ORIGINAL ARTICLE

COMPARISON OF SALIVARY ALPHA-AMYLASE LEVELS IN SCHIZOPHRENICS AND NORMAL INDIVIDUALS

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Background: Schizophrenia is an intricate mental disease with unidentified aetiology. It affects person's awareness, thought processing, language, communication and attitude and hence can lead to social and occupational dysfunctioning. So far there is no known diagnostic laboratory test for schizophrenia and the diagnosis is made only on the basis of clinical interviews before labelling a person as schizophrenic. However, recent studies indicate that salivary alpha-amylase (sAA) levels are raised in schizophrenics. Determination of sAA might help them avoid extended clinical sittings and thus expedite the diagnosis. **Methods:** The current research was a cross-sectional comparative study in which sAA levels were assessed in 100 subjects. The subjects were divided in two groups; fifty patients in schizophrenia group and fifty in control group. sAA levels were compared between the two groups. **Results:** Mean sAA levels were significantly higher in schizophrenic group as compared to normal individuals (p=0.001). However, there was no significant difference in mean sAA levels between the two genders (p=0.163). **Conclusion:** The findings indicate that sAA levels are expected to be high in schizophrenics as compared to normal individuals and hence sAA may be used as a biomarker for diagnosis of schizophrenia in future.

Keywords: Schizophrenia, Salivary alpha-amylase, Biomarker

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INTRODUCTION

Approximately twenty one million people are affected with schizophrenia throughout the world.[1] Recent studies propose that this disorder is among the top fifteen leading causes of disability in the world.[2] It includes an extensive set of instabilities of insight, mood, language and communication, efficiency of thought and speech and social behaviour.[3] The aetiology of schizophrenia is multifactorial. Genetic predilections, culture and environment and imbalance of certain neurotransmitters are thought to be the likely risk factors for schizophrenia.[4] Research indicates that schizophrenics die younger than the general population.[5-8] There is no diagnostic biomarker for schizophrenia as yet. Alpha-amylase is one of the major protein components of saliva. It helps in the early digestion of carbohydrates and is also important for maintenance of immunity inside the oral cavity, because it prevents the growth of bacteria.[9,10] A vital function of sAA is breakdown of alpha-1, 4 bonds of starch to maltose and glucose. sAA is produced by the serous acinar cells of the salivary glands. Eighty percent of all sAA is produced by the parotid glands.[11] In a recent study, it was proposed that sAA levels increased significantly in schizophrenics and sAA may relate with psychiatric symptoms in schizophrenics.[12] Few studies stated rise in sAA due to psychosocial stress, suggestive of the relationship of sAA with high stress levels.[13–16]

Therefore, sAA has the potential to turn out to be a marker of autonomic activity because salivary gland discharge is governed by both parasympathetic and sympathetic divisions.[14]

METHODOLOGY

This cross-sectional comparative research project was performed at Shaikh Zayed Federal Postgraduate Medical Institute Lahore (Shaikh Zayed Hospital Lahore) in collaboration with Punjab Institute of Mental Health, Lahore, Pakistan from March, 2016 to December, 2016 after obtaining institutional approval. Sample size of 100 patients was estimated by power and precision software using 90% power of test, 5% level of significance. Convenient sampling technique was used for data collection. The study subjects consisted of 50 patients of schizophrenia (mean age: 33.20±7.027 years; 25 males; 25 females) selected from the department of Psychiatry, Punjab Institute of Mental Health, Lahore, Pakistan and 50 volunteer healthy control subjects (mean age: 26.88±4.645 years; 25 males; 25 females) recruited from Shaikh Zayed Hospital Lahore, Pakistan from March, 2016 to December, 2016. Questionnaires regarding mental and physical status were distributed, complete medical history was taken followed by physical examination. Informed consent was taken from each participant. Subjects with history of salivary gland infection, brain trauma or pancreatic disease and other systemic diseases were excluded.

Each participant was abstained from eating meals or brushing teeth one hour prior to collection of saliva sample. Samples were taken by passive drool method after rinsing mouth with cold water. The participants were asked to sit on a chair and lean the head forward, allowing the saliva to collect on the floor of the mouth. Polypropylene vials were used for sample collection. After collection, the samples were labelled properly. Soon after collecting the samples, each of them was centrifuged at 3000 RPM and frozen in a refrigerator at -20 °C. sAA levels were measured by human salivary alpha-amylase ELISA kits (Glory Science Co., USA) and then the levels were compared between the two groups (reference interval= 60–3600 pg/ul).[17] The data were analyzed using SPSS version 20 and expressed as Mean±SD. The sAA data were not normally distributed, hence non-parametric Mann-Whitney U-test was used, and $p \leq 0.05$ was considered as statistically significant.

