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Original Article

Salivary Acetylcholine Concentration and Dementia: A Comparative Study in Dhaka City of Bangladesh

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Abstract

This comparative cross sectional study was carried out to evaluate the relationship of salivary acetylcholine concentration with the events of dementia during the period of July 2014 to June 2015. For this study total 120 respondents were selected purposively. Among them 60 respondents were suffering from dementia (Diagnosed by medicine specialist) and rest 60 were without dementia selected as comparison group.

Out of all study subjects, mean(±SD) age of dementia patients was 73.10(±4.93) years with the age range of 62 to 84 years and that of in comparative group was 71.20(±5.89) years with the age range of 64 to 85 years. Male (60.0%) was predominant in dementia patients. The mean(±SD) value of Salivary acetylcholine in dementia group was found 153.93(±98.04) pg/ml and that of in comparative group was 411.50(±112.50) pg/ml. Here Salivary acetylcholine was found lower in dementia patients than comparative group and therefore it can be concluded that salivary acetylcholine level can help to diagnose the risk of development of early dementia.

Keywords: Dementia, Acetylcholine, Salivary acetylcholine, Bangladesh

Introduction

Dementia is rapidly becoming the major public health problem worldwide, as the prevalence of dementia is rising day by day. Therefore, early diagnosis of dementia is necessary to limit as well as early management of physicians.

Dementia is derived from Latin word demense means "without mind". It was first discovered by German neurologist Alois Alzheimer's in 1906. Global prevalence of dementia from all causes to be between 5% and 7% of adults age 60+.[1] The biggest risk factor for dementia is age. Epidemiological data shows that dementia is more prevalent in the people with low education level. Alzheimer's disease (AD) is the most common form of dementia.

The worldwide number of dementia in 2010 is about 35.6 million and expected to double after every two decades, this number will be estimated nearly about 76 million in 2030 and 135.4 million in 2050.[2]

Bangladesh bearing the world's eighth-largest population of more than 160 million, the expected number of people over 60 years is projected to be increase to 9% by 2025 and 21% by 2050. The burden of people with dementia is presumed to enhance dramatically.[3]

The pathology of alzheimers disease involves deficit in acetylcholine, the presence of neurofibrillary tangle and the formation of senile plaques.[4] Acetylcholine (Ach) was the first neurotransmitter to be identified by Henry Hallett Dale in 1915. In early stages, the cholinergic neurons primarily undergo degeneration and result in a notable decrease in acetylcholine. Studies revealed that in patients with alzheimers disease, AChE activity was appreciably lower than in their age matched counterparts, suggesting the salivary level of cholinergic activity could be a biomarker.[5]

In dementia a high prevalence of acetylcholine deficiency is found. So it can be assumed that acetylcholine concentration could play a potential role in pathogenesis of dementia. But there was scarcity or lack of information in this prospect in context of Bangladesh. So, this study has been planned to find out the relationship of salivary acetylcholine level in the patients with dementia in Dhaka city of Bangladesh.

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Materials and Methods

This comparative cross sectional study was carried out to evaluate the relationship of salivary acetylcholine concentration with the events of dementia during the period of July 2014 to June 2015. For this study total 120 respondents were selected. Among them 60 respondents were suffering from dementia (Diagnosed by medicine specialist) and rest 60 were without dementia selected as comparative group. Dementia group patients were selected purposively from the Bangladesh Institute of Research and Rehabilitation for Diabetes, Endocrine and Metabolic Disorder (BIRDEM), National Institute of Neuroscience (NINS) and Dementia Care Project of Sir William Beveridge Foundation. The other without dementia group also selected purposively from the BIRDEM General Hospital, Dhaka. A structured questionnaire was filled up for each patient to collect socio demographic data. Salivary acetylcholine concentration was measured in bed side of the patient by using ELISA kit (which was collected from abroad) from both group. After taking written consent a saliva sample was collected and then centrifuge sample for 20 minutes at 1000×g at (2-8)ºC. Supernatant parts was collected and carryout the test immediately.

Results

All the findings were analyzed and presented in the form of tables and graphs.

