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Prevalence and Impact of Dental Diseases in Patients Undergoing Cataract Surgery: A Cross-sectional Study

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Aim: The aim of this work was to evaluate the prevalence of dental diseases in patients undergoing cataract surgery.
Materials and methods: This cross-sectional study was carried out on 1000 patients undergoing cataract surgery. All patients were subjected to eye examination through several tests [vision, eye structure, retinal and fluid pressure test], information on smoking habits, alcohol consumption, regular physical exercise and demographic data were taken, the dental examination include periodontal examination to detect presence of calculus, diagnosis of caries, teeth required RCT or root canal retreatment, detection of any septic focus, remaining root structure, and /or presence of periapical lesion.
Results: Dental caries were present in 65.1% of patients, patients with calculus were 76.8% with variable degree of severity. 88.2% of patients had dental events. The events of the highest frequencies were combined caries and calculus (30.9%), and combined caries, periapical lesions, and calculus (22.1%).
Conclusion: The incidence of oral infections particularly periodontitis is relatively high among adults, as their presence can significantly increase the likelihood of postoperative complications after cataract surgery, addressing oral health issues prior to surgery is crucial for improving surgical outcomes and minimizing risks of complications following cataract surgery.

Keywords: Cataract Surgery, Dental infection, Periodontitis

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Introduction

Cataract is a leading cause of visual impairment worldwide. Cataract is a cloudy area of the crystalline lens inside the eye, even though 90% of cataracts in the world are reported in developing countries, their social, physical and economic impact is still substantial in the developed world.[1] Cataract surgery is a common medical procedure that is performed to remove cloudy lenses in the eye and replace it with an artificial one. It is a successful intervention currently undertaken in medicine with approximately 434,000 cataract operations performed annually, with the primary goal of improving vision and overall quality of life for patients.[2] Additionally, Cataract surgery is generally safe and effective, offers excellent clinical outcomes coupled with rapid post-operative recovery and low risk of complications. Although the technological breakthroughs in cataract surgery over the past half century have had a positive impact on the quality of life (QOL) of millions of individuals around the world, there are potential complications, which may be both sight and non-sight threatening. There are several factors that can affect the outcome of the procedure, including the presence of dental diseases.[3]

The mechanisms linking dental diseases and cataract surgery outcomes are not fully understood, but several potential mechanisms have been proposed. One possible mechanism is that dental diseases can lead to chronic systemic inflammation, such as periodontitis and dental caries, are common health problems that affect millions of people worldwide.[4] Periodontitis may contribute to repeated or chronic ocular infections, odontogenic ocular infections may directly influence the development of cataract. Both mouth and teeth are known reservoirs for many pathogens; patients with periodontal disease are at a higher risk of infectious scleritis, and infectious keratitis than those without periodontal disease. These infectious conditions have been shown to be risk factors of cataract.[5,6] Oral microbiome from oral infection can cause immune responses to exacerbate cataractogenesis. Periodontal microbiota may trigger immune dysfunction in the oro-optic-network and promote the development of cataract. The impact of periodontitis in the induction and progression of ocular diseases such as diabetic retinopathy, glaucoma, and age-related macular degeneration has been identified.[5,7]

The association between periodontitis and cataract remains largely unknown. Periodontitis may increase the systemic inflammatory reaction, and cataract could be initiated and exacerbated by the result of chronic inflammation. Furthermore, periodontitis-induced oxidative stress may also play a crucial role in the development of cataract.[8,9] Decreased inflammatory reaction following good oral hygiene can reduce the risk of cataract occurrence.[10,11] Moreover, the presence of oral infections, particularly periodontal disease, have been linked to systemic inflammation and may increase the risk of postoperative complications in various surgical contexts.[12] So, this study aimed to assess prevalence of dental diseases in patients undergoing cataract surgery in kafrelsheikh university hospital.

This cross-sectional study aimed to show the prevalence of dental diseases in patients undergoing cataract surgery in kafrelsheikh university hospital.

Material and methods

The study was conducted on individuals prepared for cataract surgery. Cases were recruited from outpatient clinic

of ophthalmology department at Kafrelsheikh University Hospital, the study was carried out from February 2024 to August 2024. The scientific research ethical committee at the institutional ethical board approved the protocol for this study.

Inclusion criteria

- Age ≥18 years.
- Both sexes.

Exclusion criteria

- Pregnancy.
- Neoplastic disease.
- Edentulism.
- Antibiotic, or corticosteroid therapy in the last 3 months.

