

# EYE AND TOOTH CONNECTION IN GLAUCOMA PATIENTS

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Munir Amjad Baig<sup>1</sup>  
Rabeeya Munir<sup>2</sup>  
Waleed Munir<sup>3</sup>

**For Authors' affiliation & contribution  
see end of Article**

## Corresponding Author:

Dr Munir Amjad Baig  
MBBS, DOMS, MCPS, FCPS  
Ex. Consultant/HOD  
Federal Govt. Services Hospital, Islamabad  
e-mail: drmuniramjad@gmail.com

## ABSTRACT

**PURPOSE:** Most of the patients who were being followed up in our Glaucoma clinic complained about their frequent visits to dental OPDs

**AIM:** To know the eye and tooth connection in glaucoma patients. A longitudinal prospective study of six years was conducted in a Tertiary care hospital Islamabad during June 2011 to January 2018.

**METHODS:** 216 patients, age range 38-77 years, attending glaucoma clinic of Fed. Govt. Services Hospital Islamabad for glaucoma management were evaluated and screened for their oral health after taking the consent and permission from Ethical committee. Detailed ocular examination was performed by Single ophthalmologist and the information about dental health was recorded by a trained researcher. Data were analyzed for frequencies/percentages.

**RESULTS:** All 216 patients with primary open angle **glaucoma POAG**, visited dental OPD at least twice during last month. 99(45.8%) had tooth extractions, 52(24%) had filling, 41(19%) had root canal while scaling was done in 24(11.1%). Eighty-seven (40.2%) showed 27-30 teeth count, 82(38%) had 23-26 while 47(21.8%) had 20-22 teeth count. Among study group, 113(52.3%) patients had periodontal disease and visited dental OPD 35 times thus losing maximum number of teeth.

**CONCLUSION:** Our study showed a possible link between POAG and missing teeth.

**KEYWORDS:** Glaucoma, natural tooth count, lost tooth count, oral hygiene.

## INTRODUCTION

Glaucoma is a major public health problem. Worldwide, after cataract, it is the major cause of blindness.<sup>1</sup> It is a chronic disease where ganglion cells are degenerated along with axons.<sup>2</sup> Glaucoma is declared as silent thief for sight," which causes slow and irreversible loss of vision.<sup>3</sup> In the United States, POAG is a common form of glaucoma. According to the Glaucoma Research Foundation, it accounts for 90% of all glaucoma cases.<sup>4</sup> Tooth loss plays a role in human health affecting masticatory capacity, food choices, nutrition and aesthetics<sup>5</sup>. Some authors believe it to be a dental care failure impairing quality of life.<sup>5</sup> Oral infections causing periodontal disease or tooth loss are related to variety of disorders such as diabetes, hypertension, rheumatoid arthritis and glaucoma.<sup>6</sup> Periodontitis causing chronic inflammatory reactions, destabilizes the tooth structure.<sup>7</sup>

A study in the Journal of Glaucoma indicated that "the number of teeth and changes in oral bacteria may be related with glaucoma pathogenesis." Annual meeting of the American Glaucoma Society 2016 suggests periodontal (gum) disease and recent tooth loss increases the risk of POAG.<sup>8</sup>

In the oral cavity, bacteria serve as a catalyst for a inflammatory response of the immune system which may lead to oxidative stress in the cells of the trabecular meshwork causing damage.<sup>9</sup>

Tooth loss occurred in 2% of global population which ranked 36th among diseases affecting life expectancy<sup>10</sup> mentioned in a report on Global Burden of Diseases. Most of the patients who were being followed up in our Glaucoma clinic complained about their frequent visits to dental OPDs.

The purpose of this study was to investigate the possible

link between the presence of glaucoma and the number of tooth loss (Edentulousness).

**METHODOLOGY**

216 patients, 129(59.7%) male, 87(40.3%) females, age ranged 38-77 years, mean age 56.8 +15.6years were diagnosed as primary open-angle glaucoma. All diagnosed POAG/new cases who had visited dental OPD at least twice during the last month were included in this study. Those dentulous patients with good oral health, acute cases, trauma, uveitis, rubeosis, exfoliation, <39years age, smokers and those having dentures were excluded.

Detailed ocular examination was performed by single ophthalmologist and the following criteria were met: comprising (a) IOP checkup ( or < 22 mm Hg), (b) gonioscopy each eye showing unoccluded filtration angle (c) slit lamp examination showing no evidence of trauma, rubeosis, uveitis or exfoliation in either eye and (d) VF defects at diagnosis (peripheral loss only or early paracentral loss)consistent with POAG.

