ORIGINAL RESEARCH

Estimation of Salivary pH levels in Depression: An Observational Study

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Abstract

Introduction: Depression is a major problem of mental illness that influences people globally everywhere. Chronic depression could increase the activity of hypothalamic–pituitary–adrenaline (HPA) axis and sympathetic–adreno–medullary (SAM) axis, and system makes the depressive individuals more amenability to various systemic diseases. Depressive disorder could influence the autonomic nervous system that has effect on the salivary gland in which the salivary secretion is controlled by the parasympathetic and sympathetic innervation. Likewise salivary pH changes may invariably affect the oral health.

Aim: The aim of this study was to estimate the salivary pH levels in depression before and after antidepressant therapy.

Materials and methods: This study includes 40 subjects/groups, and group I (control), group IIA, and group II B (depressive individual's pre- and post-medication of antidepressant medication). Hospital anxiety and depression scale (HADS) was used to assess the depression. The whole saliva was collected in a sterile container by the spitting method of Navazesh, and Salivary pH level was measured using pH meter.

Results: Parametric *t*-test was used for statistical analysis and thus showing statistically insignificant result for salivary.

Keywords: Autonomic nervous system, Depression, Neurophysiology, Norepinephrine, Salivary pH.

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Introduction

Chronic depression could increase the activity of HPA axis and SAM axis, and system makes the depressive individuals more amenability to various diseases such as diabetes, cardiovascular diseases, and hypertension. Chronic stress is also put forward to be a determinant in the manifestations and exacerbation of several oral diseases such as recurrent aphthous ulcerations, burning mouth, lichen planus, atypical facial pain, and salivary gland functional defects.[1] Salivary gland secretion is influenced by noradrenergic α- and β-adrenoceptors (sympathetic) and muscarinic cholinoceptors (parasympathetic), and their nerve terminals located in salivary glands could be affected by the depressive disorder.[2,3] The term "salivary gland hypofunction" was proposed by Nederfor into three categories: (1) xerostomia, regarding the subjective feeling, (2) hyposalivation, denoting the decreased salivary flow rate, and (3) alteration in salivary composition.[4] Salivary gland dysfunction may cause discomfort to severe oral health issues like glossodynia, dysphagia, difficulty in speech, mucositis, burning sensation, altered taste sensation, and oral candidiasis.[4] Alterations in the salivary composition such as protein, electrolyte concentration, amylase, and pH are strongly correlated with dental caries, periodontitis, and other oral diseases.[5,6] Antidepressant drugs may act on their nerve innervation or on the salivary gland cells itself. The impacts of antidepressant drugs on the autonomic neural controls lead to hyposalivation by various actions through blockade of muscarinic cholinoceptors and α1-adrenoceptors, inhibition of noradrenaline uptake, and stimulation of α2-adrenoceptors.[7] Hence, the present study was carried out to analyze salivary pH in depressive individuals before and after antidepressant drug therapy.

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Materials and Methods

Sample Selection and Tool Used

This observational study was conducted in the Department of Psychiatry, Sri Balaji Vidyapeeth, Puducherry, and the study was presented and approved by the Institutional Review Board and Institutional Ethical Committee. The study includes 80 research participants between the age of 18 and 50 years. The research participants who had systemic illness like diabetic mellitus, autoimmune disorders like hypertension, under medication that affects salivary secretion, and head and neck radio/chemotherapy for the last 6 months were excluded from the study. HADS (developed by Zigmond and Snaith)[8] was used to assess the depression.

The study group includes the following criteria:

- Group I: HADS value of *D* ≤8 and *A* ≤8, nondepressive individuals (40 samples)
- Group IIA: HADS value of *D* ≥8 and *A* ≥8, depressive patients before taking medication (40 samples)
- Group IIB: Depressive patients (same group IIA patients) after taking 2 months of selective serotonin reuptake inhibitors

Sample Collection and Processing

The salivary samples were collected in a sterile container by spitting method of Navazesh,[9] and then transport the whole unstimulated salivary sample to the laboratory of biochemistry, and salivary pH levels were estimated by using a pH meter (Model No.: HI 2211 pH/ORP meter & Company Name: HANNA Instrument, India).

