THE EFFECT OF DIABETES AND EDUCATION ON COGNITIVE FUNCTION OF OLDER PEOPLE

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ABSTRACT

The aim of present study was to investigate the effect of diabetes on cognitive impairment of older people in relation to literacy. Total 50 older people were purposively selected from Fotepur Union of Chittagong District. Among them 30 were literate and 20 were illiterate. In each group, diabetic and non-diabetic older participants were equally incorporated. WHO five wellbeing index (WHO-5) was used to measure participant’s psychological well-being. To measure cognitive function, an adapted Bangla version of Mini Mental State Examination (BAMSE) was used. Two-way analysis of variance (ANOVA) was used to analyze data. Results revealed that diabetic older people have better cognitive function than non-diabetic older adults. Secondly, education positively affects cognitive function of older people.

Keywords: Cognitive function, Diabetes, Older people

INTRODUCTION

Cognitive impairment (CI), inability to function well in cognitive activities, is a crucial problem for successful aging. Successful aging is the absence of cognitive impairment as well as preservation of the multi-dimensional cognitive structure that allows the older adult to maintain social connectedness, and the abilities to function independently, to permit functional recovery from illness and injury, and to cope with residual cognitive deficits (Hendrie et al., 2006). CI has emotional, physical and financial toll to family caregivers (CDC 2011). Delayed of this process can reduce the burden to their family. The family provides important resources that sustain the well-being of its members at every stages of the life-course.

CI deteriorates with aging and creates different health problems in old age. Old age is the last part of life and it is the period of life after youth and middle age.

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According to World Health Organization (WHO 1984) old age begins after 55 years. And aging is a persistent decline in the age-specific fitness components of an organism due to internal physiological and psychological degeneration (Baddeley 2002). Psychological ageing is a process that includes the changes in mental functioning, such as loses of memory, reduction of learning capacity, reasoning ability, problem solving capability, and decision making ability (Morgan and Kunkel 1998) which affect their daily activities. Thus, in this stage older people are unable to maintain daily activities due to cognitive changes. Besides, some disorder as well as chronic disorders such as diabetes (CDC 2011) is a risk factor for cognitive impairment. Diabetes is the chronic disorder of the endocrine system in which the body unable to manufacture or proper use of insulin. It is most common chronic illness in the world. Prevalence of the diabetic patient in Bangladesh is about 8.4 million (Desk 2015) and about 10% (Rahman et al., 2015) of them are older people.

Chatterjee et al., (2016) conducted a study on type 2 diabetic women patients and found that type 2 diabetic patient have more than 60% risk of developing the cognitive dysfunction in women. Hazari et al., (2015) conducted a research using event-related potential to find out the relation between duration of diabetes with decreased cognitive function and found that type 2 diabetes, more than 5 year duration, was associated with cognitive deficit. McCrimmon et al., (2012) conducted a study on type 2 diabetic patients and found that in all ages, diabetes increase cognitive dysfunction. Wilson et al., (2002) conducted a study on participation in cognitively stimulating activities and risk of incident Alzheimer disease and found in their study that diabetes mellitus is associated with an increased risk of developing Alzheimer disease (AD) and may affect cognitive systems differentially. Edward et al., (2000) reported that diabetes could also contribute to the cognitive impairment among older women. They also added that women who had diabetes for more than 60 years had a 57% to 114% greater risk of major cognitive decline when compared with those women without diabetes.

Education is another factor that functions as a moderator of cognitive function (Lenehan et al., 2015; Tripp and College 2005). Some researcher argued that there is a little even no relationship between cognitive decline and literacy (Sharrett 2012, Zahodne et al., 2011). Lamottea et al., (2016) conducted study on Dementia with Lewy bodies and found higher education have a protective effect on specific cognitive functions, such as visual constructive performance and verbal retrieval strategies. Godbole et al., (2016) conducted a study on elderly
people in India and found education as a mitigating factor for cognitive deficit. Sharrett (2012) found poor association between educational level and cognitive decline in the elderly people. Glymoure et al., (2012) found in their research that the possible impacts of educational experiences on cognitive change are little and domain-specific. Zahodne et al., (2011) conducted a longitudinal study on 1014 participants and found education to be related to cognitive performance but unrelated to cognitive decline. Baker et al., (2006) found in their study that individuals with inadequate health literacy had worse physical function and mental health than individuals with adequate health literacy.

