ORIGINAL ARTICLE

Exploring the Interconnections between Denture Utilization, Oral Health, and Systemic Inflammatory Response

[1]B. O. Akinboboye, [2]A. E. Adelusi,[3]C. I. Gbiri, [4]A. P. Arikawe, [5]O. A. Obashoro-John

[1]Department of Restorative Dentistry, Faculty of Dental Sciences, College of Medicine, University of Lagos
[2]Department of Restorative Dentistry, Lagos University Teaching Hospital.
[3]Department of Physiotherapy, Faculty of Clinical Science, College of Medicine, University of Lagos
[4]Department of Physiology, Faculty of Basic Medical Sciences, College of Medicine, University of Lagos
[5]Department of Adult Education, Faculty of Education, University of Lagos

ABSTRACT

Objectives: This cross-sectional study investigated the association between tooth loss, denture use, oral health outcomes, and systemic inflammatory responses among older adults aged 60 and above.

Methods: Participants (n=427; median age 68; 60.5% female) were selected using a multistage sampling approach. Data collection involved a WHO-structured questionnaire, oral examinations, and systemic disease assessment via the Charlson Comorbidity Index. Inflammatory markers, specifically IL-6 and TNF-α, were measured. Sociodemographic characteristics, number of missing teeth, and oral health-related quality of life (OIDP) were assessed, with statistical analyses employing Chi-square, non-parametric, and Kruskal-Wallis tests (significance set at $p < 0.05$).

Results: Findings revealed that the risk estimate for tooth loss was 0.53. Denture use showed significant associations with the replacement of missing lower anterior and posterior teeth ($p < 0.0001$; $p = 0.002$, respectively). Participants missing 10-19 teeth were more likely to use dentures ($p < 0.0001$), while removable denture users reported increased psychological tension (OIDP domain, $p = 0.04$). Additionally, IL-6 levels were not higher in those with greater systemic comorbidity scores ($p = 0.74$).

Conclusion: The study demonstrated a significant association between tooth loss, and denture use in older adults. Individuals with extensive tooth loss were more apt to use dentures, especially for lower jaw teeth. Removable denture use correlated with heightened psychological stress, and elevated IL-6 levels were observed in those with higher comorbidity, but this was not statistically significant. These insights underscore the importance of monitoring systemic health in older adults with substantial oral health challenges.

Key words:Denture, Utilization, Inflammatory, Response, comorbidity

INTRODUCTION

Tooth loss is a strong indicator of poor oral health and is associated with systemic diseases such as hypertension, diabetes mellitus, and respiratory or inflammatory conditions. This is often due to chronic inflammation in cases of periodontitis—a leading cause of tooth loss in adults—or from bacterial dissemination from the oral cavity to other parts of the body [1-3]. Bacteria can spread via

Online Access

Corresponding author: Akinboboye BO.
Department of Restorative Dentistry, Faculty of Dental Sciences, College of Medicine, University of Lagos.
Email address: bakinboboye@unilag.edu.ng.
Tel: +234-7057251024

doi:10.67250/t1xvq555 ***Received:*** *21/04/2026* ***Revised:*** *07/05/2026* ***Accepted:*** *02/06/2026*

the bloodstream or through ingestion. From a systemic health perspective, the migration of oral bacteria is particularly concerning because it can hasten the onset and progression of several systemic disorders [4-6].

Poor oral health typically results from the accumulation of dental plaque and the formation of calculus [7]. These conditions provide a favorable environment for bacterial growth, which in turn triggers the immune response and leads to the release of cytokines such as interleukin-6 and tumor necrosis factor α. These cytokines cause the degradation of connective tissue and the alveolar bone that supports the teeth resulting in tooth loss [8]. These cytokines are not only located in the mouth, but also travel through the bloodstream to cause systemic inflammation [9,10]. Although evidence exists for these connections, their implications are limited—particularly in relation to tooth loss, tooth replacement, health outcomes, and systemic inflammation [11].

Exploring this association will provide insights that enhance integrated healthcare practices, leading to improved patient-centered treatment and more effective public health strategies. The study hypothesized that there is a significant relationship between tooth loss, denture use, oral health outcomes, and systemic inflammatory response in an older adult population.

The study therefore aimed to determine the relationship between tooth loss, denture use, oral health outcome and systemic inflammatory response in an older adult population.