Statistical Analysis

Mean and Standard deviation (SD) were used for data description. An unpaired *t*-test was used to compare the salivary parameters between groups I and IIA, and a paired *t*-test was used to compare the salivary parameters between groups IIA and IIB by using SPSS version 21.0.

Results

Figure 1 shows the mean unstimulated salivary pH levels of group I (6.39 ± 0.39), group IIA (6.46 ± 0.44), and group IIB (6.58 ± 0.47).

- The unstimulated whole salivary pH level was found to be slightly raised in group IIA than in group I. Table 1 did not show any statistically significant difference between group I and group IIA ($p = 0.44$).
- The unstimulated whole salivary pH level was found to be slightly increased in group IIB than in group IIA. Table 2 did not show any significance between group IIA and group IIB ($p = 0.29$).
- The unstimulated whole salivary pH level was found to be slightly higher in group IIB than in group I. Table 3 did not show any statistically significant difference between group IIA and group IIB ($p = 0.06$).

The following observations were tabulated along with statistical analysis (Table 1).

Discussion and Conclusion

The composition of saliva is affected by certain important factors like flow rate, circadian rhythm, differential gland contribution, duration and nature of stimulus, and medication. Salivary bicarbonate concentration level usually increased at the time of high flow rates and simultaneously Na^+/H^+ exchange serves to restore the intracellular pH. At low flow rate, it produces significant decreases in salivary pH levels along with electrolyte alteration.[10] Decreased salivary pH levels in stress, anxiety, and depression patients were already reported by Morse et al.,[11] Sandin and Chorot,[12] Dayan,[13] and Cohen and Khalaila.[14] The current study

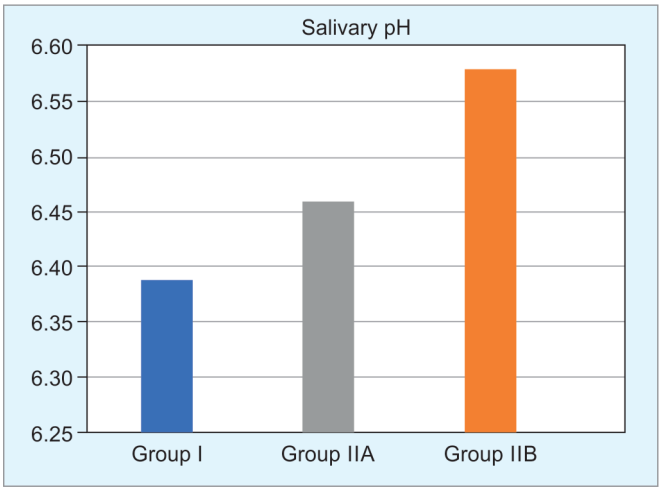

Fig. 1: Comparison of mean value of study parameter among groups I, IIA, and IIB

Table 1: Comparison of statistical values among groups I and IIB

Salivary parameters (variables)	*N*	*Mean ± Standard deviation (SD)*		*95% Confidence interval*		*t-value*	*df*	*p-value*
		Group I	*Group II*	*Lower*	*Upper*			
Salivary pH	40	6.39 ± 0.39	6.46 ± 0.44	−0.115	0.2555	0.781	78	0.44

Table 2: Comparison of statistical values among groups IIA and IIB

Salivary parameters (variables)	*N*	*Mean ± Standard deviation (SD)*		*95% Confidence interval*		*t-value*	*df*	*p-value*
		Group I	*Group II*	*Lower*	*Upper*			
Salivary pH	40	6.46 ± 0.44	6.58 ± 0.47	−0.3343	0.1018	−1.079	39	0.29

Table 3: Comparison of statistical values among groups I and IIB

Salivary parameters (variables)	*N*	*Mean ± Standard deviation (SD)*		*95% Confidence interval*		*t-value*	*df*	*p-value*
		Group I	*Group II*	*Lower*	*Upper*			
Salivary pH	40	6.39 ± 0.39	6.58 ± 0.47	−0.3810	0.0045	−1.944	78	0.06

was insignificant for salivary pH levels in any of the study groups and the values were within the normal salivary pH level only 6.8–7.4.[10] Even though salivary pH is regulated by sympathetic and parasympathetic nervous system, the current study not showing any significant reduction in salivary pH level. This disparity might be due to difference in saliva sampling, study population, and parameter used.

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