Original Article

Estimation of Salivary Lactate Dehydrogenase (LDH) in Healthy Adults.

Imam F.[1], Rabbani F.[2], Sultana A.[3], Sultana J.[4], Talukder A.H.[5], Hasnat A.[6], Hasan M.Z.[7], Ferdous R.[8]

Abstract

Background: Saliva is recognized as a promising diagnostic fluid due to its non-invasive nature and ability to reflect systemic and oral health. Among salivary biomarkers, lactate dehydrogenase (LDH) holds diagnostic value as a cytoplasmic enzyme released during cellular injury or necrosis. Establishing normative salivary LDH levels is critical for distinguishing physiological from pathological states.

Objective: To estimate the concentration of salivary LDH in healthy adults to establish reference values.

Methods: This cross-sectional observational study was conducted over six months (May to November 2017) at the Dept. of Oral and Maxillofacial Surgery, Dhaka Dental College. Thirty healthy adults (30–65 years) were enrolled via convenience sampling. Unstimulated whole saliva was collected in the morning and LDH levels were assessed using validated enzymatic biochemical assay. Data were analyzed using SPSS v22.0, and Student's t-test assessed gender differences.

Results: The mean salivary LDH level was 408.7 U/L (SD: 401.6 U/L). No significant difference was observed between male and female participants ($p > 0.05$).

Conclusion: This study provides preliminary reference values for salivary LDH in healthy adults, which may support future diagnostic applications. Further research on larger, demographically diverse populations is warranted.

Keywords: Salivary biomarkers, lactate dehydrogenase, diagnostic saliva, healthy adults, oral diagnostics

Journal of Dentistry and Allied Science, Vol 8, No 2
Article Received: 11 Mar 2025, Accepted: 16 May 2025
DOI: https://doi.org/10.3329/jdas.v8i2.85821

1. **Fakhrul Imam**, Consultant, Oral & Maxillofacial Surgery, Divine Mercy Hospital, Gazipur.
2. **Fazlay Rabbani**, Assistant Professor, OMS Dept, Dental Unit, Dhaka National Medical College.
3. **Amrin Sultana**, Dental Surgeon, Upazila Health Complex, Monohargonj, Cumilla.

***Corresponding Author**
Dr. Fakhrul Imam, BDS, MCPS, FCPS. Consultant, Oral & Maxillofacial Surgery,
Divine Mercy Hospital, Gazipur.
Mobile: 01717328835, Email: fakhrulimam2014@gmail.com

4. **Jachmen Sultana**,Associate Professor, Dept of Oral & Maxillofacial Surgery, Dhaka Dental College & Hospital.
5. **Md. Ali Hossain Talukder**,Junior Consultant, Dept of Oral & Maxillofacial Surgery, Shaheed Suhrawardy Medical College & Hospital.
6. **Abul Hasnat**, Associate Professor, Dept of Oral & Maxillofacial Surgery, Dental Unit, Dhaka National Medical College & Hospital.
7. **Md. Zakirul Hasan**, HMO, Dept of OMS, Dhaka Dental College & Hospital.
8. **Ruhi Ferdous**, HMO, Dept of Conservative Dentistry & Endodontics, BSMMU.

Introduction

Saliva is continuously secreted by the salivary glands, bathing the oral cavity and maintaining homeostasis. Due to its direct contact with oral tissues and ease of collection, saliva has emerged as a useful medium for biomarker discovery in both dental and systemic health. In recent years, body fluids including blood, urine, cerebrospinal fluid (CSF), peritoneal fluid, and saliva have gained attention as diagnostic tools in modern medicine [1].

Saliva contains a wide range of biomarkers including cytokines, enzymes, antibodies, and hormones. Among these, lactate dehydrogenase (LDH), a cytoplasmic enzyme released upon cell injury, has been studied extensively [2,3]. LDH is an intracellular enzyme that catalyzes the interconversion of lactate and pyruvate during glycolysis. Its presence in extracellular fluids indicates cellular damage or necrosis [4]. Elevated salivary LDH levels have been reported in oral malignancy, periodontitis, and systemic inflammation [5,6].

Establishing baseline salivary LDH values in healthy individuals is critical to improve the clinical interpretation of elevated levels. This study aims to quantify salivary LDH concentrations in healthy Bangladeshi adults, serving as a reference for future research.

Materials and Methods

Study Design and Setting:

This observational cross-sectional study was conducted at the Department of Oral and Maxillofacial Surgery, Dhaka Dental College and Hospital, Mirpur, Dhaka.

