INTRODUCTION

"Sleep that knits up the ravell'd sleave of care. The death of each day's life, sore labour's path, Balm of hurt minds, great nature's second course, Chief nourisher in life's feast"

Macbeth, 2. ii. 37
Sleep -wakefulness is a complex paradigm of a constellation of events. Since time immemorial, sleep has been known to be important to life. Although an objective characterization of sleep has been done relatively recently, mention of the stages of sleep can be found in the ancient texts, the Upanishads. The four states of consciousness has been described in the Mandukya Upanishad as a) jagrat: state of awareness and awake consciousness; b) sushupta: deep sound dreamless sleep; c) swapna: dream sleep state and d) thuriya : higher state of consciousness.

Based on various electrophysiological parameters, the modern literature classifies sleep into two stages- Non Rapid Eye Movement (NREM) and Rapid Eye Movement (REM) sleep. The NREM sleep is characterized by the presence of high voltage, low frequency waves and spindles in the EEG; while the REM sleep is characterized by the presence of low voltage and high frequency waves in the EEG, rapid eye movements, hippocampal theta rhythm, PGO waves and absence of tone in postural muscles. The REM sleep occupies only 10-15% of the total sleep time. This stage of sleep is believed to have evolved as early as 300 million years ago. Since REM sleep is conserved during evolution, its function is likely to be very basic to life. Although the precise mechanism of generation and function of REM sleep are not known, evidence so far suggests that it serves very important physiological function(s) and therefore, it cannot be ignored.

The functions of REM sleep have been investigated by studying the effects of its deprivation on the parameters under consideration. REM sleep deprivation is followed by longer periods of sleep, in which REM sleep occupies a larger percentage of sleep time. Longer periods of REM sleep deprivation is fatal. REM sleep deprivation causes fatigue, irritability, aggressiveness and lack of concentration. Subsequent electrophysiological studies showed that REM sleep deprivation caused a decrease in threshold to seizures and electroconvulsive shocks. This indicated that REM sleep deprivation increases brain excitability.
This aspect was studied further at single neuronal level, where it was shown that REM sleep deprivation affected the neuronal excitability, as revealed by alteration in neuronal firing rates.

Recent studies showed an increase in membrane bound Na-K ATPase activity after REM sleep deprivation. This increase in Na-K ATPase activity is likely to be due to an increase in level of NE. Also, REM sleep deprivation has been reported to affect neuronal calcium levels and membrane fluidity, which are known to regulate Na-K ATPase activity. Since this enzyme maintains transmembrane potential, the REM sleep deprivation induced increase in neuronal excitability may be due to NE mediated increase in Na-K ATPase activity. Based on isolated indirect evidence, it has been proposed that REM sleep deprivation induced NE mediated increase in Na-K ATPase activity may be mediated partly by adrenoceptor and partly by calcium. However, since the cellular mechanism of REM sleep deprivation induced NE mediated increase in Na-K ATPase activity was not known, in this study, an attempt has been made to investigate the same.

The thesis has been divided for convenience, into four sections: review of literature, materials and methods, results obtained and discussion of the results in view of the existing knowledge.