All selected patients were subjected to ophthalmological and dental examination on one page two sides chart (Figure 1):

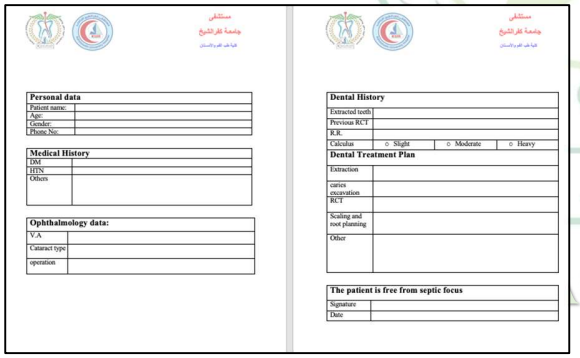

Figure 1: Patient chart: ophthalmological and dental chart on one page two sides.

Ophthalmological examination

Medical history and demographic data were taken [age, sex, household income, body mass index (BMI), DM, HTN, and cardiac stent].

Detailed ophthalmic examination, including:

Visual acuity assessment using Landolt's broken rings chart.

Slit lamp biomicroscopy to assess corneal clarity, depth of the anterior chamber, pupil reaction, lens morphology.

Fundus examination; slit lamp biomicroscopy, using non-contact Volk 90 lens and indirect ophthalmoscopy if possible.

Measuring ocular tension using the Goldman applanation tonometer.

Dental examination

- Dental history and dental examination were taken as following:

1) Previous root canal treatment (RCT),

2) Oral surgery history including extracted teeth,

Clinical examination

a- Extra oral examination: these were including the following:

Examination of facial asymmetry, palpations of lymph nodes, TMJ & muscles of mastication, Lips position during smiling.

b- Intra oral examination: these were including the following:

Examination of soft tissues, teeth, and supporting structures, tongue, floor of the mouth, vestibules, cheeks, and the hard & soft palates were examined; and any abnormalities were recorded as following:

i. Periodontal examination: to detect presence of calculus (heavy, moderate, slight), Pocket's depth, tooth mobility, furcation involvement.

ii. Diagnosis of caries: to detect presence of any caries lesion.

iii. Diagnosis of teeth required RCT, or retreatment,

iv. Radiographic examination:

All patients were asked to make panoramic radiograph film to detect presence of any oral septic focus, remaining root structure, periapical lesion.

Dental treatment plan

All patients were treated to be free from any oral septic focus as the following treatment phases:

1- Urgent phase

Any patient presented with swelling, sever infection, bleeding, or pain were managed as soon as possible.

2- Control phase

All remaining roots and hopeless tooth were extracted, endodontics treatment, periodontal debridement and scaling, caries excavation, replacement/repair of defective restorations such as those with gingival overhangs, and use of caries control measures were performed as needed. Stabilizing the patient's dental health and removing causative factors were the objectives of this phase.

3- Re-evaluation phase

The patient gave time to allow healing and resolution of inflammation, and patient took oral hygiene instruction at home,[13] the results of the first therapy and pulpal responses were reassessed before definitive treatment.

4- Definitive phase

Sequencing operative care with endodontic, periodontal, orthodontic, oral surgical, and prosthodontic treatment were performed.

5- Maintenance phase

This was included regular recall examinations to prevent future breakdown and provide an opportunity to reinforce home care.

After finishing dental treatment and patient became free from septic focus, the patient referred to ophthalmology department for cataract surgery after stamped the dental chart with the institution stam

Cataract Type:

Cataract types were defined by where the opacities exist within the lens and graded by how severe the opacities were at that location.

Treatment:

Phacoemulsification was the cataract operation which employed ultrasound energy to emulsify cataract.

Standard postoperative treatment was as follows:

- Antibiotic drops.
- Steroid drops QID for 1-2 weeks.
- NSAID drops QID for 1-2 weeks (some prefer not to use this unless evidence of post op cystoid macular edema [CME]).

Patient Instructions after surgery was as follows:

- Avoid bending.
- No heavy lifting.
- No rubbing eye.
- Avoid water in eye (e.g. no swimming and keep water out of eye while showering).
- Consider protective eyewear (e.g. glasses) during the day and eye patch at night.

Statistical analysis

Statistical analysis was done by SPSS v26 (IBM Inc., Chicago, IL, USA). Shapiro-Wilks test and histograms were used to evaluate the normality of the distribution of data. Quantitative parametric data were presented as mean and standard deviation (SD). Quantitative non-parametric data were presented as median and interquartile range (IQR). Qualitative variables were presented as frequency and percentage (%).