Study Duration: The study was conducted from May 2017 to November 2017.

Ethical Considerations: Ethical approval was obtained from the institutional review board of Dhaka Dental College. Written informed consent was obtained from each participant.

Study Population: Thirty healthy adults aged 30–65 years who visited the outpatient department were selected via non-probability convenience sampling.

Inclusion and Exclusion Criteria

Inclusion Criteria:

1. Participants aged between 30 and 65 years.

2. Participants who are healthy adults with no known systemic or oral diseases.

3. Individuals who have given written informed consent to participate in the study.

4. Participants who do not use tobacco products (smoking, chewing, or other forms of tobacco).

5. Participants who do not consume alcohol.

6. Individuals not currently on medication that

might influence saliva composition, such as chemotherapy, immunosuppressive therapy, or certain antibiotics.

7. Participants who have not undergone any oral surgery or dental procedures (e.g. tooth extractions, periodontal treatment) in the past 6 months.

8. Female participants who are not pregnant or breastfeeding.

9. Participants with no history of periodontal disease or severe dental caries, ensuring relatively stable oral health.

Exclusion Criteria:

1) Advanced periodontitis
2) Coronary arterial disease
3) Liver disease
4) Kidney disease
5) Megaloblastic anaemia
6) Immuno-compromised patient.
7) Individuals who are not interested to participate in this study.

Saliva Collection protocol

Saliva Collection Unstimulated whole saliva was collected in the early morning before breakfast using the spitting method into sterile containers. Samples were transported to the lab within 15 minutes and centrifuged. LDH levels were measured using a validated enzymatic assay [5].

Statistical Analysis Data were analyzed using SPSS v22.0. Descriptive statistics and independent t-test were applied.

Results

A total of 30 healthy adult participants were included, comprising 17 males and 13 females. The mean salivary LDH concentration was 408.7 U/L with a standard deviation of 401.6 U/L.

Pie chart: Gender distribution of participants.

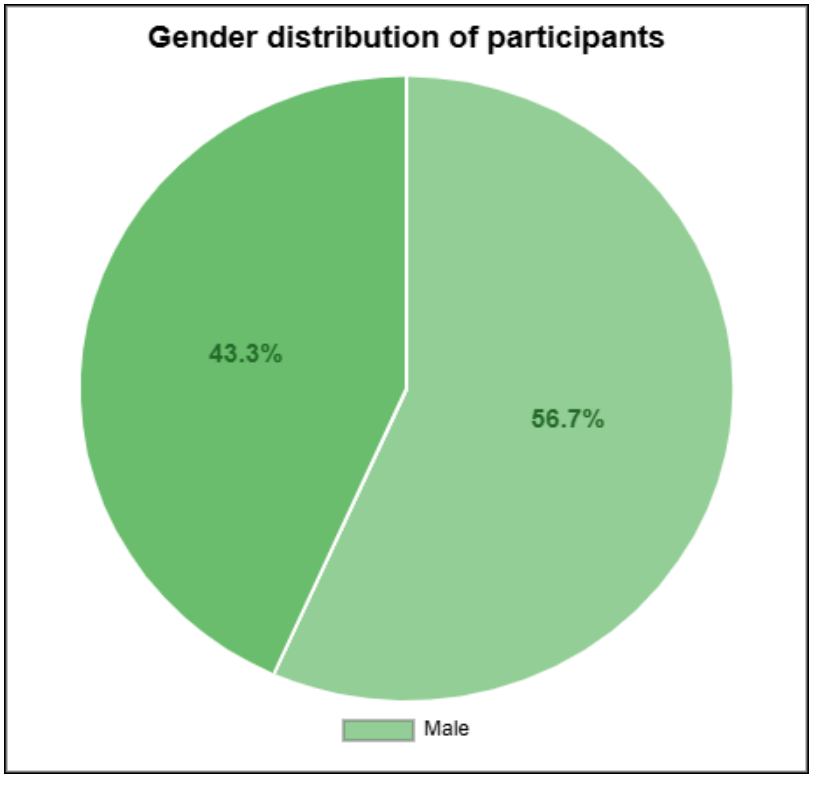

Table 2. Table: Descriptive Statistics of Salivary LDH Levels

Parameters	Value
sample size (n)	30
Mean LDH (U/L)	408.7
Standard Deviation	401.6

The difference in LDH levels between genders was not statistically significant ($p > 0.05$).