METHOD

Study Design

This cross-sectional study included individuals aged 60 years and above in Lagos State, Nigeria [12]. Participants were selected using a multistage sampling technique. Six local government areas (LGAs) within a 10 km radius of Lagos University Teaching Hospital were chosen. In each LGA, two wards were randomly selected. Investigators visited households in these wards to invite older adults to participate. Data collection involved four calibrated investigators (dentists) administering a WHO-structured questionnaire and conducting oral examinations. Systemic diseases were evaluated using the Charlson Comorbidity Index [13].

For the Charlson Comorbidity Index [13], scores were assigned as follows: Age: <50 years = 0; 50–59 years = 1; 60–69 years = 2; 70–79 years = 3; ⩾ 80 years = 4. Each of the following conditions: myocardial infarction, congestive heart failure, peripheral vascular disease, cerebrovascular accident or transient ischemic attack, dementia, chronic obstructive pulmonary disease, connective tissue disease, and peptic ulcer disease were scored 1 if present, 0 if absent.

Diabetes mellitus: none or diet-controlled = 0; uncomplicated = 1; with end-organ damage = 3

Hemiplegia, moderate to severe chronic kidney disease, and leukemia: no = 0; yes = 2

Solid tumor: none = 0; localized = 2; metastatic = 6

Acquired immunodeficiency syndrome (AIDS): no = 0; yes = 6

The total Charlson Comorbidity Index score was calculated by summing the points for each applicable condition and used for the systemic score analysis.

Sociodemographic factors, number of missing teeth were categorised as follows, use of dentures, and Oral Impacts on Daily Performances (OIDP) were evaluated on a 4-point scale. The individual questions on 10 items of OIDP [14] included eating, speaking, smiling, appearance,being tense, dry mouth, affecting usual activities, taking day off at work, relationship with spouse,and sleep. the individual question were rated on a 4 -point scale.

1=no

2=sometimes

3=fairly often

4=very often

Inflammatory markers [IL-6 and TNF-α] [15]

Levels of inflammatory markers [IL-6 and TNF-α] were measured. This was done by collecting venous blood from participants.

Sample Collection and Protocol for Analysis Peripheral venous blood samples were collected from participants under standard aseptic conditions. Three millilitres of blood were drawn and placed into plain tubes for serum analysis of IL-6 and TNF-α. After collection, blood samples were left to clot for 30 minutes before centrifugation at 1,000 rpm for 15 minutes. The resulting serum was then separated, divided into aliquots, and stored at –20°C until analysis.

Biochemical Analysis: IL-6 and TNF-α ELISA Serum levels of interleukin-6 (IL-6) and tumour necrosis factor-α (TNF-α) were measured using the Elabscience™ (Elabscience Biotechnology, Houston, TX, USA) human IL-6 and TNF-α ELISA kits. All reagents, standards, and procedures followed the manufacturer's instructions. Briefly, 96-well plates pre-coated with antibodies specific to human IL-6 and TNF-α were used. Serum samples were added, enabling IL-6 and TNF-α to bind to the immobilised antibodies. After washing, biotinylated anti-human IL-6 and TNF-α antibodies were introduced, followed by another wash step. HRP-conjugated streptavidin was then added, and, after a further wash, TMB substrate solution was used to develop colour. The intensity of the yellow colour, following the addition of stop solution, was measured at 450 nm using a microplate reader (BioTek, Winooski, VT, USA). The minimum detection levels for TNF-α and IL-6 were 15 pg/ml and 4 pg/ml, respectively.

Sample size determination

The sample size was determined using OpenEpi (https://www.openepi.com/SampleSize/SSPropor.htm). The study population consisted of more than 10,000 individuals in Lagos State. The following formula was applied: n = [DEFF*Np(1-p)] / [(d²/Z²1-α/2*(N-1) + p(1-p)]. An odds ratio of 0.8 for tooth loss was used. Based on a 95% confidence interval, a design effect of 1 for cluster sampling, and a 10% attrition rate, the estimated sample size was 422 participants.