All glaucoma patients were followed up yearly with questionnaires about dental status were asked from their dental care providers like gender, age, family history of glaucoma, history of periodontitis during previous 2 years, natural teeth count, teeth lost in past 2 years and dental health habits like tooth brushing, dental scaling and frequency of interdental cleaning where link between POAG and oral infections was ascertained.

Our main interest was presence of periodontal disease, existing teeth count and teeth lost during previous 2 years.

**RESULTS**

All patients had visited dental OPD at least twice during last month. 99(45.8%) had tooth extractions, (53(53.5%) lost two teeth(26 male-27female), 46(46.6%) lost one tooth(25male-21female) in the past 2 years), 52(24%) had tooth filling, 41(19%) had root canal treatment while scaling was done in 24(11.1%). 87(40.2%) showed 27-30 teeth count, 82(38%) had 23-26 while 47(21.8%) had 20-22 teeth count. 113(52.3%) patients had periodontal disease, visited dental OPD 35 times, belonged to 58-78years group were having more percentages of POAG losing maximum number of teeth.

In present study the subjects with loss of one or two teeth in the past 2 years showed increased risk of POAG, suggesting that people who underwent more dental work had a higher risk of glaucoma. The possible link is release of certain factors from base of tooth triggering an inflammatory response to the eye leading to the development of glaucoma. However, in our study we did not find any connection between chance of having glaucoma in patients with root canal treatments as well as tooth fillings.

This study also showed higher mortality among those having low tooth count. Subjects with lost teeth recently belonged to (58-77 years age group) and longer history of dental disease while no gender difference was found in this study.

**Table-1:** Subject characteristics

Gender	Male (n=129)	Female (n = 87)	Total (n = 216)
Mean Age (years)	56.2 ± 14.2	55.1 ± 15.6	56.8 ± 15.6
38 ~ 47 years old	34 (26.3 %)	20 (23 %)	54 (25%)
48~ 57 years old	35 (27.1 %)	22 (23 %)	57 (26.3 %)
58 ~ 67 years old	34 (26.3 %)	28 (32.1 %)	62 (28.7 %)
68 ~ 77 years old	26 (20.1 %)	17 (19.5 %)	43 (19.9 %)
Family H/O Glaucoma	28 (51.8%)	26 (48.2%)	54(25%)
Urban	98(69.5%)	43(30.5%)	141 (65.2%)
Rural	43(57.3%)	32(42.7%)	75(34.8%)
Interdental cleaning per week	45(27%)	11(13%)	56(26%)
Recent visit to dental clinics	88(68.2%)	61 (70 %)	149 (68.9 %)
Dental brushing once/day	101(78.2%)	73(84%)	174(80.5%)
Dental brushing Twice/day	28(22%)	14(16%)	42(19.4%)
Mouth washes Twice/day	26(20.1%)	17(19.5%)	43(19.9%)
Frequency of dental scaling visit- None	79 (61.0 %)	61 (70.1 %)	140 (64.8 %)
Frequency of dental scaling visit- Once or twice a year	40 (31 %)	18 (20.6 %)	58 (26.8 %)
Frequency of dental scaling visit- 3~ 5 times a year	10 (7.7 %)	8 (9.1%)	18 (8.3 %)

**Table-2:** Reason for loss of teeth among partially edentulous patients

Reason	Frequency	Percentage
Trauma	19	8.7%
Decay	75	34.7%
Periodontal disease	113	52.3%
Others	9	4.1%

**Table - 3:** Number of visits to dental OPD

Age	n %	Existing teeth	Lost teeth	Diseases	Visits/last 2 yrs
38 - 47	64(29.6%)	32	--	filling	2
48 - 57	59(27.3%)	30	2	trauma	11
58 - 67	51(23.6%)	28	4	poor oral health	24
68 - 77	42(19.4%)	26	6	periodontitis	35

**DISCUSSION**

In America approximately 178 million people have missed one tooth while other 40 million have lost their all teeth. According to epidemiological studies of American college of Prosthodontists, 30 percent of 65-74 years adults have no natural teeth.

The relation between human mortality and dental health is not clear. This relationship is also present in coronary artery disease, rheumatoid arthritis and cardiovascular disease which have shorter span of life.<sup>11</sup> The relation between teeth count and all-cause circulatory mortality had been observed by Polzer et al.<sup>12</sup>

Evidence showed association between mortality and tooth count. Oral infections and associated bacteremia causing tooth loss, tooth count effect on mastication and nutrition maintenance were other mechanisms.<sup>13</sup> Endothelial cell dysfunction affecting optic nerve blood flow causing POAG may be the other mechanism.<sup>14</sup>

A clinic-based case-control study of 103 African-American subjects observed that older glaucoma patients had fewer teeth.<sup>15</sup> The possible mechanisms might be upregulation of complement system with microglial activation in the optic nerve, probably through another mechanism, resulting in glaucoma.<sup>16</sup> Our study showed similar results; 99(45.8%) of our study subjects had tooth extractions in 59-78 years age group. 53(53.5%) lost two teeth (26 males and 27 females), 46(46.6%) lost one tooth (25 males and 21 sfemale) in the past 2 years.

