Original Article

Moderating role of diabetes mellitus in older adults: role of depression, attention shifting, task inhibition and working memory

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Objective: To understand the moderating role of diabetes mellitus for depression and executive dysfunctioning (Attention shifting, Task inhibition and Working memory) in older adults.

Methodology: In this quantitative cross sectional study, data of 100 participants were collected through purposive and convenient sampling technique who were diabetic geriatric patients from Lahore, Pakistan. Demographic sheet, Patient Health Questionnaire-9, Encephal App Stroop Test (online application), Mini Mental Status Examination and Ichihara Color Blindness online tests were used.

Results: Type II diabetics were more depressed as compared to type I and people with type II diabetes showed poor attention shifting and task inhibition than type I diabetics. However, working memory, attention shifting and task inhibition showed non-significant results. There was increase in level of depression which further increased and strengthened the relationship of attention shifting and task inhibition on collective and separate level in type 2 diabetes. Independent variables showed no significant effect of moderator as types of diabetes in relation between depression and three types of executive dysfunctioning ($p>0.05$).

Conclusion: There are certain significant differences among type of diabetes and depression as well as executive dysfunctioning in diabetic older adults. Diabetes serves as moderator between depression and executive dysfunctioning in older adults who have type 2 diabetes mellitus. (Rawal Med J 202;45:519-522).

Keywords: Diabetes mellitus, executive dysfunctioning, geriatric depression.

INTRODUCTION

The prevalence of diabetes mellitus in Pakistan is 26.3%.[1] Diabetes is characterized by hyperglycemia resulting from defects in insulin secretion.[2] Performance on executive functioning tests was found to be significantly deteriorated in type 2 diabetic individuals and diabetes and depressive symptoms had a negative effect on executive functioning.[3] There are three core executive functions i.e. attention shifting, task inhibition and working memory.[4] Depression and impaired cognition were identified as major complications among certain other factors which included poor physical functioning, malnutrition, chronic pain and poor self-care.[5]

Executive dysfunction is present in both type 1 and type 2 diabetics.[6] Almost 63% older adults in twin cities of Pakistan are diagnosed with mild to severe geriatric depression that exclusively leads to cognitive dysfunctioning (combination of attention shifting, task inhibition and working memory) among older adults.[7] The relationship between diabetes mellitus, depression and executive dysfunctioning in older adults is relatively lesser explored area in Pakistan. Present study was aimed to explore and understand how diabetes, depression and executive dysfunctioning are associated with each other.

METHODOLOGY

The cross sectional study collected data through purposive and convenient sampling technique after taking approval from Psych Research Cell, GHQ Rawalpindi, Pakistan. Research was conducted from June to September 2019. Initially, a sample of 140 community dwelling older adults (above 55 years of age) with diabetes mellitus was gathered from the community population of Lahore. Participants who are not visual and temporal impaired and were free of Alzheimer and dementia

disorders were taken. After screening for depression, dementia and Alzheimer, a sample of 100 was left for final data analyses.

Demographic sheet and measurement tools i.e., PHQ-9 (Urdu version depression scale), Encephal App Stroop test with Urdu translated guidelines (online mobile app-executive dysfunctioning measuring tool), Ichihara color blindness test (online app, for exclusion criteria), Urdu translated Mini Mental State Examination (for exclusion criteria of dementia and Alzheimer's disease) were used for screening and testing purpose.[7-10]

Statistical Analysis: SPSS version 22 was used to analyze the data. Percentages and frequencies were reported for categorical variables, and means±SD were reported for non-normal continuous data. $p<0.05$ was considered significant.

RESULTS

Total 100 diabetics were in this study with mean age of 60±12.3 years. Among 100 participants, 28 had done graduation, while 29 were educated until masters. 75 were married, 30 were employed and 29 were housewives. 83 had no psychological illness while 57 were having certain physical ailments. 63 of the participants were using both insulin and tablets.

Fig. Attention shifting tasks inhibition.

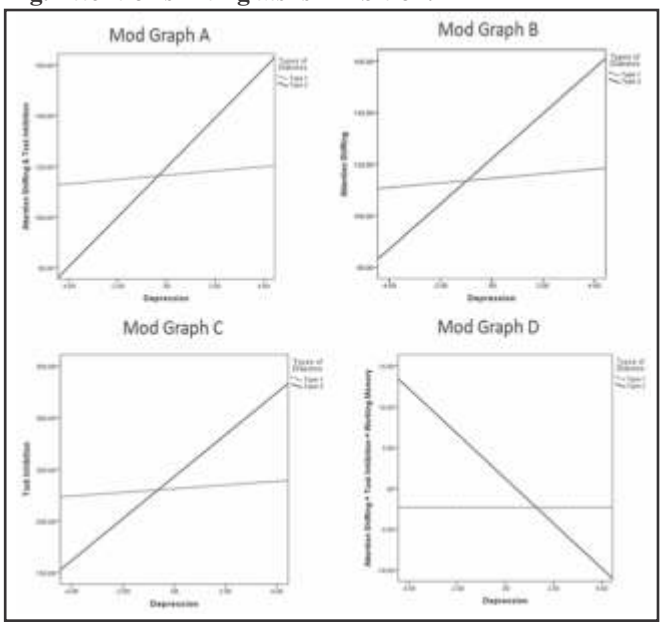

Table 1. Type of diabetes differences on scores of PHQ-9 and Stroop App test among diabetic geriatrics (N = 100).