Results

The study included 1000 cataract patients with mean age 58.4 ± 11.2 years. Most of included patients were females (65.7%) (table 1). About 311 patients had previous RCT (31.1%), 7 cases of them were presented with periapical lesion (2.25%). The most common site for previous RCT was the molar tooth (53%), followed by 32% for premolar tooth, and the anterior tooth presented with 15% of

previously RCT. Out of 1000 cataract patients included in the present study, 721 patients had history of tooth extraction (table 2)

Table 1: Demographics of the included patients

	Total Cohort (n= 1000)
Age (years) Mean ± SD	58.4 ± 11.2
Sex No. (%) - Male - Female	 - 343 (34.3%) - 657 (65.7%)

Table 2: Percentages of previous RCT and extracted tooth among the patients

	Total Cohort (n= 1000)
Number of patients with previous root canal treatment No. (%)	311 (31.1%)
Number of patients with previous root canal treatment with apical lesion No. (%)	7 (0.07%)
Number of patients with extracted teeth No. (%)	721 (72.1%)

The most extracted tooth was the molar tooth (#46, #26 followed by #36, #37). Other teeth had lower frequencies of extraction.Dental caries was present in 651 (65.1%) of patients, tooth required RCT was present in 242 patient (24.2%), and periapical lesion was present in 256 patients (25.6%). The most common teeth affected by dental caries were the molar teeth (63%), followed by premolar (32%) and anterior teeth (15%), while the most common teeth required RCT were premolar teeth (63%) followed by molar teeth (23%) and finally the anterior teeth (14%). Remaining roots were present in 308 patients (30.8%) and 286 of remaining roots cases were presented with periapical lesion (92.8%) (table 3).

Table 3: Percentage of dental caries, tooth required RCT, periapical lesions and remaining roots among all patients

	Total Cohort (n= 1000)
Number of patients with dental caries No. (%)	651 (65.1%)
Number of patients required RCT (%)	242 (24.2%)
Number of patients with periapical lesions No. (%)	256 (25.6%)
Number of patients with remaining roots No. (%)	308 (30.8%)
Number of remaining roots with periapical lesion No. (%)	286 (28.6%)

Dental calculus was presented in 768 (76.8%) of patients with variable degree of severity. Most of patient had moderate degree of calculus (35.7%) and heavy degree of calculus (30.4%) while 10.7% of patients had slight degree of calculus (table 4).

Table 4: Calculus severity

	Total Cohort (n= 1000)
Patients with calculus No. (%)	768 (76.8%)
Degree of calculus - Slight - Moderate - Heavy	 107 (10.7%) 357 (35.7%) 304 (30.4%)

By calculation the total dental infection in all patients, 882 patients had dental infection (88.2%) while 11.8% of patients were free from septic foci. The infection of the highest frequencies was the combined caries and calculus (30.9%), and

combined caries, periapical lesions, and calculus (22.1%) (table 5).

Table 5: Overall frequencies of dental infection

	Total Cohort (n= 1000)
Dental events No. (%) - Patients with dental events - Free from septic focus	 - 882 (88.2%) - 118 (11.8%)
Type of lesions: - Only dental caries - Only tooth required RCT - Only apical lesion - Only Calculus - Caries + Calculus - Caries + RCT - RCT + Periapical lesion - RCT + Calculus - Carious + Periapical lesion + Calculus	 - 79 (7.9%) - 58 (5.8%) - 35 (3.5%) - 238 (23.8%) - 309 (30.9%) - 121 (12.1%) - 13 (0.13%) - 201 (20.1%) - 221 (22.1%)

Discussion

This study aimed to show cross sectional analysis of incidence of presence of oral infection in cataract patient, as presence of oral septic focus could increase the risk factor of post operative complication.

In a variety of surgical operation, oral infections especially periodontal disease has been associated to systemic inflammation and may raise the possibility of postoperative complication,[14] Periodontitis, characterized by prolonged inflammation, can have far-reaching consequences. Studies indicate that the bacterial components and inflammatory agents linked to periodontitis may enter the bloodstream, affecting general health and possibly exacerbating a number of conditions such as cardiovascular disease,[15] rheumatoid arthritis,[16] Alzheimer's,[17] gastrointestinal issues,[18] respiratory infections,[19] adverse pregnancy outcomes,[20] diabetes,[21] insulin resistance.[22] also, patients with periodontitis were associated with cataract infection. [23] This correlation stems from the inflammatory load that severe periodontal disease imposes, which may impact systemic disorders.