A recently published case control study in the Journal of Glaucoma indicated relationship between presence of glaucoma and oral bacterial flora<sup>17</sup> similar to our study.

Primary open-angle glaucoma was 43% higher in subjects who lost one or more teeth compared to those with no teeth loss.<sup>18</sup> Also the risk for POAG was 86% higher in those having periodontitis with tooth loss.<sup>19</sup> Our study is akin to this study showing 52.3%(113) of

our subjects had history of periodontitis and 34.7%(75) had dental decay so 87%(188) patients had oral pathology.

Recent tooth loss with gum disease was related to primary open-angle glaucoma after a survey of 40,000 health professionals.<sup>20</sup> Our study noticed 34.7% (75) male of 58-67 years group having higher risk of POAG after losing two/more teeth.

People who had undergone more dental work had a higher risk of glaucoma.<sup>21</sup> In present study 53(53.5%) lost two teeth(26 male-27female)and 46(46.6%) lost one tooth (25male-21female) in the previous years, noticing an association between one tooth loss and higher risk of POAG in last two years. However no connection was found between glaucoma patients and those with root canal treatment like other study.<sup>22</sup>

27(12.5%) of our study subjects showed early visual field changes, showing endothelial cell dysfunction. This is similar to one other review mentioning relationship between POAG with paracentral visual field loss.<sup>23</sup>

Periodontal diseases causing oral infections with tooth and bone loss was linked with risk of Primary open angle glaucoma as this tooth loss was mainly due to gum disease and dental caries.<sup>24</sup>

Subjects with poor economic status, low education level and those who did not have the habit of brushing their teeth showed a higher missing teeth average. Also the tooth loss difference between urban and rural subjects depends on the poor facilities in rural dental care than urban dental care in our study<sup>4</sup>

The ability to retain more number of teeth is the most important indicator of oral health throughout life. Edentulism or total loss of teeth is prevalent worldwide among older people. Studies have noticed that edentulism affects elderly health and the overall quality of life.<sup>25</sup>

**CONCLUSION**

People who had undergone more dental work had a higher rate of glaucoma. We concluded that partial edentulism was high among study population. The greater the tooth loss count, the higher was the mortality in our study.

### Authors' Affiliation & Contribution

<sup>1</sup>Dr Munir Amjad Baig  
Ex. Consultant/HOD  
Federal Govt. Services Hospital  
Main idea, data collection, Discussion

<sup>2</sup>Dr Rabeeya Munir,  
Demonstrator Islamic International Medical and Dental  
College, Islamabad.  
*Data collection, Results, Analysis*

<sup>3</sup>Waleed Munir,  
Lahore University of Management Sciences.  
*Data Analysis, Results*

<sup>4</sup>Muhammad Ali Naqvi  
BSc (hons) optometry  
COAVS  
s.alinaqvi@gmail.com  
*Proof Reading/ Editing The Script*