Above literature showed that diabetes type 2 and its duration are associated with cognitive dysfunction. It is also seen that literacy is positively associated with cognitive function in some specific domain. In another aspect, literacy is not associated with cognitive function. Contradictory finding arises here. It is also seen that most of the researches were done on older women. However, the cognitive function of diabetic older people of Bangladesh is less known. Thus, the aim of this study was to investigate the effect of diabetes on cognitive function in relation to education. It was also well known that education is related with better cognitive function but in case of diabetic patient, how these factors are related with cognitive function was not clearly understood. This study helped to understand the knowledge gap in this context. So it was theoretically as well as practically important to investigate the relation between diabetes and cognitive function with regards to education level in Bangladesh.

The objective of this study was to investigate the effect of diabetes and education on cognitive function of older people. To ensure the objective following hypothesis were framed-

- **H1**: Cognitive function of non diabetic older adult would be better than diabetic older adult;
- **H2**: Cognitive function of literate older adult would be better than illiterate older adult;

**MATERIALS AND METHODS**

**Participants**

68 older people were primarily selected purposively from the Fotepur Union of Chittagong District. Among them, only 50 older participants fulfill inclusion criteria and finally included in this study. 30 were literate and 20 were illiterate. In each group diabetic and non-diabetic older participant were equally included. Their average age was 69.32 years (Table 1).
TABLE 1: DISTRIBUTION OF SAMPLE ACCORDING TO EDUCATION LEVEL AND DIABETES

<table>
<thead>
<tr>
<th>Education level</th>
<th>Diabetic Patient status</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Diabetic</td>
<td>Non diabetic</td>
</tr>
<tr>
<td>Illiterate</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Primary</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Literate</td>
<td></td>
<td></td>
</tr>
<tr>
<td>SSC</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Bachelor</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>25</td>
</tr>
</tbody>
</table>

Instruments Used
Adapted Bangla version of Mini-mental State Examination (BAMSE) (Kabir and Herlitz 2000) test was used in this study. It covers the person’s orientation to time and place, recall ability, short-term memory, and arithmetic ability. Maximum score of this test is 30 and higher score indicates better cognitive function whereas lower score indicate cognitive impairment. Any score greater than or equal to 24 points (out of 30) indicates a normal cognition. Below this, scores can indicate severe (≤ 9 points), moderate (10–18 points) or mild (19–23 points) cognitive impairment. The concurrent validity of the scale is $r = 0.57$ and test-retest reliability is $r = 0.70$. To screen participants WHO Five Wellbeing Index (WHO-5) was used and it measures their psychological well-being at the moment of taking test.

Design
Cross sectional survey design was used for present study.

Procedure
The respondents were contacted personally and their age was confirmed by their national ID card. After taking prior consent, their personal information was recorded and WHO (Five) Well-Being Index (Ware 1998) was applied to ensure their psychological well-being at that moment of collecting data. Finally, participants who scored higher than 12 in well-being test were included in this study and administered BAMSE to them with trained expert. They were tested individually and data were collected at one session in a quiet environment. After collection of data, they were inputted SPSS 16 and analyzed by two-way and one-way ANOVA.
RESULTS AND DISCUSSION
The aim of this study was to find out the effect of diabetes and literacy on cognitive function of older people. In order to analysis the effect, two-way analysis of variance (ANOVA) was done and summary of the ANOVA has been presented in table 2.

