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Research Article

INFLUENCE OF LITERACY, OCCUPATION AND HEREDITARY ON COGNITIVE FUNCTIONING IN DIABETIC INDIVIDUALS

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ABSTRACT

Objective: To assess the influence of literacy, occupation and hereditary of diabetes with regard to cognitive functioning of diabetic patients. The study was 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 schedule 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 Diabetic patients with minimal literacy exhibited a potential decline in cognitive function, further more there was as significant impact of diabetes on cognitive function with regard to occupation. Diabetic patients working as private employees marked a high level of cognitive decline than patients who worked in other sectors. The study concluded that literacy, occupation and a positive family history of diabetes imparts a significant role in cognitive functioning of diabetic patients.

Keywords: Cognitive dysfunctioning, Diabetes, Mini Mental State Examination, Literacy, Occupation and hereditary.

INTRODUCTION

Possible predictors of cognitive decline include: age [1], low education [1, 2, 3, 4], diabetes [5, 6, 7, 8, 9]. Education is useful as a measure of a population's socioeconomic status and may reflect nutritional status, health behaviours, or access to health care, factors that may have biological consequences in later life [10]. Individuals with lower educational attainment have increased risk of cognitive decline.

Educational attainment may potentially influence genetic effects on cognitive aging and future neurodegenerative disease [1, 11, 12, and 13]. Some other studies also suggest that the lower educated show faster cognitive decline as they get older than people with a high educational level [14, 15, and 16]. Although several studies have examined the association between age and change in cognitive function over time [17-23] only limited studies have specifically examined the impact of literacy and occupation on cognitive function.

Recently, the association between educational attainment and change in cognitive function over time intervals varying from 3 to 6 years was examined in three population based studies of community- dwelling elderly [24-27]. Each of these three studies used a different method of analysis. All three studies found that low educational attainment was associated with decline in cognitive function over time, with one of the studies finding this association only in women [24]. An understanding of the relationship between educational attainment and decline in cognitive function is particularly important since education has been found to be associated with the prevalence of dementia. Thus, different rates of decline in cognitive performance with education may be a reflection of different real or apparent rates of cognition with education.

The relationship between education and cognitive decline first came to attention in the context of cross-sectional studies reporting prevalence rates of Alzheimer's disease (AD). AD was found to be significantly more common among persons with little or no education than among persons with middle-school or more education. Moreover, these findings emerged from studies conducted in geographically and culturally diverse settings. For example, a survey conducted in France [28] reported that those with little education had a twofold increase in the relative risk of developing dementia, and a study conducted in China [29] reported a threefold increase in the relative risk of developing dementia, when other factors such as age and gender were taken into account. Studies in Italy [30], Israel [31], Finland [32], and Sweden [33] reported similar findings. Some of the latter studies reported that the association was stronger with forms of dementia other than AD, such as vascular dementia

and alcoholic dementia, but all of these investigators observed a relationship between levels of education and evidence of significant cognitive decline. Studies of patients at risk for cognitive decline because of a variety of medical illnesses have led to similar conclusions.

The Multicenter AIDS Cohort Study reported that patients who are seropositive and less educated are three times more likely to display cognitive declines over time than are other patients at risk for acquired immunodeficiency syndrome (AIDS) [34]. Likewise, patients undergoing coronary artery bypass surgery were more likely to demonstrate declines on cognitive testing if they had lower levels of education [35]. In the latter study, the relationship between education and cognitive test score was strongest for tests of memory and conceptualization and weakest for tests of language, suggesting a selective effect of education on cognitive decline. Some other studies also suggest that the lower educated show faster cognitive decline as they get older than people with a high educational level [36 and 37].

Although much research has been done, the pathophysiology underlying this complication is not well understood, and the most appropriate methods to diagnose, treat, and prevent cognitive dysfunction in diabetes have not yet been defined. Diabetes being a hereditary complication it is vital to study the impact of hereditary diabetes on cognitive dysfunction. It is a proven fact that diabetes id a potential cause for cognitive dysfunctioning [38-42].

METHODS

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.

Ethical Clearnce

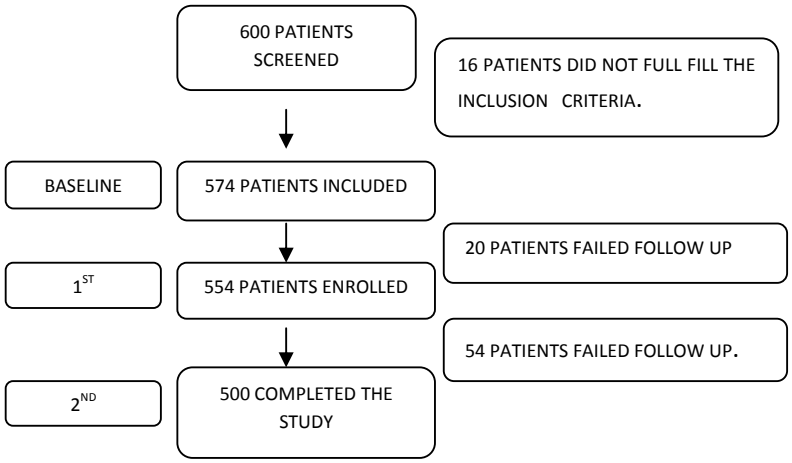
The study was approved by the Ethics Committee of M.S. Chellamuthu Trust and Research Foundations, Madurai, Tamil Nadu, India. Patients were informed that the information they provided was confidential and would be presented only as group information without any identifying characteristics. Written informed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

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 literacy and occupation on cognitive functioning in diabetic population. A pilot study was done prior to the study, to standardise the scale as per the study environment.

