ISSN 0975 - 6299 Vol 2 / Issue 3 / Jul - Sept 2011

International Journal of Pharma and Bio Sciences

RESEARCH ARTICLE PHARMACY PRACTICE

POTENTIAL RISK FACTORS FOR COGNITIVE DECLINE IN DIABETIC COHORT

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ABSTRACT

OBJECTIVE: The objective of the study was to evaluate the association between Gender, Age and Social habits with regard to Cognitive dysfunction in Diabetic patients. Research Design: The study is a randomised prospective study on 500 diabetic patients of various socio demographic characteristics, extending over a period of eighteen months with baseline and follow up's scheduled at every six months intervals with the aid of Mini Mental State Examination (MMSE scale). Results and Conclusion: Among Diabetic patients studied for cognitive dysfunction with regard to our study objective, it was evident that older Diabetic patients exhibited a potential decline in cognitive function, further more there was as significant impact of diabetes on cognitive function with regard to gender. Women with diabetes marked a high level of cognitive decline than men of the same age group. The study concluded that a social habit imparts a significant risk to cognitive functioning.

KEY WORDS

Cognitive dysfunction, Diabetes, Mini Mental State Examination, Socio habits, Gender and Age.

INTRODUCTION

The prevalence of diabetes varies markedly among countries [1,2], and this is attributed to a combination of ethnic, cultural, environmental economic and social risk factors such as diet, level of obesity, physical activity and age distribution [3–7] of which Age, Gender and Social habits have been considered as a potential risk factors in this study of cognitive decline in diabetic cohorts. There is now substantial evidence from longitudinal aging studies that cognitive impairment with advancing age is a negative predictor of subsequent survival [8, 9]. This association appears in many studies to remain even after adjusting for medical conditions and self-rated health and therefore, has been attributed to the effects of decreased biological vitality [10, 11]. The more distal explanation of the cognition is that higher levels of cognition are associated with higher socioeconomic status leading to earlier diagnosis, better chronic disease management [12].In this study we evaluated the association between Gender, Age and social habits with regard to Cognitive decline in Diabetic patients. Thus far no long term large prospective study has specifically examined for the possible effect modification by these factors on cognitive function in diabetic cohorts.

RISK FACTORS ASSOCIATED WITH COGNITIVE IMPAIRMENT:

The increase in the number of elderly with difficulty in cognitive function will be substantial. Until now, there have only been limited data on cognitive function in Asian population [13, 14, 15, 16] , while prospective data on risk factors are even more limited [16]. We have attempted to investigate the predictive factors with regard to cognitive function in diabetic cohorts, with regard to diabetes as done in a study which demonstrated the effect of age, sex ,low education as a prediction model on cognitive decline [17], researchers found that presence of disease such as diabetes, hypertension and use of psychotic medication were predictive of cognitive decline[18,19]. It is well established that impairments in cognitive functioning are often seen with advancing age but that such a decline is not an all-or-nothing phenomenon. That is; age does not seem to affect all areas of cognition and all older adults in the same way [20,21], closer examination of specific cognitive functions indicates that some cognitive abilities are affected by age to a greater extent than others. For example, Ryan and Geckle's study [22] of relatively young older adults with diabetes (mean age 51 years) showed that some psychomotor slowing was present but that learning, memory, and problem solving were unaffected. Psychomotor slowing was assessed by a combination of cognitive tests that included the Digit Vigilance [23] test measuring sustained attention, the Digit Symbol [24] test measuring visual attention and learning, and the Embedded Figures [25] test measuring visuospatial analysis without a motor response. The work of Cosway et al [26] found no evidence of cognitive impairment in a relatively youthful group of people with diabetes (mean age 57 years).