Data Analysis

A cross-sectional study was conducted among individuals aged 60 years and above, recruited using a multistage sampling technique. Data collection included a WHO-structured questionnaire, oral examinations, and assessment of systemic disease using the Charlson Comorbidity Index. Levels of inflammatory markers (IL-6 and TNF-α) were measured. Sociodemographic factors, number of missing teeth, and oral health-related quality of life (OIDP) were evaluated on a 4-point scale. Data analysis was performed using SPSS version 26, applying Chi-square, non-parametric, and Kruskal-Wallis tests, with significance set at $p < 0.05$.

RESULTS

The study examined a population with a median age of 68 years, predominantly female (60.5%), and largely belonging to socioeconomic status group 2 (60.9%). Most participants were missing 1–9 teeth (48.7%), and only 6.6% of all participants wore a partial denture (Table 1).

Table 1: Socio-demographic Table

Variable	Frequency (%)
Age	
60-70	272 (63.8)
71-80	105 (24.6)
81-90	47 (11.02)
>90	2 (0.4)
Gender	
Male	135(39.5)
Female	292(68.4)
Educational Level	
No formal Education	97 (22.7)
Primary Education	132 (30.9)
Secondary Education	128 (30.0)
Tertiary Education	70 (16.4)
Socioeconomic status	
Class 1	70 (16.4)
Class 2	260 (60.9)
Class 3	97(22.7)
Missing Teeth	
1-9 Teeth	208 (48.7)
10-19 Teeth	26 (6.1)
≧20 Teeth	5 (1.2)
No missing teeth	188 (44.0)
Use of Removable Partial Denture	
A full lower Denture	1 (0.2)
A partial Denture	28 (6.6)
No denture currently	398 (93.2)
Total	**427 (100)**
Skewness	0.746
Standard error of skewness	0.12
Range	35
Minimum Age	60 years
Maximum Age	95 years
Median	68 years
Missing teeth	
Median	1.00
Minimum Tooth Loss	0
Maximum Tooth Loss	29

Table 2: Association of Tooth loss and Use of Denture

Variable	Use of full lower denture	Use of Partial Denture	No denture in Use	Fishers Exact Test	P value
Educational level				28.77	**0.004***
No formal Education	0	3	94		
Primary Education	0	12	120		
Secondary Education	1	7	120		
Tertiary Education	**0**	6	64		
Missing teeth	**Use of full lower denture**	**Use of Partial Denture**	**No denture in Use**		
1-9 teeth	0	17	191	0.001	**0.0001***
10-19 teeth	0	6	20		
20 teeth or more	1	0	4		
No missing teeth	0	0	188		
Socioeconomic Status					
Class 1		7	63	37.62	**0.048***
Class 2	1	19	240		
Class 3		2	95		
Use of Removable Partial Denture	Missing teeth yes	Missing teeth no			
Yes	24	0	24	6.7	1.00
No	215	188	403		
Risk Estimate	Value	95% confidence interval Lower Limit	Upper Limit		
For cohort Missing teeth= Yes	0.53	0.48	0.58		

* Risk Estimate: Interpretation of result the odds of an individual missing teeth wearing a denture or replacement is 53%, this suggest a negative association.

Participants with higher education were more likely to use dentures (P = 0.004). Similarly, those missing 1–9 teeth were more likely to use dentures (P = 0.0001). The odds of an individual with missing teeth wearing a denture or replacement was 53% (risk estimate = 0.53), suggesting a negative association (Table 2).

There was a highly statistically significant association between missing lower anterior teeth and denture use (P < 0.0001). Individuals without missing lower anterior teeth were more likely to use no denture or a partial denture. A statistically significant association was also found between missing lower posterior teeth and denture use (P = 0.002); again, individuals without missing lower posterior teeth were more likely to use no denture or a partial denture (Table 3).

Table 3: Sociodemographic Association with Denture Use

	Use of Full lower denture	Use of partial denture	No denture Use	Fishers Exact Value	Fishers Exact P value
Missing Upper Anterior					
Yes	0	7	0	12.10	0.92
No	1	21	398		
Missing Upper Posterior			0		
Yes	0	5	398	5.72	0.33
No	1	23			
Missing Lower Anterior					
Yes	1	9	0	36.55	**< 0.0001***
No	0	19	398		
Missing Lower Posterior					
Yes	1	11	0	23.45	**0.002***
No	0	17	398		
Total	**1**	**28**	**398**		

The association between the use of removable dentures and various domains of oral daily impact performance revealed a statistically significant association between denture use and feeling tense (Table 4).