Discussion

LDH is an intracellular enzyme involved in anaerobic glycolysis. When tissue damage occurs, LDH is released into extracellular fluids such as saliva. This study found a mean salivary LDH level of 408.7 U/L in healthy adults, aligning with previous reports in similar healthy cohorts [6–9]. Multiple international studies have reported mean salivary LDH levels ranging from 200 to 500 U/L in healthy individuals, though these vary with demographic factors and methodological differences [10–15].No statistically significant difference was observed between genders in our study, similar to the findings by Rai et al. [16], suggesting that gender may not influence baseline salivary LDH values.

Clinical applications of salivary LDH extend from monitoring periodontal disease, detecting malignancies, and evaluating mucosal healing post-surgery. Establishing baseline values is essential for meaningful interpretation in these settings [17–25].

The limitations of this study include small sample size, single-center design, and potential confounding due to unrecognized subclinical inflammation. Further large-scale multicentric research is required.

Acknowledgements: We acknowledge the guidance of Prof. Dr. Tarin Rahman and Prof. Dr. Ismat Ara Haider.

Conflict of Interest: None declared. Funding: No funding was received.

References

1. Azizi A, Ranjbari A, Ghafari MA, Jahan F. Comparative evaluation of lactate dehydrogenase (LDH) and aspartate aminotransferase (AST) levels in periodontal diseases. Journal of Isfahan Dental School, 2011; 7(3): 265-271.

2. Giannobile W. V. (2012). Salivary diagnostics for periodontal diseases. Journal of the American Dental Association (1939), 143(10 Suppl), 6S–11S.

3. Kaufman, E., & Lamster, I. B. (2002). The diagnostic applications of saliva--a review. Critical reviews in oral biology and medicine : an official publication of the American Association of Oral Biologists, 13(2), 197–212.

4. Liaw, C. C., Wang, C. H., Huang, J. S., Kiu, M. C., Chen, J. S., & Chang, H. K. (1997). Serum lactate dehydrogenase level in patients with nasopharyngeal carcinoma. Acta oncologica (Stock-

holm, Sweden), 36(2), 159–164.
5. Lokesh, K., Kannabiran, J., & Rao, M. D. (2016). Salivary Lactate Dehydrogenase (LDH)-A Novel Technique in Oral Cancer Detection and Diagnosis. Journal of clinical and diagnostic research : JCDR, 10(2), ZC34–ZC37.
6. Yakob, M., Fuentes, L., Wang, M. B., Abemayor, E., & Wong, D. T. (2014). Salivary biomarkers for detection of oral squamous cell carcinoma - current state and recent advances. Current oral health reports, 1(2), 133–141.
7. Kallalli BN, Rawson K, Muzammil, Singh A, Awati MA, Shivhare P. Lactate dehydrogenase as a biomarker in oral cancer and oral submucous fibrosis. J Oral Pathol Med. 2016 Oct;45(9):687-690
8. Soukhtanloo M, Shakeri MT, Mohtasham N. Overexpression of Lactate Dehydrogenase in the Saliva and Tissues of Patients with Head and Neck Squamous Cell Carcinoma. Rep Biochem Mol Biol. 2019 Jan;7(2):142-149.
9. Mousa HA, Saliem SS. Assessment of Alkaline Phosphatase, Salivary Flow Rate and Salivary Potential of Hydrogen in Relation to Severity of Chronic Periodontitis. J Bagh Coll Dent 2016 Sep. 28(3):126-31.
10. Tenovuo J. (1997). Salivary parameters of relevance for assessing caries activity in individuals and populations. Community dentistry and oral epidemiology, 25(1), 82–86.
11. Hu CC, Wang SG, Gao Z, Qing MF, Pan S, Liu YY, Li F. Emerging salivary biomarkers for early detection of oral squamous cell carcinoma. World J Clin Oncol. 2025 Apr 24;16(4)
12. Nguyen TTH, Sodnom-Ish B, Choi SW, Jung HI, Cho J, Hwang I, Kim SM. Salivary biomarkers in oral squamous cell carcinoma. J Korean Assoc Oral Maxillofac Surg. 2020 Oct 31;46(5):301-312.
13. Rawdhah R, Mahmood MS. Salivary lactate dehydrogenase and salivary total protein as potential biomarkers for screening periodontal disease. Saudi Dent J. 2023 Nov;35(7):827-833
14. Podzimek S, Vondrackova L, Duskova J, Janatova T, Broukal Z. Salivary Markers for Periodontal and General Diseases. Dis Markers. 2016;2016:9179632.
15. Rao K, Babu SG, Shetty SR, Castelino RL. Evaluation of Serum and Salivary Lactate Dehydrogenase Levels in Patients with Oral Potentially Malignant Conditions/Lesions: A Clinical and Biochemical Study. Indian J Community Med. 2024 Mar-Apr;49(2):316-321
16. Ali Alftaikhah SA, Issrani R, Alnasser M, Almutairi HA, Khattak O, Iqbal A, Prabhu N. Salivary Biomarkers in Periodontitis: A Scoping Review. Cureus. 2023 Dec 8;15(12)
17. Jaedicke, K. M., Preshaw, P. M., & Taylor, J. J. (2016). Salivary cytokines as biomarkers of periodontal diseases. Periodontology 2000, 70(1), 164–183.
18. Zhou, Y., & Liu, Z. (2023). Saliva biomarkers in oral disease. Clinica chimica acta; international journal of clinical chemistry, 548.
19. Albagieh H, Alshehri AZ, Alduraywishi AS, Aldaws A, AlBalawi SS, Abu Shaqqaf HF,

