

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

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Introduction:

Dementia is rapidly becoming a 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 the Latin word demense means "without mind". It was first discovered by German neurologist Alois Alzheimer's in 1906. The global prevalence of dementia from all causes is between 5% and 7% of adults aged 60 years and above.¹ The biggest risk factor for dementia is age. Epidemiological data shows that dementia is more

Abstract

Introduction:

Dementia is rapidly becoming a major public health problem worldwide. In dementia, the rate of acetylcholine deficiency is very high. Therefore, it can be assumed that acetylcholine levels may play a potential role in the pathogenesis of dementia.

Objective:

To evaluate the relationship of salivary acetylcholine concentration with the events of dementia.

Methods:

This comparative cross-sectional study was carried out during the period of July 2014 to June 2015. Among the purposively selected 120 respondents, 60 respondents were suffering from dementia were selected from the Bangladesh Institute of Research and Rehabilitation for Diabetes, Endocrine and Metabolic Disorder (BIRDEM), National Institute of Neuroscience (NINS), and the Dementia Care Project of Sir William Beveridge Foundation, and the rest 60 were without dementia selected as the comparison group.

Results:

Out of all study subjects, the mean (\pm SD) age of dementia patients was 73.10(\pm 4.93) years with an age range of 62 to 84 years and that of in comparative group was 71.20(\pm 5.89) years with an age range of 64 to 85 years. Male (60.0%) was predominant in dementia patients. The mean (\pm SD) value of Salivary acetylcholine in the dementia group was found 153.93(\pm 98.04) pg/ml and that of in comparative group was 411.50(\pm 112.50) pg/ml. Here Salivary acetylcholine was found lower in dementia patients than comparative group ($p < 0.001$)

Conclusion:

Salivary acetylcholine level can help to diagnose the risk of development of early dementia.

Keywords: Dementia, Acetylcholine, Salivary acetylcholine, Bangladesh

prevalent in people with low education levels. Alzheimer's disease (AD) is the most common form of dementia.

The worldwide number of dementia in 2010 was about 35.6 million and is expected to double every two decades, This number will be estimated nearly 76 million in 2030 and 135.4 million in 2050.²

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

The pathology of AD involves a 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 the early stages, the cholinergic neurons primarily undergo degeneration and result in a notable decrease in acetylcholine. Studies revealed that in patients with AD, 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 the pathogenesis of dementia. However, there was a scarcity or lack of information on this prospect in the context of Bangladesh. So, this study has been planned to find out the relationship between salivary acetylcholine levels in patients with dementia in Dhaka city of Bangladesh.

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, a total of 120 respondents were selected. Among them, 60 respondents were suffering from dementia (Diagnosed by a medicine specialist), and the rest 60 were without dementia selected as a 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 the Dementia Care Project of Sir William Beveridge Foundation. The other without dementia group was also selected purposively from the BIRDEM General Hospital, Dhaka. A structured questionnaire was filled up for each patient to collect sociodemographic data. Salivary acetylcholine concentration was measured on bed side of the patient by using an ELISA kit (which was collected from abroad) from both groups. After obtaining written consent, a saliva sample was collected and then centrifuged sample for 20 minutes at 1000×g at (2-8)°C. Supernatant parts were collected and carried out the test immediately.

Results:

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

Table-I: Distribution of the respondents by age

Variable	Group	
	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-I showed 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.

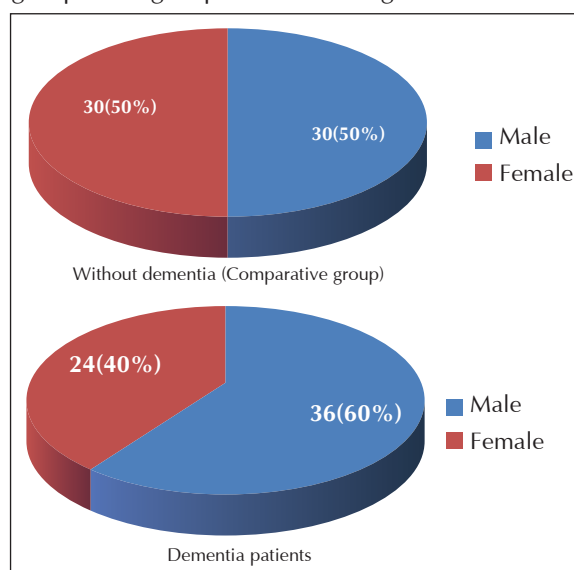


Figure-1: Distribution of the respondents by sex

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

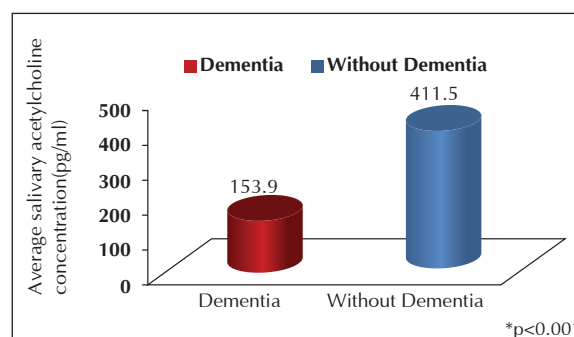


Figure-2: Distribution of the respondents by average Acetylcholine concentration among two groups

Figure-2 showed that average salivary acetylcholine concentration was significantly lower (153.9pg/ml) in dementia patients than comparative group (411.5pg/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 a scarcity of publications demonstrating salivary levels of acetylcholine in dementia. However, there are several articles on salivary acetylcholinesterase in dementia specially Alzheimer's disease, some of them done on the sample of Cerebro Spinal Fluid (CSF). However, it was hardly any articles on salivary acetylcholine level in the case of dementia. We compared our study findings with the results of some other published articles elsewhere in the world to verify our results.^{5,8,9}

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

Salivary acetylcholine was significantly lower in dementia patients than the control group (p -value <0.01). The mean (\pm SD) value of Salivary acetylcholine in the dementia group was found 153.93(\pm 98.04) pg/ml and that of in the control group was 411.50(\pm 112.50) pg/ml. Frulich et al.⁸ measured acetylcholine in CSF and found that 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 for 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 signifi-

cantly 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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