No statistically significant association was found between IL-6 levels and systemic disease, missing teeth, or OIDP scores (p=0.37, p=0.56).

Similarly, there was no statistically significant association between TNF-alpha levels and systemic disease, missing teeth, or OIDP scores (P = 0.71 and 0.84, respectively) (Table 5).

DISCUSSION

This study offers valuable insights into the demographics and oral health characteristics of the examined population, as well as the factors influencing denture use and the relationship between oral and systemic health markers.

The participant group was predominantly female and older, with most individuals belonging to socioeconomic status group 2, consistent with previous studies [16, 17]. Tooth loss was common, but the majority of participants had fewer than ten missing teeth, and partial denture use was relatively low. Previous reports have linked such findings to an increased risk of mortality from all causes, including cardiovascular disease, cancer, and other causes, but not respiratory disease [18]. Notably, those studies were conducted in a larger Chinese population (7,192 participants) with longitudinal follow-up, whereas this study is a cross-sectional analysis of an African population.

In contrast, a study of individuals aged 50 and above in Iran reported a high prevalence of edentulism and denture use (46%), with rates increasing with age [19]. This was attributed to the affordability of tooth extraction compared to more expensive dental treatments such as root canals or implants. Additionally, the widespread cultural acceptance of dentures among older Iranians contributed to the preference for extraction and prosthetic rehabilitation over other interventions [20-22].

The low prevalence of denture use in this study, despite significant tooth loss, may reflect barriers such as limited access, cost, or cultural attitudes toward prosthetic rehabilitation [17, 23].

Table 4: Association between denture use and different domains of oral daily impact

use of Removable Dentures	Chewing Don't know	Chewing Fairly Often	Chewing No	Chewing Sometimes	Chewing Very Often	Fishers Exact Test	Fishers Exact P value
No	8	40	248	49	54	5.9	0.43
Yes	0	5	11	7	5		
Total	**8**	**45**	**259**	**56**	**59**		
use of Removable Dentures	Biting Don't know	Biting Fairly Often	Biting No	Biting Sometimes	Biting Very Often		
No	13	38	246	51	50	6.32	0.38
Yes	1	4	13	5	6		
Total	**14**	**42**	**259**	**56**	**56**		
use of Removable Dentures	Speech Don't know	Speech Fairly Often	Speech No	Speech Sometimes	Speech Very Often		
No	21	9	336	24	9	8.21	0.19
Yes	0	2	21	3	2		
Total	**21**	**11**	**357**	**27**	**11**		
use of Removable Dentures	Appearance Don't know	Appearance Fairly Often	Appearance No	Appearance Sometimes	Appearance Very Often		
No	19	12	318	31	19	8.19	0.19
Yes	0	2	20	6	0		
Total	**19**	**14**	**338**	**37**	**19**		
Use of Removable Dentures	Tense Don't know	Tense Fairly Often	Tense No	Tense Sometimes	Tense Very Often		
No	17	11	338	21	12	11.81	**0.04***
Yes	4	3	16	4	1		
Total	**21**	**14**	**354**	**25**	**13**		
Use of Removable Dentures	Dry mouth Don't know	Dry mouth Fairly Often	Dry Mouth No	Dry Mouth Sometimes	Dry Mouth Very Often		
No	29	8	332	23	7	2.43	0.9
Yes	0	1	25	2	0		
Total	**29**	**9**	**357**	**25**	**7**		
Use of Removable Dentures	Sleep Don't know	Sleep Fairly Often	Sleep No	Sleep Sometimes	Sleep Very Often		
No	22	14	332	20	10	5.24	0.44
Yes	0	1	24	4	0		
Total	**22**	**15**	**356**	**24**	**10**		
Use of Removable Dentures	Days off work Don't know	Days off work Fairly Often	Days off work No	Days off work Sometimes	Days off work Very Often		
No	21	3	361	10	3	4.15	0.62
Yes	1	1	26	1	0		
Total	**22**	**4**	**387**	**11**	**3**		
Use of Removable Dentures	Affect usual activities Don't know	Affect usual activities Fairly Often	Affect usual activities No	Affect usual activities Sometimes	Affect usual activities Very Often		
No	23	8	346	16	5	5.91	0.51
Yes	0	1	25	2	0		
Total	**23**	**9**	**371**	**18**	**5**		

use of Removable Dentures	Chewing Don't know	Chewing Fairly Often	Chewing No	Chewing Sometimes	Chewing Very Often	Fishers Exact Test	Fishers Exact P value
Use of Removable Dentures	Relation with spouse Don't know	Relation with spouse Fairly Often	Relation with spouse No	Relation with spouse Sometimes	Relation with spouse Very Often		
No	23	1	365	8	1	4.29	0.64
Yes	0	0	28	1	0		
Total	**23**	**1**	**393**	**9**	**1**		