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).



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

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 diabetic population consisted of 100 patients who had completed primary education, 138 secondary, 104 higher secondary, 140 patients who had attained a degree or diploma and 18 illiterate patients.

It is inferred from the obtained result that literacy level significantly influence the cognitive function. P<0.05. Patients who are illiterate and primary education show a remarkable decline in cognitive function.

Table reveals that there is a significant difference in TMMSE base, 1st and 2nd follow up on the basis of occupation. P<0.05. Result concluded that private employees (21.95) have a marked decrease in cognitive function than others.

Table 1: ANOVA test for TMMSE Score Vs Literacy

Literacy level	TMMSE Base					
	N	Mean	SD	SE	F-value	P Value
Primary	100	22.29	4.52	0.45	2.847	0.024 (Significant)
Secondary	138	25.35	4.25	0.36		
Higher secondary	104	24.30	4.99	0.49		
Degree/ Diploma	140	25.69	4.38	0.37		
Illiterate	18	21.39	3.63	0.86		
Total	500	24.94	4.52	0.20		
	TMMSE First Follow up					
Primary	100	22.19	4.44	0.44	3.227	0.012 (Significant)
Secondary	138	25.31	4.25	0.36		
Higher secondary	104	24.35	4.84	0.47		
Degree/ Diploma	140	25.65	4.39	0.37		
Illiterate	18	20.94	3.40	0.80		
Total	500	24.90	4.47	0.20		
	TMMSE Second Follow up					
Primary	100	22.16	4.49	0.45	3.579	0.007 (Significant)
Secondary	138	25.09	4.23	0.36		
Higher secondary	104	24.20	4.91	0.48		
Degree/ Diploma	140	25.34	4.41	0.37		
Illiterate	18	20.22	3.17	0.75		
Total	500	24.63	4.50	0.20		

*total MMSE score

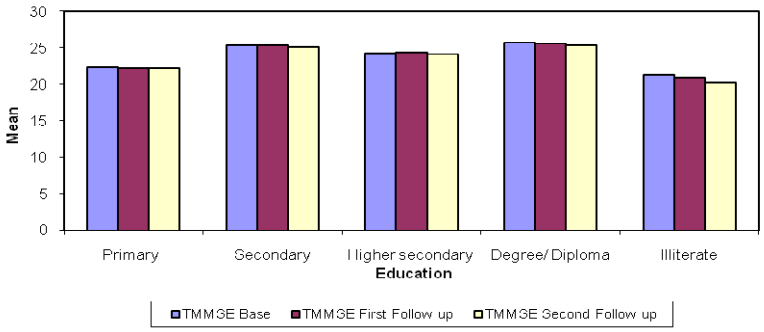


Fig. 1: Mean score for TMMSE Score on the basis of Education

Table 2: ANOVA test for TMMSE Score Vs Occupation

Occupation	TMMSE Base					
	N	Mean	SD	SE	F-value	P Value
Self employee	183	26.39	3.59	0.36	7.304	0.001 (Significant)
Govt employee	65	26.03	3.75	0.46		
Private employee	99	22.16	4.87	0.36		
Unemployed	153	24.48	4.65	0.38		
Total	500	24.94	4.52	0.20		
	TMMSE First Follow up					
Self employee	183	26.42	3.49	0.35	8.095	0.001 (Significant)
Govt employee	65	26.02	3.75	0.46		
Private employee	99	22.14	4.78	0.35		
Unemployed	153	24.33	4.62	0.37		
Total	500	24.90	4.47	0.20		
	TMMSE Second Follow up					
Self employee	183	26.32	3.56	0.36	8.250	0.001 (Significant)
Govt employee	65	25.48	3.88	0.48		
Private employee	99	21.95	4.73	0.35		
Unemployed	153	23.99	4.68	0.38		
Total	500	24.63	4.50	0.20		