With the rapid rise in the number of older persons suffering from dementia and the associated care burden, there is an increasing interest in maintaining cognitive health in later life[27], it would be important to examine factors influencing change in cognitive function over time[28].Recently, there has been a growing emphasis on the identification of risk factors and development of primary prevention strategies for promoting cognitive health [29] studies suggest that positive health behaviours, such as non-smoking [30,31], and moderate alcohol consumption [32] are associated with a decreased risk of cognitive decline. Evidence for gender differences in level of brain

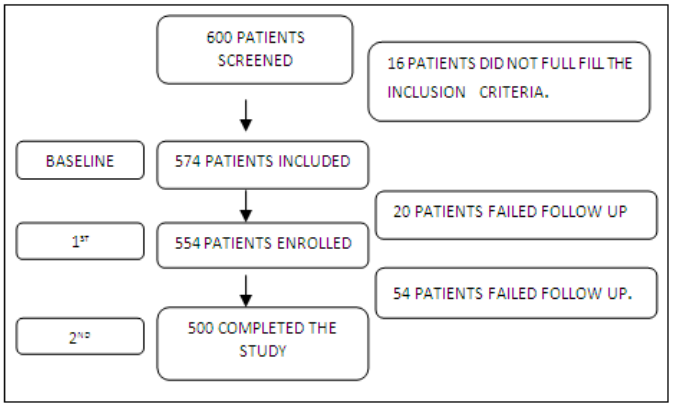
functioning comes from a study on the structure of the brain [33]. The study observed a more pronounced atrophy with advancing age in men than in women, suggesting that women are less vulnerable to age-related changes in cognitive abilities than men. Only a few other studies have focused on gender differences in the cognition mortality link [34]. In some studies, women perform better than men with respect to memory functioning [35] and men show better results on reasoning [20]. Results concerning gender differences in decline of cognitive function and in cognition related mortality risk varies [34, 36].

2. METHODS

2.1 STUDY POPULATION AND DATA COLLECTION

The study was based on complete patient data including the data collection form used. The prospective study among diabetic cohort, both men and women living in and around the district of Coimbatore, Tamilnadu, India belonging to varying socio economic status was studied over a period of 18 months.

Flow Chart for the Patient Inclusion during the Baseline and Follow up Period of Six Months



2.2 ETHICAL CLEARNCE

The study was approved by the Ethics Committee of M.S. Chellamuthu Trust and Research Foundations, Madurai, Tamil Nadu, India. Patients were informed that the information they provided was confidential and would be presented only as group information without any identifying characteristics. Written informed consent was provided by all patient participants prior to entry into the study.

2.3 MEASURES OF COGNITIVE PERFORMANCE

Cognitive functioning in the cohort was measured by using the MMSE scale (MINI MENTAL STATE EXAMINATION). The scale was administered on every subject and data recorded from baseline to the second follow up. The data were statistically analysed for the influence of gender, age and social habits on cognitive functioning in diabetic cohort. A pilot study was done prior to the study, to standardise the scale as per the study environment.

2.4 STATISTICAL ANALYSIS

A statistical power analysis was performed before the study start. It was calculated that 500 patients would be enough to detect significant differences in cognitive functioning (>5 points/dimension) in the OPTIMAL-study, with a power of 80%. In order to compensate for a potential loss of 10% of patients during the course of the study, we intended to include 600 patients at the start of the study.

Statistical analysis was done using SPSS V11 on windows xp plat form. Means of continuous measures across categorical variables were tested using t-Test and analysis of variance (ANOVA).

RESULTS

Among the 600 patients screened 16 patients did not full fill the inclusion criteria. A baseline was marked with 574 patients; the data were collected from patients as per ethical consideration after receiving the concern form. After six months interval the 554 patients were studied with the same questionnaire as used in the baseline with similar environmental factors as that of the baseline.

The remaining 20 patients failed to appear for the follow up. The study was repeated after the prescribed duration of six months interval with the same cohort and data were recorded, 500 patients completed the study. The cohort consisted of 350 men and 150 women with earlier screened diabetes.

