on MDD. A parallel study can be performed in the future by applying logistic and ordinal logistic regression analysis with the symptoms of MDD.
- Chapter 5 and 6 dealt with renewal and alternating renewal processes. It was not possible to use real life data for analysis of these processes due to limitations of scope of such data. For this, the data has to be simulated from stochastic process for analysis.
- As far as parametric statistical inference is concerned, parameters of renewal process may be estimated by using M.L.E or method of moments. However it is not possible to obtain the closed form expression for the estimators, for this purpose Newton’s Raphson Scoring numerical method can be used. This can be identified as a future work.
• In this thesis the occurrence of depressive episodes by only two specific causes are considered. In future this can be extended to the occurrence of depressive episodes due to multiple causes, which will result in analyzing multivariate distributions.
• Disease and depression related work can be studied in future.
• A nonparametric approach can be undertaken by considering a discrete time set up in place of the continuous set up considered in this thesis.