RESULTS

Table-1 depicts the characteristics of both schizophrenia group and normal healthy controls.

Table-1: characteristics

	Schizophrenics	Controls	*p*
Number (n)	50	50	
Gender M/F	25/25	25/25	0.163
Age (years)	33.20±7.027	26.88±4.645	0.731
Mean±SD sAA (pg/µl)	1383.14 ±515.337	971.23 ±396.933	0.001*

(Statistical analysis was conducted by unpaired t-test, Mann-Whitney U-test and χ^2 test. *$p \leq 0.05$ was considered as statistically significant.)

The schizophrenics and controls were matched for gender and age. Mean sAA levels were significantly higher in schizophrenic group as compared to normal individuals (p=0.001). However, there was insignificant difference in mean sAA levels between the two genders (p=0.163).

Figure-1 shows the frequency and mean sAA levels of schizophrenics and normal healthy controls.

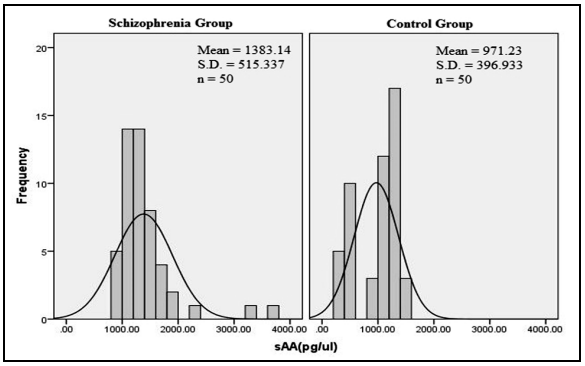

Figure-1: Frequency and mean sAA levels in study groups

DISCUSSION

A significant difference was found in mean sAA levels between the two groups (p=0.001). However, the results revealed an insignificant difference in mean sAA levels between the two genders (p=0.163).

A recent study was held in Japan in which fifty four patients of schizophrenia were selected from a private psychiatric clinic and their mean sAA levels were compared with that of fifty five normal subjects. The results revealed that the mean sAA levels were significantly higher in patients of schizophrenia as compared to normal healthy individuals. Their study proposed that increased levels of sAA might indicate further severe psychotic symptoms and therefore sAA might relate to psychotic symptoms in patients of schizophrenia.[12]

A small number of other researches, suggested a rise in the levels of sAA after psychological stress, suggestive of the relationship of sAA with high stress levels.[13–16] Another research explained a possible association concerning the levels of sAA and sympathetic nervous system, which was assessed by means of heart rate variability factors in the progression of stress.[13]

A recent study presented the case of a female schizophrenic who had electroconvulsive therapy (ECT). During the course of her treatment sAA levels along with the psychotic symptoms of the patient were assessed. The results revealed that the levels of sAA were raised prior to ECT. On the other hand, the levels went down during the period of ECT, and this decrease was accompanied by improvement of symptoms. Therefore it was determined that measurement of sAA levels may act as a useful biomarker for assessment of psychological state of an individual.[18] A similar case report was recently published in which a case of 59 year old schizophrenic lady was presented. Her sAA levels were determined before and after ECT, and it was proposed that sAA levels decreased after ECT.[19] According to another latest study, sAA levels were estimated in schizophrenics and normal controls and the response of treatment was determined by giving antipsychotic drugs in schizophrenia patients. It was concluded that sAA levels may serve as biological marker of treatment response in schizophrenics.[20]

Therefore, sAA is a candidate which indicates salivary gland secretion in response to mental and emotional state. The findings of earlier researches have recommended it as a probable biological marker of psychological stimuli and might be a useful tool for assessment of the severity of symptoms in patients of schizophrenia.[12]

In the current study, it was determined that the sAA levels were significantly raised in patients of

schizophrenia. Therefore, additional study is evidently required as the precise mechanism involved in schizophrenia and other psychiatric disorders, especially the imbalance between sympathetic and parasympathetic divisions, is not known.[18]

CONCLUSION

We compared the mean sAA levels between schizophrenics and normal healthy individuals. The findings indicate that sAA levels are expected to be high in schizophrenics as compared to normal individuals and hence sAA may be a useful tool for diagnosis of schizophrenia in future.

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