Table 1
ANOVA test for TMMSE Score Vs Age

Age	TMMSE Base					
	N	Mean	SD	SE	F-value	P Value
35-40 years	73	25.36	4.65	0.54	3.365	0.019 (Significant)
41-50 years	200	24.57	4.54	0.32		
51-60 years	148	26.27	2.80	0.31		
60 above & 70 below	79	21.53	5.03	0.41		
Total	500	24.94	4.52	0.20		
	TMMSE First Follow up					
35-40 years	73	25.27	4.66	0.55	2.979	0.031 (Significant)
41-50 years	200	24.60	4.43	0.31		
51-60 years	148	26.13	2.81	0.32		
60 above & 70 below	79	22.46	5.02	0.41		
Total	500	24.90	4.47	0.20		
	TMMSE Second Follow up					
35-40 years	73	25.10	4.76	0.56	2.957	0.032 (Significant)
41-50 years	200	24.31	4.40	0.31		
51-60 years	148	25.82	2.89	0.33		
60 above & 70 below	79	22.40	4.84	0.42		
Total	500	24.63	4.50	0.20		

**total MMSE score*

The above table shows significant difference with respect to various age groups in TMMSE base, 1st follow up and 2nd follow up. In all cases age is a significant variable. But in the final follow up. Patient of age group above 60 years exhibit a significant decline in cognitive function. It is statistically proved by the obtained mean value and p-value (P<0.05).

Fig 1
Mean score for TMMSE score on the basis of Age

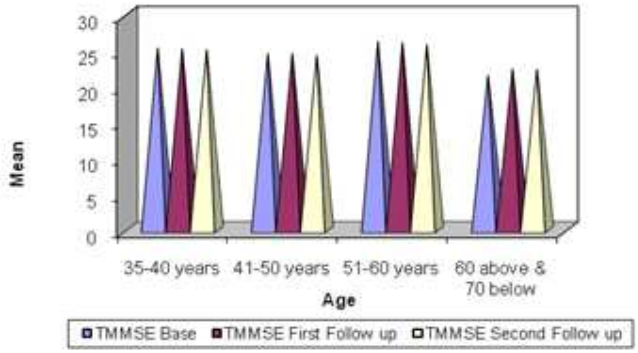


TABLE 2
t-test for TMMSE Score Vs Gender

Gender	TMMSE Base					
	N	Mean	SD	SE_M	t-value	P Value
Male	350	25.18	4.54	0.24	1.843	0.066 (Not Significant)
Female	150	24.38	4.43	0.36		
	TMMSE First Follow up					
Male	350	25.19	4.48	0.24	2.241	0.026 (Significant)
Female	150	24.22	4.39	0.36		
	TMMSE Second Follow up					
Male	350	24.93	4.48	0.24	2.295	0.022 (Significant)
Female	150	23.93	4.47	0.37		

**total MMSE score*

Referring the statistical result's that of the Total MMSE scores, the male and female groups differ significantly in cognitive function. Since P<0.05. In 1st and 2nd follow up. It is clear that men and women with diabetes have a significant difference in cognitive function due to the fact that the p<0.05. To add up, the mean value of diabetic women with regard to Total MMSE fall drastically and significantly with each follow up, proving that diabetic women are more prone to cognitive dysfunction than that of diabetic men of the same age group.