Table1: Distribution of the respondents by age

	Group	
Variable	**Dementia patients (n=60)**	**Without Dementia (n=60)**
Age (year)		
≤ 70	17 (28.3%)	25 (41.7%)
> 70	43 (71.7%)	35 (58.3%)
Mean(±SD)	73.10± 4.93	71.98± 5.24
Range	62 to 84 years	64 to 85 years

Table 1 shows that among dementia patients 43(71.7%) were more than 70 years of age group whereas 35(58.3%) were more than 70 years age group among respondents having no Dementia.

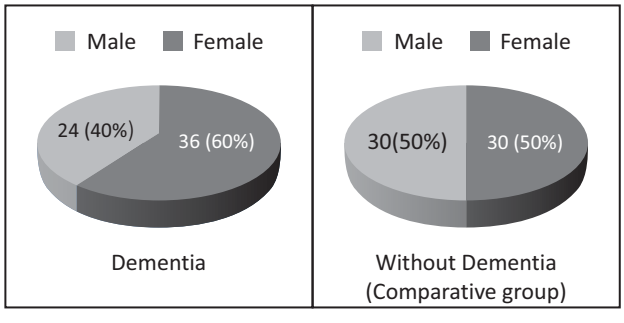

Figure 1: Distribution of the respondents by sex

Figure 1 shows that 36(60.0%) were male among dementia patients and 30(50.0%) among without dementia group

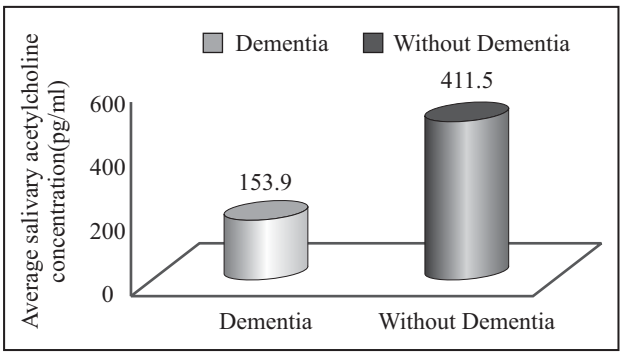

Figure 2: Distribution of the respondents by average Acetylcholine concentration among two groups

Figure 2 shows that average salivary acetylcholine concentration was significantly lower (153.9 pg/ml) in dementia patients than comparative group (411.5 pg/ml).

Discussion

The prevalence of dementia is rising day by day. In an epidemiological study findings found that in 2001, 60.1% of all people with dementia were living in developing countries; this proportion is expected to rise to 71.2% by 2040 which is alarming for these countries.[6,7] So, early diagnosis of dementia is necessary to limit as well as early management of physicians.

There is scarcity on publication demonstrating salivary level of acetylcholine in dementia. However, there are several articles on salivary acetylcholinesterase in dementia specially Alzeimer's disease, some of it done on the sample of Cerebro Spinal Fluid (CSF). But it was hardly found any articles on salivary acetylcholine level in case of dementia. We compared our study findings with result of some other published articles elsewhere in the world to verify our results.[5,8,9]

According to age analysis, mean(±SD) age of dementia patients was 73.10(±4.93) with the age range of 62 to 84 years. This result is consistent with some other study done in the world.[7]

Salivary acetylcholine was significantly lower in dementia patients than control group (p value <0.01). The mean(±SD) value of Salivary acetylcholine in dementia group was found 153.93(±98.04) pg/ml and that of in control group 411.50(±112.50) pg/ml. Frölich et al.[8] measured acetylcholine in CSF and found as using high pressure liquid chromatography (HPLC), ACh concentrations were greatly reduced in the dementia of Alzheimer-type group (3.75±1.40 pmol/ml CSF) as compared to the controls (6.14±1.39 pmol/ml CSF). Sayer et al.[5] accounted the activity of the enzyme Salivary acetylcholinesterase enzyme (AChE) was significantly lower in people with Alzheimer's disease (AD) than in age-

matched controls which is in accordance of our study. Tohgi et al.[9] investigated the acetylcholine (ACh) concentrations in the cerebrospinal fluid. The ACh concentration in patients with Alzheimer-type dementia was found to be significantly lower than in controls (73%, $p < 0.01$). In vascular dementia of the Binswanger type patients, the ACh concentration was significantly lower than in controls ($p < 0.01$).

Conclusion

Salivary acetylcholine was significantly lower in dementia patients than comparison group. So, it can be concluded that salivary acetylcholine level can help to diagnose the risk of development of early dementia and thus recommended a large scale study with well supported statistical interpretation.

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