### REFERENCES

1. World Health Organization. Oral Health Surveys: Basic Methods. 4th ed. Geneva: WHO; 2014.
2. Schacknow P, Samples J. The Glaucoma Book: A Practical, Evidence-Based Approach to Patient Care. New York, NY: Springer; 2010:399-420.
3. Stamper R, Lieberman M, Drake M. Becker-Shaffer's Diagnosis and Therapy of the Glaucomas. 8th Edition. New York, NY: Mosby; 2009:239-265.
4. Pasquale LR, Hyman L, Wiggs JL, Rosner BA. Prospective study of oral health and risk of primary open-angle glaucoma in men: data from the Health Professionals Follow-up Study. *Ophthalmology*. 2016 Nov; 123(11): 2318–27.
5. Batista MJ, Rihs LB, Sousa Mda L. Risk indicators for tooth loss in adult workers. *Braz Oral Res*. 2012; 26(5):390–6.
6. Kaur T, Uppoor, A, Naik D. Parkinson's disease and periodontitis-the missing link? A review. *Gerodontology*. 2016 Dec; 33(4):434-438.
7. Bartova J, Sommerova P, Lyuya-Mi Y, Mysak J, Prochazkova J, Duskova J, Janatova T, Podzimek S. Periodontitis as a risk factor of atherosclerosis. *J Immunol Res*. 2014;2014:636893. doi: 10.1155/2014/636893.
8. Polla D, Astafurov K, Hawy E, Hyman L, Hou W, Danias J. A Pilot Study to Evaluate the Oral Microbiome and Dental Health in Primary Open-Angle Glaucoma. *J Glaucoma*. 2017 Apr;26(4):320-327. doi: 10.1097/IJG.0000000000000465.
9. Astafurov K, Elhawy E, Ren L, Dong CQ, Igboin C, Hyman L, Griffen A, Mittag T, Danias J. Oral microbiome link to neurodegeneration in glaucoma. *PLoS One*. 2014 Sep 2;9(9):e104416. doi: 10.1371/journal.pone.0104416.
10. D'Souza KM, Aras M. Association between socio-demographic variables and partial edentulism in the Goan population: An epidemiological study in India. *Indian J Dent Res* 2014;25(4):434–8.
11. Polzer I, Haring R, Dorr M, Wallaschofski H, Kocher T, et al. Missing, unreplaced teeth and risk of all-cause and cardiovascular mortality. *Int J Cardiol* 2013;167:1430–7.
12. Polzer I, Schwahn C, Völzke H, Mundt T, Biffar R. The association of tooth loss with all-cause and circulatory mortality. Is there a benefit of replaced teeth? A systematic review and meta-analysis. *Clin Oral Investig* 2012 Apr;16(2):333-51
13. Koka S, Gupta A. Association between missing tooth count and mortality: A systematic review; *J Prosth Res* 2018;62:134-51
14. Schwahn C, Polzer I, Haring R, Dorr M, Wallaschofski H, Kocher T et al. Missing, unreplaced teeth and risk of all-cause and cardiovascular mortality. *Int J Cardiol* 2013;167:1430–7
15. Janket SJ, Baird AE, Jones JA, Jackson EA, Surakka M, Tao W, et al. Number of teeth, C-reactive protein, fibrinogen and cardiovascular mortality: a 15-year follow-up study in a Finnish cohort. *J Clin Periodontol* 2014;41:131–40
16. Renvert S, Wallin-Bengtsson V, Berglund J, Persson RG. Periodontitis in older Swedish individuals fails to predict mortality. *Clin Oral Investig* 2015;19:193–200.

17. Marín-Zuluaga D-J, Sandvik L, Gil-Montoya J-A, Willumsen T. Oral health and mortality risk in the institutionalised elderly. *Med Oral Patol Oral Cir Bucal* 2012; 17:e618
18. Hiroto T, Yoshihara A, Ogawa H, Miyazaki H. Number of teeth and 5-year mortality in an elderly population. *Community Dent Oral Epidemiol* 2015 Jun;43(3):226-231. DOI: 10.1111/cdoe.12146.
19. Liljestrand JM, Havulinna AS, Paju S, Mannisto S, Salomaa V, Pussinen PJ. Missing teeth predict incident cardiovascular events, diabetes, and death. *J Dent Res* 2015;94:1055–62
20. Johansson CS, Ravald N, Pagonis C, Richter A. Periodontitis in patients with coronary artery disease: an 8-year follow-up. *J. Periodontol* 2014;85:417–425
21. Saarela RK, Soini H, Hiltunen K, Muurinen S, Suominen M, Pitkala K. Dentition status, malnutrition and mortality among older service housing residents. *J Nutr Health Aging* 2014;18:34–8.
22. Peng J, Song J, Han J, Chen Z, Yin X, Zhu J, et al. The relationship between tooth loss and mortality from all causes, cardiovascular diseases, and coronary heart disease in the general population: systematic review and dose-response meta-analysis of prospective cohort studies. *Biosci Rep*. 2019;39(1):BSR20181773. Published 2019 Jan 11. doi:10.1042/BSR20181773
23. Kang JH, Loomis SJ, Rosner BA, Wiggs JL, Pasquale LR. Comparison of risk factor profiles for primary open angle glaucoma subtypes defined by pattern of visual field loss: a prospective study. *Invest Ophthalmol Vis Sci*. 2015;56(4):2439–48
24. Jaleel BF, Nagarajappa R, Mohapatra AK, Ramesh G. Risk indicators associated with tooth loss among Indian adults. *Oral Health Dent Manag*. 2014;13(2):170–8.
25. Rawshani A, Svensson AM, Zethelius B, Eliasson B, Rosengren A, Gudbjornsdottir S. Association Between Socioeconomic Status and Mortality, Cardiovascular Disease, and Cancer in Patients With Type 2 Diabetes. *JAMA internal medicine*. 2016;176(8):1146–1154.