Our study showed that the most common extracted tooth was the first molar, this could be attributed to several factor including their anatomical location at the back of the mouth making them less accessible for effective cleaning, which contributes to a higher risk of caries (decay) and periodontal disease.[24]

Periodontal diseases impact between 20–50% of the world's population and are common in both developed and developing countries,[25] Trindade et al [26] studied the prevalence of periodontitis in dentate people between 2011 and 2020 and this study showed that about 62% of dentate individuals had periodontitis, and 23.6% had severe periodontitis. These findings demonstrate an atypically high incidence of periodontitis. Patients with periodontitis are more likely to acquire cataracts compared to people without periodontitis.[23] These finding are concise with our finding which showed that 76.8% patients had calculus.

Studies indicate that the prevalence of root filled teeth is common among adults, with prevalence rates varying widely, about 55.7% of individuals worldwide had at least one root filled teeth,[27] the overall success rate of primary root canal treatments is generally high, ranging from 85% to 97% depending on various factor.[28] Our study showed 31.1% of cataract patients has root filled tooth, and 2.25% of these patients has failed root canal treatment and present with periapical lesion.

Other source of infection from the oral cavity is remaining root structure that could be retained and presented after

crown fractures caused by trauma or dental caries or after incomplete dental extraction, as this remaining root have high risk to develop pain and infection thus it's usually recommended to remove them beforehand.[29] This study showed that 30.8% of patient seeking for cataract surgery had remaining roots and 92.8% of them were presented with apical lesion. Pre-operative dental evaluation and treatment is very important for both the outcomes of the cataract surgery and reducing the postoperative complications.

Conclusion

The incidence of oral infections particularly periodontitis is relatively high among adults, as their presence can significantly increase the likelihood of postoperative complications after cataract surgery, addressing oral health issues prior to surgery is crucial for improving surgical outcomes and minimizing risks of complications following cataract surgery.

References

1. Han X, Zhang J, Liu Z, Tan X, Jin G, He M, Luo L, Liu Y. Real-world visual outcomes of cataract surgery based on population-based studies: a systematic review. Br J Ophthalmol. 2023;107(8):56-65.
2. Chen X, Xu J, Chen X, Yao K. Cataract: advances in surgery and whether surgery remains the only treatment in future. Adv Ophthalmol Pract Res. 2021;1(1):1-8.
3. Naderi K, Gormley J, O'Brart D. Cataract surgery and dry eye disease: a review. Eur J Ophthalmol. 2020;30(5):40-55.
4. Park J-H, Lee H, Kim J-W, Song T-J. Better oral hygiene is associated with a reduced risk of cataract: A nationwide cohort study. Front Med. 2023;9:36-45.
5. Arjunan P. Eye on the Enigmatic Link: Dysbiotic Oral Pathogens in Ocular Diseases; The Flip Side. Int Rev Immunol. 2021;40(6):9-20.
6. Yeh LJ, Shen TC, Sun KT, Lin CL, Hsia NY. Periodontitis and Subsequent Risk of Cataract: Results From Real-World Practice. Front Med. 2022;9:11-22.
7. Veena H R, Natesh S, Patil SR. Association between Diabetic Retinopathy and Chronic Periodontitis-A Cross-Sectional Study. Med Sci. 2018;6(4):23-36.
8. Chen M, Cai W, Zhao S, Shi L, Chen Y, Li X, Sun X, Mao Y, He B, Hou Y, Zhou Y, Zhou Q, Ma J, Huang S. Oxidative stress-related biomarkers in saliva and gingival crevicular fluid associated with chronic periodontitis: A systematic review and meta-analysis. J Clin Periodontol. 2019;46(6):18-26.
9. Ahmad A, Ahsan H. Biomarkers of inflammation and oxidative stress in ophthalmic disorders. J Immunoassay Immunochem. 2020;41(3):257-271.
10. Wang Y, Andrukhov O, Rausch-Fan X. Oxidative Stress and Antioxidant System in Periodontitis. Front Physiol. 2017;8:46-57.
11. Kapila YL. Oral health's inextricable connection to systemic health: Special populations bring to bear multimodal relationships and factors connecting periodontal disease to systemic diseases and conditions. Periodontol. 2021;87(1):11-16.
12. Nwizu N, Wactawski-Wende J, Robert |, Genco J. Periodontal disease and cancer: Epidemiologic studies and possible mechanisms. Periodontology. 2000;83:213-233.
13. Ahmad Abdarrazik M, Hatem Abdel Aziz E, El-Sayed Salama A, Sayed El-Shall O, Mohamad Taha K. Orthodontics and Pedodontics section Changes in Osteocalcin Levels During Orthodontic Tooth Movement in Periodontally Affected Mandibular Anterior Teeth. ASDJ. 2024;34:174-181.
14. Villar A, Mendes B, Viègas M, de Aquino Alexandre AL, Paladini S, Cossatis J. The relationship between periodontal disease and cancer: Insights from a Systematic Literature Network Analysis. Cancer Epidemiol. 2024;91:102595.
15. Bahekar AA, Singh S, Saha S, Molnar J, Arora R. The prevalence and incidence of coronary heart disease is significantly increased in periodontitis: a meta-analysis. Am Heart J. 2007;154(5):830-837.
16. Qiao Y, Wang Z, Li Y, Han Y, Zhou Y, Cao X. Rheumatoid arthritis risk in periodontitis patients: A systematic review and meta-analysis. Jt Bone Spine. 2020;87(6):556-564.
17. Borsa L, Dubois M, Sacco G, Lupi L. Analysis the Link between Periodontal Diseases and Alzheimer's Disease: A Systematic Review. Int J Environ Res Public Health. 2021;18(17).
18. Gheorghe DN, Camen A, Popescu DM, Sincar C, Pitru A, Ionele CM, Nicolae FM, Danilescu CM, Roman A, Florescu C. Periodontitis, Metabolic and Gastrointestinal Tract