*total MMSE score

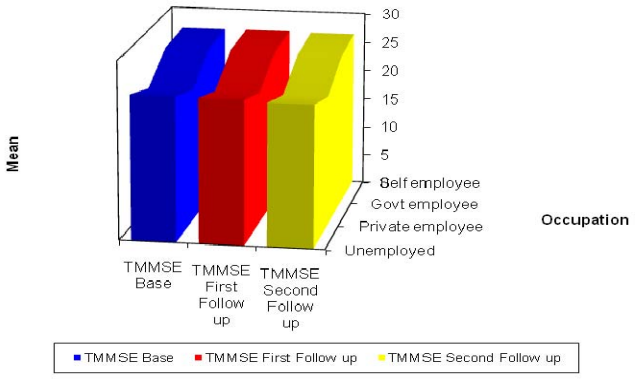


Fig. 2: Mean score for TMMSE Score on the basis of Occupation

Table 3: t-test for TMMSE Score Vs Family history

Family history	TMMSE Base					
	N	Mean	SD	SE_M	t-value	P Value
Yes [+ve]	276	21.72	4.77	0.29	1.981	0.05 (Significant)
No [-ve]	224	25.21	4.19	0.28		
	TMMSE First Follow up					
Yes [+ve]	276	22.20	4.72	0.28	2.101	0.020 (Significant)
No [-ve]	224	25.14	4.13	0.28		
	TMMSE Second Follow up					
Yes [+ve]	276	22.38	4.73	0.28	2.462	0.01 (Significant)
No [-ve]	224	25.93	4.18	0.28		

Result shows that there is a significant difference in cognitive function on the basis of family history [hereditary] $P<0.05$. Further patients who have positive family history (yes) patients have a more incidence of cognitive decline than that of others.

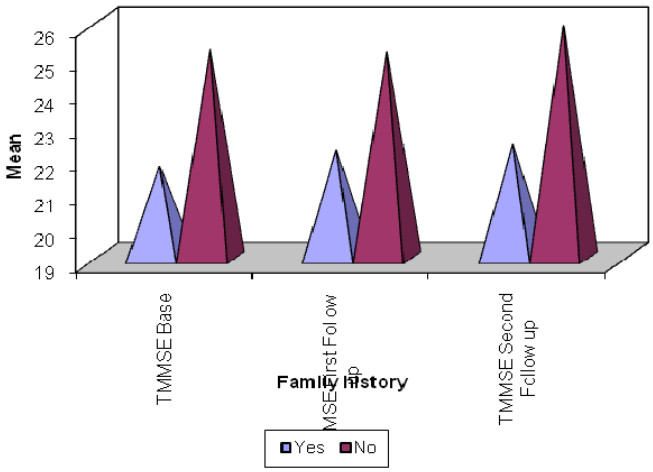


Fig. 3: Mean score for TMMSE Score on the basis of Family history

DISCUSSION

Although several studies have examined the association between age and change in cognitive function over time [17-23] only limited studies have specifically examined the impact of literacy and occupation on cognitive function, our study aimed at examining the role of literacy and occupation with regard to cognitive function in diabetic patients. It is vital that an understanding of the relationship between educational attainment and decline in cognitive function is particularly imparted since education has been found to be associated with diabetes self management. 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 [43]. With developing economical needs of the nation it is necessary to attain better personal disease management especially in diabetes, and thereby it would be important to examine factors influencing change in cognitive function over time [44]. With no more than minimal work done on impact of cognitive function in diabetic patients with regard to occupation, the study has triggered a new era in the management of diabetes. Further it is clearly evident that diabetes requires high level of self management unlike in case of other disease management, thereby it is mandatory for a specific patient oriented approach in diabetes management. Cognitive function being a major criterion that alters the self management in diabetic patients is not considered as a risk factor among diabetic individuals, it is necessary that health care providers impart a more pronounced awareness among diabetic patients regarding the possible effects of cognitive functioning and causes of its decline.

CONCLUSION

The rising prevalence of diabetes poses a major clinical, economical and social burden to India [45]. The metabolic deregulation associated with DM causes secondary pathophysiological changes in multiple organ system [46].The cost of diabetes care is high and is escalating worldwide. There are only spare data available from developing countries on the expenditure on diabetes care. In a developing country like India which lacks a comprehensive health care system, especially the cost of treatment is limited. No uniform norms exist for disease management establishing the need for a minimal biased health care system in the country. Awareness for better diabetes management among patients needs a satisfactory literacy level, with our study proving the impact of occupation and diabetic hereditary on cognitive function ; it is to be a real concern to health care providers that patients be individualised as per there literacy and occupation status and diabetic hereditary.

Long term complications of the disease are extremely concerning thus appropriate therapy is highly recommended [47], that too in diabetes that requires high level of self management. Diabetic patients with minimal level of literacy tend to exhibit a drastic decline in cognitive performance than the other diabetic patients with a relatively high level of literacy. The result on occupational and diabetic hereditary impact on cognitive performance is a mile stone in understanding diversity among diabetic patients and a area of interest in futuristic diabetes management. However the precise mechanism or reason why the private employees have a comparatively drastic decline in cognitive performance was not studied paving the need for more studies in this concern. We conclude that special emphasis needs to be given for diagnosis and treatment of diabetic patients taking into account the individuality of each diabetic patient so as to attain a remarkable cost effective diabetes management.

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