CHAPTER 6

CONCLUSION

The analysis of HRV gives an inside view of an individual’s health and the also acts as a predictor of cardiac status of the individual. It also helps in the assessment of the functioning of ANS. The HRV data obtained shows that HRV was reduced among Smokers, Alcoholics and subjects suffering from life style modifying diseases like stress, diabetes and hypertension. This concludes that there were changes in the ANS and the balancing act done by Sympathetic and parasympathetic was altered. This leads to lot of diseases including premature cardiac death.

The heart rate was higher among addicted and in stressed subjects, compared to the normal subject’s heart rate. The LF/HF values denote the ANS functions. The LF/HF value was around 1.2 in nonsmokers and it was around 2.5 among smokers. The increase in LF/HF values denotes decrease in the activities of Parasympathetic nervous system and rise in the activity of Sympathetic nervous system among smokers. The TINN value was around 130 among nonsmoking subjects and around 50 among smoking subjects. The nonlinear methods like Poincare plot will give the advantage of visual analyzing of the parameters. Poincare plot clearly distinguished between the alcoholics by analyzing the location of points in the ellipse of the Poincare plot. In alcoholics, the points of the Poincare plot will be concentrated at the centre of the ellipse and in nonalcoholic the points will be more concentrated along the periphery of the ellipse. The Approximate Entropy value was less than one in alcoholics and in nonalcoholic the entropy showed values greater than one. The increased LF/HF value in alcoholics denotes the rise in sympathetic nervous system activities and decrease of the parasympathetic activity which will be lesser in alcoholics subjects. Linear methods such as mean of R-R interval at various time intervals were analyzed. This indicated increased sympathetic tone, and decreased parasympathetic tone, the percentage on NN50 was around 36 percent in nonalcoholic and in alcoholics it was around 8 percent. The Detrended Fluctuation analysis clearly differentiates between the alcoholics and non-alcoholics by studying the points along the line of the plot. In non-alcoholic subjects the points were aligned along the line of the plot, where as in alcoholic subjects, very few points were aligned along the line of plot. The low frequency power lies around 624ms$^2$ in nonalcoholics and around
1103ms² in alcoholic subjects. The Shannon Entropy values were around 2.5 in nonalcoholics and for alcoholic subjects it was around three. The above value clearly distinguished the two data sets under study among alcoholics and non-alcoholics. Therefore, the present work quantifies the nonlinear behavior of autonomous cardiac regulations. Sophisticated techniques from nonlinear systems dynamics and theories which are chaotic were applied for the analysis of HRV for diagnosing CVS diseases.

The performance of the proposed methodology was experimented considering various samples of the subjects. The overall health of the cardiac system can be obtained by using the linear and nonlinear HRV analysis. Hence the SD1 and SD2 values of Poincare plot were lower in nonsmoking subjects compared to the smoking subjects. Thus HRV can forecast the illness that can be caused because of smoking. Nonlinear parameters obtained can distinguish the ECG signals from alcoholics and non alcoholics. Thus extracted parameters can be considered as a model in detecting alcohol. The parameters of HRV not only detect the illness but can also predict the possibility of getting a disease. Youth with stress showed signs of early cardiac autonomous neuropathy, reduced overall HRV and parasympathetic loss with sympathetic override. Both, in diabetic and hyper tensioned subjects, the HRV were found to be decreased compared to the HRV of normal subjects.

**Scope for Future Work**

There is a further need of study to quantify the readings of ANS. Further study is required to quantify the effect of addiction, drugs and stress on other organs as ANS not only controls CVS but also other systems in the body such as RS, GIS etc.