Memory function is not unique to human beings. Memory is an active system that receives, stores, organizes, alters and recovers information (Baddeley, 1990, 1996). It is the way in which individuals’ record the past for later use, in the future. Memory has been found to be strongly correlated with good physical health. Research clearly shows that people with cardiovascular disease, diabetes, and untreated hypertension have cognitive impairments. Although mild age-related memory loss is considered normal, more severe memory impairment is not. Aging causes memory impairment but the truth is that it has a wide range of causes including medical disorders, medications and even life style factors. Several health problems are now known to cause memory loss and increase the risk of dementia. Some of these problems, such as diabetes and hypertension, become more common with age and, together with age-related changes in the brain, help explain why people might become more forgetful as they age. Cognitive impairment i.e., decline in mental functions, includes short and long-term memory, and is often associated with changes in language, logical thinking and personality. Neuropsychological research with brain damaged patients has provided insight into the specificity of neural areas and functions in memory.

The present research was planned to study the effect of diabetes and hypertension on memory because these are the largest health care problems in terms of prevalence, cost and the physical and psychological burden it places on individuals living with the illness. In 2006, according to the World Health Organisation, at least 171 million people worldwide suffer from diabetes. These two chronic disorders occur throughout the world. WHO has warned that there is a real danger of India becoming the diabetes capital of the world. Kearney et al. (2005) reported the total number of adults worldwide who had hypertension in 2000 was 972 million (333 million in economically developed and 639 million in economically developing countries). The number was predicted to increase to 1.56 billion by 2025.
In addition, review of literature clearly indicates that there are quite extensive data linking the profound effect of diabetes and hypertension on memory, though at present it appears virtually impossible to draw any firm conclusion about the specificity of memory impairment in diabetics and hypertensives. In view of the above, the following problem was formulated:

**Problem:** Specificity of memory impairment in diabetics and hypertensives.

**Objectives:** The objectives of the present investigation were as follows:

1. To study the memory functioning of diabetics and hypertensives as compared to normal controls.
2. To study the impact of co-morbidity of diabetes and hypertension on memory functioning.
3. To study the effect of severity of diabetes and hypertension on memory functioning.
4. To study the specificity of memory impairment in diabetics and hypertensives.
5. To study the role of neuropsychological functions and lobe functions in memory impairment observed in diabetics and hypertensives.

**Hypotheses**

1. Memory functioning of diabetics and hypertensives would be significantly lower as compared to normal controls.
2. Co-morbidity of diabetes and hypertension would increase the severity of memory impairment.
3. Severity of memory impairment would increase with severity of disease (diabetes/hypertension).
4. Memory profile of diabetics would be significantly different as compared to hypertensives.
5. Neuropsychological and lobe functions of diabetics and hypertensives would be significantly lower as compared to normal controls.

6. Co-morbidity of diabetes and hypertension would increase the severity of neuropsychological and lobe functions impairment.

7. Severity of impairments in neuropsychological and lobe functions would increase with severity of disease (diabetes/hypertension).

8. Impairments in neuropsychological and lobe functions of diabetics would be significantly different as compared to hypertensives.

A purposive sample of 190 adults (age range: 45 to 60 years) was selected for the present study. Among these 160 respondents (mean age 52.23 years, SD 3.93 years) were selected from the patients suffering from diabetes/hypertension while 30 respondents (mean age 53.2 years, SD 3.18 years) were selected from non-diseased population. The patients were taken from the OPD’s of private medical practitioners of Rohtak, Rewari and Bhiwani districts of Haryana while normal controls were mostly the attendants of the patients who met the inclusion-exclusion criterion. The minimum duration of the patients’ disease was 3 years. The minimum educational level of all the respondents was secondary (matriculation) level. The patients who were taking beta blockers or insulin and patients with other chronic diseases were excluded from the study.

In order to achieve the objectives of the present investigation, quasi-experimental group designs (two groups/three groups) were used.

For the assessment of respondents, the following tools were used:

- Personal Data Form, Raven's Standard Progressive Matrices (SPM), Wechsler Memory Scale – III (WMS – III) and AIIMS Comprehensive Neuropsychological Battery

The measures of personal information, memory, and neuropsychological functions of all the respondents were obtained. A measure of general intelligence
Summary

was also obtained in order to match the patients and normal controls on a premorbid intelligence level.

All respondents were informed about the nature of the assessment procedure and signed the appropriate informed consent form. Patients who voluntarily agree to participate in the study were administered the four measures, at their residence individually in a quiet room. These four measures were administered in two sessions i.e., measure of personal information, general intelligence, and memory were administered in the same sequence on first day and measure of neuropsychological functions on second day. The blood glucose/blood pressure of all the respondents was also measured before testing on each day.

Scoring was done with the help of the manual for each item. Then, these scores were statistically analyzed. To analyze the data, descriptive statistics, one-way Analysis of Variance (ANOVA)/one-way Analysis of Covariance (ANCOVA) were applied.

Main Findings

- Diabetics and hypertensives have significant global memory impairment in comparison to normal controls.

- Co-morbidity of diabetes and hypertension caused subtle dysfunctional impact on six memory indexes (auditory immediate, visual immediate, immediate memory, auditory delayed, general memory and working memory) in comparison to sole diabetes and hypertension.

- Diabetics uncontrolled performed poorer on auditory immediate, visual immediate, immediate memory, visual delayed and general memory than the diabetics controlled.

- Hypertensives uncontrolled have profound deterioration in auditory immediate, visual immediate, immediate memory, auditory delayed and working memory as compared to hypertensives controlled.
Across disease comparison in both controlled and uncontrolled condition revealed that diabetics have specific impairment in visual delayed memory and hypertensives have specific impairment in auditory immediate and working memory.

Diabetes and hypertension also caused global deterioration in neuropsychological and lobe functions when respondents of both diseases were compared with normal controls.

When both diseased-groups were compared with each other, diabetics have more decline in sensory-perceptual functions (tactile functions, visual functions, reading and writing) and in right sensory-motor lobe as compared to hypertensives.

Co-morbid respondents have increased severity of impairment in higher cognitive processes (arithmetic, memory and intellectual processes) and in left frontal lobe as compared to sole diabetic respondents.

Co-morbid respondents also have subtle decay in sensory-perceptual functions (tactile, visual, reading) and in both right and left sensory-motor lobes as compared to sole hypertensive respondents.

Severity of diabetes (uncontrolled condition) increased the severity of dysfunction in sensory-perceptual processes along with deficits in right and left hemisphere as well as in both right and left frontal and sensory-motor lobes, right parietal-occipital and right temporal lobe in comparison to diabetes in controlled condition.

Hypertensives uncontrolled showed greater deterioration in motor functions, intellectual processes, right and left hemisphere and greater erosion of left frontal and left sensory-motor lobe as compared to hypertensives controlled.

No specificity was found in neuropsychological and lobe functions in across disease comparison in controlled condition. However, specificity was found in uncontrolled condition as diabetics uncontrolled performed
worse on sensory-perceptual tasks and on right sensory-motor and right temporal lobe as compared to hypertensives uncontrolled and similarly hypertensives uncontrolled performed worse on higher cognitive functions (memory scale) and on left frontal lobe in comparison to diabetics uncontrolled.

Thus, the present results verify the eight hypotheses postulated in Chapter III. In nutshell, cognitive and neuropsychological erosion found in diabetic and hypertensive respondents may have important practical implications for daily activities, including effective working ability for these patients. These findings may have implication for disease education and self-management behaviour in these patients.