Education emerged as a significant factor, with higher educational attainment associated with a greater likelihood of denture use, as previously observed [24]. This suggests that awareness, knowledge, and value placed on oral health may influence the decision to seek dental replacements. Improving education and oral health literacy could therefore enhance the uptake of dentures and other tooth replacements in older adults [17].

Similarly, participants with 1–9 missing teeth were more likely to wear dentures, indicating that partial tooth loss prompts prosthetic intervention more than edentulism or minimal tooth loss. The presence of missing lower anterior and posterior teeth showed strong associations with denture use, highlighting the functional and aesthetic importance of these teeth. Anterior teeth are often replaced for aesthetics, while posterior teeth are replaced for function [25]. These findings underscore the need for targeted patient education and resources for those at risk of anterior and posterior tooth loss.

Interestingly, while denture use was associated with feelings of tension; a domain of oral daily impact performance, other domains did not show significant associations. This indicates that while dentures can improve function and aesthetics, they may also introduce new psychosocial challenges, such as anxiety or discomfort with prosthesis use, as previously reported [26]. Psychologically, dentures have been shown to increase self-esteem-esteem and reduce social anxiety, facilitating improved social interactions, though patient-centered approaches are advised to optimize health outcomes [27].

Importantly, the study did not find significant associations between key inflammatory markers (IL-6 and TNF-alpha) and systemic disease, tooth loss, or oral impact scores. Locally produced pro-inflammatory mediators such as interleukin (IL)-1, IL-6, tumor necrosis factor (TNF), and prostaglandin E2 (PGE2) have been linked to periodontitis, with potential dissemination into the bloodstream that could amplify systemic inflammation and affect distant organs [28]. These cytokines are consistently elevated in the gingival crevicular fluid, saliva, and serum of individuals with active periodontitis, and their levels often correlate with clinical parameters such as probing depth, attachment loss, and bleeding on probing. In particular, IL-6 has shown promise in distinguishing between health, gingivitis, and periodontitis [29-31].

This study focused on participants who had experienced tooth loss but did not have acute periodontitis. The findings suggest that within this population, the biological pathways linking oral and systemic health may be more complex or influenced by additional confounders not captured in this study.

CONCLUSION

The results emphasize the multi-factorial nature of denture use and oral health impacts, highlighting the roles of education, specific tooth loss patterns, and psycho-social factors. The lack of association between inflammatory markers and oral health outcomes suggests that further research is needed to clarify these relationships. These findings can inform dental public health strategies and patient counseling aimed at improving oral health and quality of life in similar populations.