### TABLE 2: SUMMARY OF ANOVA OF COGNITIVE FUNCTION (BAMES) SCORE ACCORDING TO DIABETES STATUS AND LITERACY STATUS

<table>
<thead>
<tr>
<th>Source</th>
<th>SS</th>
<th>df</th>
<th>MS</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes Status (A)</td>
<td>154.08</td>
<td>1</td>
<td>154.08</td>
<td>12.62*</td>
</tr>
<tr>
<td>Literacy Status (B)</td>
<td>302.00</td>
<td>1</td>
<td>302.00</td>
<td>24.73*</td>
</tr>
<tr>
<td>A x B</td>
<td>19.76</td>
<td>1</td>
<td>19.76</td>
<td>1.62</td>
</tr>
<tr>
<td>Error</td>
<td>561.83</td>
<td>46</td>
<td>12.21</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>23034.00</td>
<td>49</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*p<0.01

### TABLE 3: DESCRIPTIVE STATISTICS OF COGNITIVE FUNCTION (BAMES) SCORE ACCORDING TO DIABETES STATUS AND LITERACY STATUS

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Response</th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diabetes Status</td>
<td>Diabetic</td>
<td>25</td>
<td>22.88</td>
<td>4.42</td>
</tr>
<tr>
<td></td>
<td>Non diabetic</td>
<td>25</td>
<td>19.04</td>
<td>4.16</td>
</tr>
<tr>
<td>Literacy Status</td>
<td>Literate</td>
<td>30</td>
<td>22.97</td>
<td>4.57</td>
</tr>
<tr>
<td></td>
<td>Illiterate</td>
<td>20</td>
<td>17.95</td>
<td>2.89</td>
</tr>
</tbody>
</table>

Table 2 shows that there were significant main effect of diabetes ($F = 12.62$, df = 1/49, $p < 0.01$) and literacy ($F = 24.73$, df = 1/49, $p < 0.01$) on cognitive function. The results indicate that cognitive function of diabetic (22.88) older people is significantly different from the cognitive function of non diabetic (19.04) older people. Our first hypothesis states that cognitive function of non diabetic older adult would be better than diabetic older adult but the findings rejected our first hypothesis. This finding contradicts with (Zilliox et al., 2016). It is found here that despite being a risk factor of cognitive deficit, diabetes did not affect older peoples’ cognition. The possible causes might be the awareness and control of diabetes. It is evident that to control diabetes people need to maintain a routine physical activity and dietary. Physical activity (Kramer and Erickson...
2006) and dietary (Witte and Fobker 2009) improve cognitive ability despite having diabetes. Older adult with diabetes can maintain their cognitive functions by monitoring of blood glucose; eating healthy meals; engaging in physical activity; taking medications as directed; recognizing and managing hypoglycemia; performing proper hygiene, including foot and dental care; attending medical appointments; and understanding sick-day management (Ogbera and Adeyemi 2011). It is common that people with well cognitive function are able to control their physical problem which positively affects their health. The findings of the present study have provided a new insight for the diabetes of older patient in Bangladesh.

The results also indicate a significant difference between cognitive function (CF) score of literate ($M = 22.97$) older people was better than the cognitive function of Illiterate ($M = 17.95$) older people. Our second hypothesis was $H_2$: Cognitive function of literate older adult would be better than illiterate older adult which is supported by this result. Older people with education have better CF than those who have no education. So, education positively affects cognitive function of older people in this study. This finding is in the line with Alewijn and Jules (1995). Education improves cognitive function in a variety of ways. Education may increase competency, improve reading, math, and reasoning skills, as well as problem solving abilities of older adults. At the same time, education improves brain function by creating greater number of synapses. Individuals with higher education may enter old age with a greater synaptic density which enriches their cognitive function (Diamond 1988). Educated older people are hypothesized to process tasks more efficiently than non-educated older people (Stern 2002) because they make more efficient use of brain networks.

REFERENCES


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