Fig 2
Mean score for TMMSE Score on the basis of Gender

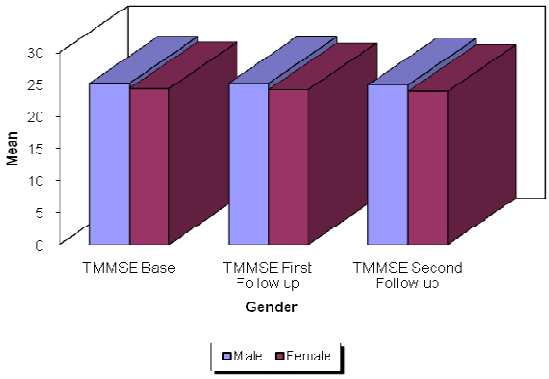


Table 3
t-test for TMMSE Score Vs Social habits

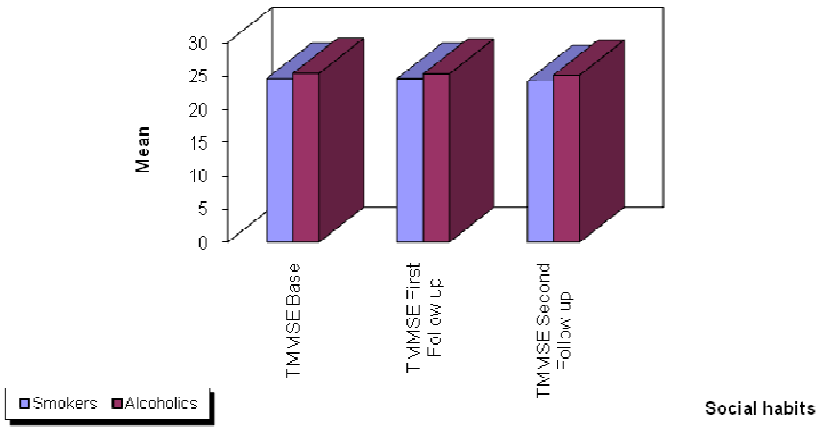
Social habits	TMMSE Base					
	N	Mean	SD	SE_M	t-value	P Value
Smokers	266	24.59	4.71	0.29	1.852	0.065 (Not Significant)
Alcoholics	234	25.34	4.27	0.28		
	TMMSE First Follow up					
Smokers	266	24.58	4.64	0.28	1.724	0.085 (Not Significant)
Alcoholics	234	25.26	4.25	0.28		
	TMMSE Second Follow up					
Smokers	266	24.23	4.61	0.28	2.110	0.035 (Significant)
Alcoholics	234	25.08	4.32	0.28		

**total MMSE score*

The above results of (P<0.05) depict that social habits have a significant role in cognitive dysfunction in diabetic cohort, the fact that smokers exhibit a more drastic decline in cognitive function than that exhibited by cohorts who consumed alcohol.

Fig 3

Mean score for TMMSE Score on the basis of Social habits



DISCUSSION

As for now only limited studies have studied on the cognitive function in Asian population [13, 14, 15, and 16].The findings of this randomised prospective study on diabetic cohorts indicates that that cognitive impairment varies remarkably among diabetic individuals through study on cognitive function as measured by the MMSE.

With substantial evidence from aging studies that cognitive impairment with advancing age is a negative predictor [8]. Considering this fact the study was done to investigate cognitive performance of diabetic individuals of varying age, sex and social habits.

The study justifies that age imparts a vital role in cognitive functioning of diabetic cohorts. Patients in the age group of 60 and above have a marked decrease in cognitive functioning than the other age group. This may due to vascular health declines related with age [37]. The study also observed a more pronounced atrophy with cognition in diabetic women than in diabetic men, suggesting that diabetic men are less vulnerable to changes in cognitive abilities than diabetic women. Only a few other studies have focused on gender differences in the cognition [18].

Considering the fact that cognitive decline in diabetes was not subjected to studies on social habits, our study had proven that diabetic cohorts with smoking and alcohol consumption had a potential decline in cognitive performance. The results interpret that diabetic patients are greatly influenced on cognitive function with regard age and gender, it is vital to consider the importance of early diagnosis of cognitive function and cessation of smoking for proper diabetes management.

CONCLUSION

With the prevalence of diabetes in epidemic proportions, WHO predicts that developing countries will bear the brunt of this epidemic in this century. With an estimated 50.8 million people with diabetics, India has the largest population, followed by china with 43.2 million. The International Diabetes Federation has reported that the 50.8 million diabetic subjects in India in 2010 would rise to 87 million by the year 2030.

Thus far no long term large prospective study has specifically examined for the possible effect modification of cognition in diabetic patients in India. With Diabetes becoming an emerging threat and a burden to the country's economy it is vital that

screening for cognitive dysfunction; be made as an integral part of the assessment process for subjects with diabetes mellitus.

Evidence of significant decrease in cognitive functioning of diabetic patients with regard to Age, Gender and social habits paves way for need of a remarkable change in diabetes management. It is highly necessary that subjects with diabetes be screened for cognitive functioning at the earliest, considering the fact that diabetes requires high level of self management especially for better compliance.

The study emphasis that diabetic patients require a renewal in the social habits, patients need to be educated regarding the cognitive effect of diabetes so as to enable patients manage their diabetes with ease. Future studies should aim to employ longitudinal designs to clarify more carefully the relationship between diabetes and cognitive function and better identify risk factors for developing cognitive dysfunction.

ACKNOWLEDGEMENT

We would like to thank Dr Balamurugan Ramanathan ,Kovai Diabetes Speciality Centre & Hospital, Coimbatore for supporting the study.

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