Almubayi RA. Evaluation of Salivary Diagnostics: Applications, Benefits, Challenges, and Future Prospects in Dental and Systemic Disease Detection. Cureus. 2025 Jan 16;17(1)
20. Panneerselvam K, Ishikawa S, Krishnan R, Sugimoto M. Salivary Metabolomics for Oral Cancer Detection: A Narrative Review. Metabolites. 2022 May 12;12(5)
21. Panda A, Behura SS, Bhuyan L, Dash KC, Kumar V, Mukherjee S. Assessment of lactate dehydrogenase enzyme levels in saliva and serum of oral submucous fibrosis and leukoplakia patients. J Oral Maxillofac Pathol. 2020 Jan-Apr;24(1):183.
22. Meleti M, Cassi D, Vescovi P, Setti G, Pertinhez TA, Pezzi ME. Salivary biomarkers for diagnosis of systemic diseases and malignant tumors. A systematic review. Med Oral Patol Oral Cir Bucal. 2020 Mar 1;25(2)
23. Zhang, Y., Kang, N., Xue, F. et al. Evaluation of salivary biomarkers for the diagnosis of periodontitis. BMC Oral Health 21, 266 (2021)
24. Surdu A, Foia LG, Luchian I, Trifan D, Tatarciuc MS, Scutariu MM, Ciupilan C, Budala DG. Saliva as a Diagnostic Tool for Systemic Diseases-A Narrative Review. Medicina (Kaunas). 2025 Jan 30;61(2):243
25. Lamster, I. B., Mandella, R. D., & Gordon, J. M. (1985). Lactate dehydrogenase activity in gingival crevicular fluid collected with filter paper strips: analysis in subjects with non-inflamed and mildly inflamed gingiva. Journal of clinical periodontology, 12(2), 153–161
26. Pandarathodiyil, A. K., Ramanathan, A., Garg, R., Doss, J. G., Abd Rahman, F. B., Ghani, W. M. Nabillah, Warnakulasuriya, S. Lactate Dehydrogenase Levels in the Saliva of Cigarette and E-Cigarette Smokers (Vapers): A Comparative Analysis. Asian Pacific Journal of Cancer Prevention, 2021; 22(10): 3227-3235.
27. Noh, J. W., Jang, J. H., Yoon, H. S., Kim, K. B., Heo, M. H., Jang, H. E., Kim, Y. J., & Lee, Y. (2022). Evaluation of Salivary Biomarkers of Periodontal Disease Based on Smoking Status: A Systematic Review. International journal of environmental research and public health, 19(21), 14619.
28. Batista JA, Wakayama B, Freitas RN, Fiais GA, Chaves-Neto AH, Saliba TA, Garbin AJI, Garbin CAS. Impact of oral conditions on salivary biochemical parameters in individuals with substance use disorder: a cross-sectional study. Braz Oral Res. 2025 May 12;39
29. Nunes LAS, Mussavira S, Bindhu OS. Clinical and diagnostic utility of saliva as a non-invasive diagnostic fluid: a systematic review. Biochem Med (Zagreb). 2015;25:177-192
30. Lopez-Pintor RM, González-Serrano J, Vallina C, IvaylovaSerkedzhieva K, Virto L, Nuevo P, Caponio VCA, Iniesta M, Rodríguez Santamarta T, Lequerica Fernández P, Iglesias Velazquez O, Hernandez G, de Vicente JC. Factors influencing salivary lactate dehydrogenase levels in oral squamous cell carcinoma and oral potentially malignant disorders. Front Oral Health. 2025 Jan 7;5