Table 5: Association between IL6, TNF alpha, systemic disease and Missing teeth

Variable	Frequency (N)	Mean Rank	Chi Square	P Value
Systemic disease IL 6 (pg/ml)			**1.24**	0.74
2	73	62.15		
3	27	54.20		
4	17	56.38		
6	1	62.00		
Total	**118**			
TNF α(pg/ml)			**1.37**	**0.71**
2	73	57.62		
3	27	58.87		
4	17	67.85		
6	1	71.50		
Total	**118**			
Missing Teeth CountIL 6 (pg/ml)			**14.71**	**0.55**
0	41	69.96		
1	10	59.15		
2	25	50.56		
3	11	50.36		
4	5	58.40		
5	1	10.00		
6	1	58.50		
7	6	49.83		
8	3	52.33		
9	1	26.00		
10	4	65.88		
11	2	35.00		
13	1	65.50		
14	1	38.00		
15	3	81.17		
17	2	57.00		
29	1	106.00		
Total	**118**			
TNF (pg/ml)			10.52	0.84
0	41	60.88		
1	10	51.75		
2	25	68.30		
3	11	46.59		
4	5	58.70		
5	1	86.00		
6	1	81.00		
7	6	48.83		
8	3	76.00		
9	1	62.50		
10	4	49.50		
11	2	65.50		
13	1	69.00		
14	1	83.50		
15	3	59.83		
17	2	40.25		
29	1	2.00		
OIDP Scores IL 6				
0	29	61.09	**21.56**	**0.37**
1	1	65.50		
9	1	111.00		
10	1	55.00		
11	28	55.84		
12	2	33.00		
13	9	44.33		
14	9	77.89		
15	2	40.00		
16	6	57.67		
17	12	68.83		
18	2	47.50		
19	4	80.00		
20	2	25.50		
21	2	46.25		
22	2	79.50		
23	2	31.50		
26	1	10.00		
27	1	33.00		
34	1	21.00		
44	1	108.00		
Total	**118**			
TNF α (pg/ml)				
0	29	58.14	**18.50**	**0.56**
1	1	69.00		
9	1	64.50		
10	1	56.50		
11	28	63.20		
12	2	37.50		
13	9	36.22		
14	9	67.00		
15	2	49.00		
16	6	68.42		
17	12	53.75		
18	2	94.25		
19	**4**	76.88		
20	**2**	29.50		
21	**2**	58.75		
22	**2**	71.00		
23	**2**	79.00		
26	**1**	10.00		
27	**1**	108.00		
34	**1**	29.50		
44	**1**	98.00		
Total	**118**			

Non parametric test and Kruskal wallis test showed that there was no statistically significant differences in IL6 (pg/ml) & TNF levels between groups for systemic disease. (P value =0.74, 0.71, respectively).