Variable	Type I (n = 50)		Type II (n= 50)		T	p	95% CI		Cohen's d
	M	SD	M	SD			LL	UL	
Depression	10.7	3.7	12.5	3.5	-2.24	.02	-3.28	-.19	0.49
Attention Shifting + Task Inhibition	108.7	33.3	129.4	49.6	-2.28	.02	-38.8	2.61	0.49
Attention Shifting	111.03	31.4	124.7	43.3	-1.68	.09	-29.8	-2.51	0.36
Task Inhibition	2.27	19.3	4.75	27.7	1.372	.1	-3.2	-17.2	0.29
Executive Dysfunctioning	219.7	61.8	254.2	88.9	-2.09	.04	-67.1	1.60	0.45

There were significant differences of types of diabetes mellitus in older adults on scores of depression (t= -2.24, p=0.02), attention shifting and task inhibition collectively (t= -2.28, p=0.02) and in overall executive dysfunctioning components including attention shifting, task inhibition and working memory (t=-2.09, p=0.04) (Table 1). Older adults with type II diabetes were more depressed and had poor executive functioning when tested separately and collectively as compared to type I diabetics. There was non-significant differences between two types of diabetes when tested separately on level of attention shifting and inhibition of task alone.

Table 2. Moderating role of types of diabetes mellitus in relationship between depression, attention shifting, task inhibition and working memory (n=100).

		Attention Shifting & Task Inhibition	
		95% CI	
Predictor	**B**	**LL**	**UL**
Constant	117.79**	109.51	126.07
Types of Diabetes	2.99	-13.77	19.75
Depression	4.68**	1.14	8.22
Types of Diabetes x Depression	8.91**	.92	16.91
R^2	.07		
F	2.50**		
ΔR^2	.047		
ΔF	4.89*		
		Attention Shifting	
		95% CI	
Predictor	B	LL	UL
Constant	117.51**	110.32	124.70
Types of Diabetes	7.59	-7.09	22.28
Depression	4.05**	.878	7.22
Types of Diabetes x Depression	7.89*	.27	15.52
R^2	.075		
F	2.61**		
ΔR^2	.04		
ΔF	4.22**		
		Task Inhibition	
		95% CI	
Predictor	B	LL	UL
Constant	235.955**	221.31	250.60
Types of Diabetes	11.64	-18.26	41.55
Depression	9.20**	2.74	15.66
Types of Diabetes x Depression	18.54**	3.02	34.06
R^2	.09		
F	2.97**		
ΔR^2	.05		
ΔF	5.62*		
		Executive Dysfunctioning (Attention	
		95% CI	
Predictor	B	LL	UL
Constant	-.94	-5.73	3.855
Types of Diabetes	3.55	-6.24	13.34
Depression	-1.10	-3.22	1.01
Types of Diabetes x Depression	-2.75	-7.83	2.32
R^2	.02		
F	.55		
ΔR^2	.01		
ΔF	1.16		

Types of diabetes significantly moderated the relationship between depression and attention shifting and task inhibition (β=0.8.91**, p<0.001**) collectively; depression and attention shifting (β=0.7.89**, p<0.001**) only and lastly in depression and task inhibition (β=18.54**, p< 0.001**) by explaining 4.7%, 7.5, and 5 % variance, respectively in outcome variables (Table 2). Mod graph A, B, & C (Figure) further elaborates that moderation between depression, attention shifting and task inhibition was carried out by type 2 diabetes (p<0.05) which means increase in level of depression further increases and strengthen the relationship of attention shifting and task inhibition on collectively and separate level in presence of type 2 diabetes.

DISCUSSION

We explored the association between depression and cognitive dysfunctioning in geriatric patients with diabetes mellitus. Chances of depression among diabetics were found to be double as compared to non-diabetic ones.[11] Our results revealed that depression and cognitive dysfunction had certain significant relationships for certain types of socio-demographic variables particularly type of diabetes.

A lot of people recently have been developing type II diabetes and the prognosis is getting better with advancements in treatment interventions. With this, certain new unique issues may emerge which may include multiple factors as cognitive impairment. This cognitive impairment thus may have been developed due to hypoglycemia.[12]

The present study showed that individuals performed poorly on stroop off (attention shifting + task inhibition both) and stroop off plus on (attention shifting only) among type II diabetic individuals. Recent studies have showed that geriatric depression was associated with substantially worse performance on tasks of executive functioning and overall cognition.[7,13] People with type II diabetes perform poorly on tests of memory and learning as compared to people with type I; while both experience the same level of cognitive dysfunctioning.[14] A meta-analysis of 33 studies showed that type 1 diabetes was more linked

to slowing of mental speed and reduced mental flexibility.[15]

Moderation analysis showed that there was a moderating effect of type II diabetes in relationship between depression and attention shifting along with task inhibition in mod graphs. In non-demented patients with type II diabetes mellitus, there is a mild to moderate cognitive decrement in individuals with type II diabetes mellitus. This type of decrement encompassed information processing speed, verbal memory and executive functioning.[16]

CONCLUSION

Patient suffering from type 2 diabetes have high chances of having severe level of depression which leads to more dysfunctioning in attention shifting and task inhibition of a patient.

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