Diseases: Current Perspectives on Possible Pathogenic Connections. J Pers Med. 2022;12(3).
19. Gomes-Filho IS, Cruz SS da, Trindade SC, Passos-Soares J de S, Carvalho-Filho PC, Figueiredo ACMG, Lyrio AO, Hintz AM, Pereira MG, Scannapieco F. Periodontitis and respiratory diseases: A systematic review with meta-analysis. Oral Dis. 2020;26(2):439-446.
20. Pockpa ZAD, Soueidan A, Koffi-Coulibaly NT, Limam A, Badran Z, Struillou X. Periodontal Diseases and Adverse Pregnancy Outcomes: Review of Two Decades of Clinical Research. Oral Health Prev Dent. 2021;19(1):77-83.
21. P K, S V, Rajendra B, A S, K T, K P. Does periodontitis have synergistic effect in elevating serum creatinine level in type 2 diabetes mellitus? Natl J Physiol Pharm Pharmacol. 2022;12(11):1.
22. Thouvenot K, Turpin T, Taïlé J, Clément K, Meilhac O, Gonthier MP. Links between Insulin Resistance and Periodontal Bacteria: Insights on Molecular Players and Therapeutic Potential of Polyphenols. Biomolecules. 2022;12(3).
23. Yeh LJ, Shen TC, Sun KT, Lin CL, Hsia NY. Periodontitis and Subsequent Risk of Cataract: Results From Real-World Practice. Front Med. 2022;9(February):11-22.
24. Sharif RA, Chaturvedi S, Suleman G, Elmahdi AE, Elagib MFA. Analysis of tooth extraction causes and patterns. Open Access Maced J Med Sci. 2020;8(D):36-41.
25. Nazir MA. Prevalence of periodontal disease, its association with systemic diseases and prevention. Int J Health Sci (Qassim). 2017;11(2):72.
26. Trindade D, Carvalho R, Machado V, Chambrone L, Mendes JJ, Botelho J. Prevalence of periodontitis in dentate people between 2011 and 2020: A systematic review and meta-analysis of epidemiological studies. J Clin Periodontol. 2023;50(5):604-626.
27. León-López M, Cabanillas-Balsera D, Martín-González J, Montero-Miralles P, Saúco-Márquez JJ, Segura-Egea JJ. Prevalence of root canal treatment worldwide: A systematic review and meta-analysis. Int Endod J. 2022;55(11):1105.
28. Ng YL, Mann V, Gulabivala K. A prospective study of the factors affecting outcomes of nonsurgical root canal treatment: part 1: periapical health. Int Endod J. 2011;44(7):583-609.
29. Gadhia A, Pepper T. Oral Surgery, Extraction of Teeth. StatPearls. June 2023.