REFERENCES

1. 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 2000. 2021;87(1):11–16.
2. Litvinov E, Litvinov A. The relationship between periodontitis, gingivitis, smoking, missing teeth, endodontic infections, aortic aneurysm, and coronary artery disease: the 10-year results of 25 patients. Cureus. 2024;16:e73584.
3. Peres MA, Macpherson LMD, Weyant RJ, Daly B, Venturelli R, Mathur MR, et al. Oral diseases: a global public health challenge. Lancet. 2019;394(10194): 249–260.
4. Varoni EM, Rimondini L. Oral microbiome, oral health and systemic health: a multidirectional link. Biomedicines. 2022;10(1):186.
5. Peng X, Cheng L, You Y, Tang C, Ren B, Li Y, et al. Oral microbiota in human systemic diseases. Int J Oral Sci. 2022;14(1):14.
6. Lee YH, Chung SW, Auh QS, Hong SJ, Lee YA, Jung J, et al. Progress in oral microbiome related to oral and systemic diseases: an update. Diagnostics (Basel). 2021;11(7):1283.
7. Chapple ILC, Genco R. Diabetes and periodontal diseases: consensus report of the joint EFP/AAP workshop on periodontitis and systemic diseases. J Periodontol. 2013;84(4 Suppl):S106–S112.
8. D'Aiuto F, Parkar M, Andreou G, Suvan J, Brett PM, Ready D, et al. Periodontitis and systemic inflammation: control of the local infection is associated with a reduction in serum inflammatory markers. J Dent Res. 2004;83(2):156–160.
9. Bhuyan R, Bhuyan SK, Mohanty JN, Das S, Juliana N, Juliana IF. Periodontitis and its inflammatory changes linked to various systemic diseases: a review of its underlying mechanisms. Biomedicines. 2022;10(10):2659.
10. Hajishengallis G, Chavakis T. Local and systemic mechanisms linking periodontal disease and inflammatory comorbidities. Nat Rev Immunol. 2021;21(7):426–440.
11. Natarajan P, Madanian S, Marshall S. Investigating the link between oral health conditions and systemic diseases: a cross-sectional analysis. Sci Rep. 2025;15:10476.
12. Kuyinu YA, Femi-Adebayo TT, Adebayo BI, Abdurraheem-Salami I, Odusanya OO. Health literacy: prevalence and determinants in Lagos State, Nigeria. PLoS One. 2020;15(8):e0237813.
13. Perkins GD, Hawkes CA, Eli K, Griffin J, Jacques C, Huxley CJ, et al. Recommended summary plan for emergency care and treatment: ReSPECT a mixed-methods study [Internet]. Southampton (UK): National Institute for Health and Care Research; 2022 [cited 2026 Jun 11]. Available from: https://www.ncbi. nlm.nih.gov/ books/NBK587905/
14. Amilani U, Jayasekara P, Perera IR, Carter HE, Senanayake S, Kularatna S. Oral impact on daily performance (OIDP) scale for use in Sri Lankan adolescents: a cross-sectional modification and validation study. BMC Oral Health. 2020;20(1):16.
15. Ogechukwu UA, Ocheni S, Ugwu EO, Ekwueme PC, Ajuba IC, Duru AN, et al. Relationship between levels of interleukin-6 and tumour necrosis factor alpha and Khorana scores of newly diagnosed ambulatory cancer patients. Niger J Med. 2023;32:660–666.
16. Akinboboye BO, Malomo BI, Gbiri CA, Ogunyemi AO, Arikawe AP, Obashoro-John OA. Oral health factors linked to cognitive and physical function. Spec Care Dentist. 2025;45(6):e70131.
17. Akinboboye BO, Malomo BI, Gbiri CA, Ogunyemi AO, Arikawe AP, Obashoro-John OA. Oral health literacy: effectiveness of a homegrown intervention among community-dwelling older Nigerians. BMC Oral Health. 2025;25(1):1119.
18. Dai M, Song Q, Lin T, Huang X, Xie Y, Wang X, et al. Tooth loss, denture use, and all-cause and cause-specific mortality in older adults: a community cohort study. Front Public Health. 2023;11:1194054.
19. Delbari A, Ghavidel F, Rashedi V, Bidkhori M, Saatchi M, Hooshmand E. Evaluation of oral health status in the population above 50: evidence from the Ardakan Cohort Study on Aging (ACSA). BMC Oral Health. 2024;24(1):154.
20. Kalsbeek H, Truin GJ, Burgersdijk R, van't Hof M. Tooth loss and dental caries in Dutch adults. Community Dent Oral Epidemiol. 1991;19(4):201–204.
21. Soh G, Chong YH, Ong G. Dental state and needs for episodic care of institutionalized elderly in an Asian community. Soc Sci Med. 1992;34(4):415–418.
22. Kamberi B, Koçani F, Begzati A, Kelmendi J, Ilijazi D, Berisha N, et al. Prevalence of dental caries in Kosovar adult population. Int J Dent. 2016;2016:4290291.
23. Akinboboye BO, Ogunyemi AO. Treatment needs and demand association of missing and replaced teeth among older population in a rural setting. Niger J Dent Res. 2019;4:88–96.
24. Yuan L, Yuan Y, Ren H, Zhang F, Zhao Z, Jiang Q, et al. Decomposition analysis of the prevalence of denture use between rural and urban older individuals with edentulism in China: a cross-sectional study. Interact J Med Res. 2024;13:e48778.
25. Alalawi H, Alhumaily H. Professional assessment compared to patients' attitudes toward tooth replacement:

a cross-sectional study. BMC Oral Health. 2023;23(1):634.

26. Jar AA, Khormi AA, Al-Khamiss NA, Alnaim AA, Alharbi ZF, Holba HA, et al. The effect of dentures on oral health and quality of life. Int J Community Med Public Health. 2023;10(12):5067–5071.
27. Malomo BI, Akinboboye BO, Adenuga-Taiwo OA. Evaluating self-efficacy of patients with new prosthetic dentures in two teaching hospitals in Lagos, Nigeria. ASSU J Soc Sci. 2021;8:130–136.
28. Loos BG. Systemic markers of inflammation in periodontitis. J Periodontol. 2005;76(11 Suppl): 2106–2115.
29. Plemmenos G, Evangeliou E, Polizogopoulos N, Chalazias A, Deligianni M, Piperi C. Central regulatory role of cytokines in periodontitis and targeting options. Curr Med Chem. 2021;28(15):3032–3058.
30. Dolińska E, Wiśniewski P, Pietruska M. Periodontal molecular diagnostics: state of knowledge and future prospects for clinical application. Int J Mol Sci. 2024;25(23):12624.
31. Moore G. The effect of interproximal home regimens on inflammatory biomarkers in periodontal maintenance patients [master's thesis]. Omaha (NE): University of Nebraska Medical Center; 2022.