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Research Article

The Impact of Age and Gender on Periodontal Conditions in Iraqi People: A Retrospective Study

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Abstract

Background: Periodontal disease is initially associated with a bacterial infection, such as dental plaque. With aging, the prevalence of periodontal diseases increases, and periodontal destruction in older individuals is due to cumulative damage rather than cumulative rates of devastation. ***Objective***: To assess the effect of gender and age on periodontal health in selected Iraqi populations. ***Methods***: The cross-sectional retrospective study analyzed the periodontal records of patients from October 2021 to June 2023. The study was conducted at the Dentistry Department, Al-Rafidain University College, Baghdad, Iraq. The sample was taken from patients who visited the periodontal department. A total of 508 subjects, with an age range of 10-69 years (35.23±10.25), participated in this study, including 287 males and 221 females. The sample was classified based on age and sex into 5 groups. The clinical evaluation includes plaque index (PLI), gingival index (GI), probing pocket depth (PPD), and clinical attachment loss (CAL). ***Results***: The overall percentage of chronic gingivitis was 53.94%, while the percentage of chronic periodontitis was 46.06%. The 60–69-year-old group reported the highest rate of patients with chronic periodontitis. Additionally, the 10–19-year group showed the highest percentage of patients with chronic gingivitis. ***Conclusions***: The prevalence of chronic periodontitis increases with age, and it is higher among females than males. Clinical periodontal parameters such as plaque index, probing pocket depth, and clinical attachment level are higher in older age groups than in younger age groups.

Keywords: Age, Gender, Gingivitis, Periodontal disease, Periodontitis, Risk factors.

أثر العمر والجنس على أمراض اللثة لدى عينة من العراقيين: دراسة بأثر رجعي

الخلاصة

الخلفية: يرتبط مرض اللثة في البداية بعدوى بكتيرية ، مثل لوحة الأسنان. مع تقدم العمر، يزداد انتشار أمراض اللثة. وقد اقترح أن تدمير اللثة لدى الأفراد المسنين يرجع إلى الضرر التراكمي وليس إلى المعدلات التراكمية للدمار. **الهدف:** تهدف هذه الدراسة إلى تقييم تأثير الجنس والعمر على صحة اللثة في مجموعات سكانية عراقية مختارة. **الطريقة:** حللت الدراسة المقطعية بأثر رجعي سجلات اللثة للمرضى من أكتوبر 2021 إلى يونيو 2023. أجريت الدراسة في قسم اللثة في قسم طب الأسنان في كلية الرافيديان الجامعة في بغداد، العراق. تم أخذ العينة من المرضى الذين زاروا قسم اللثة. شارك في هذه الدراسة ما مجموعه 508 أشخاص ، تتراوح أعمارهم بين 10-69 عاما ومتوسط SD ± يبلغ 10.25±35.23 ، بما في ذلك 287 من الذكور و 221 من الإناث. في هذه الدراسة ، تم تصنيف العينة على أساس العمر والجنس إلى المجموعات التالية: 10-19، 20-29، 30-39، 40-49، 50-59، و 60-69 سنة. هي مؤشر، ومؤشر اللثة، وفحص عمق الجيب هي وفقدان الارتباط السريري المعلمات السريرية المستخدمة في الدراسة . **النتيجة:** كانت النسبة المئوية الإجمالية لالتهاب اللثة المزمن 53.94٪ ، بينما كانت النسبة المئوية لالتهاب اللثة المزمن 46.06٪. كان أعلى معدل للمرضى الذين يعانون من التهاب اللثة المزمن (100%) في الفئة العمرية 60-69 سنة. بالإضافة إلى ذلك ، تم العثور على أعلى نسبة من المرضى الذين يعانون من التهاب اللثة المزمن (75 ٪) في الفئة العمرية 10-19 سنة . **الاستنتاج**: يزداد انتشار التهاب دواعم السن المزمن مع تقدم العمر، وهو أعلى بين الإناث منه عند الذكور. تكون معلمات اللثة السريرية مثل مؤشر اللويحات وعمق جيب الفحص ومستوى التعلق السريري أعلى في الفئات العمرية الأكبر سنا منها في الفئات العمرية الأصغر سنا.

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INTRODUCTION

Periodontal disease is a widespread infectious condition affecting up to 90% of the population [1]. Gingivitis is when the gingiva becomes red, swollen, and bleeds easily. If untreated, it can progress to periodontitis, potentially leading to tooth loss [2]. Periodontal disease is a complex and progressive chronic inflammatory condition that leads to damage to the alveolar bone and tooth loss. It has been associated with several systemic diseases, such as obesity and diabetes mellitus. A number of these conditions are part of the cluster of metabolic syndromes, which significantly increase the risk of stroke, diabetes, and cardiovascular disease based on age and sex [3]. In addition, periodontitis has been linked to various systemic disorders such as neurodegenerative diseases, autoimmune diseases, and cancer [4,5]. Periodontitis is a chronic inflammatory disease caused by specific periodontal pathogens that

can lead to inflammatory host responses. This can result in periodontal tissue destruction, alveolar bone resorption, and tooth loss [5]. Regarding the risk factors for periodontal diseases, Poor oral hygiene is primarily caused by local factors such as bacterial dental plaque and calculus. These factors directly irritate the periodontal tissues, leading to periodontal diseases. Some risk factors for periodontal diseases include certain ethnicities, low educational levels, and poor economic conditions [6]. In addition, periodontal diseases can be influenced by systemic conditions and disorders, which are the secondary cause of their initiation or progression. There is a strong connection between periodontal diseases and common systemic conditions such as diabetes, cardiovascular disease, and adverse pregnancy outcomes. Additionally, smoking and using tobacco products can also contribute to the development of periodontal diseases [6]. Periodontal diseases can be caused by systemic and local risk factors, impacting the patient's quality of life [7]. It is worth noting that the periodontitis progression rate is slower in those without systemic diseases [8]. In terms of the relationship between periodontal diseases and age, the incidence of periodontal diseases increases as people age [9]. The prevalence of periodontitis increases as the global population ages. Periodontitis has been suggested to accelerate aging and increase mortality. Moreover, periodontitis may exacerbate the link between biological aging and all-cause mortality in middle-aged and older adults. Therefore, maintaining and improving periodontal health is anticipated to be an intervention for slowing aging and extending lifespan [10]. It has been suggested that periodontal degradation in older individuals is attributed to cumulative damage rather than increasing destruction rates. This implies that being older alone is not a risk factor [11]. According to [12], periodontal disease is one of the most widespread oral disorders globally. Chronic periodontitis affects people of all ages, with a higher prevalence in older age groups. It affects 56% of adolescents, 74% of adults, and 88% of the elderly. Generally, the incidence of periodontitis increases with age, and for individuals aged 30 to 40 years, the prevalence of periodontitis sharply rises. With the aging population, the prevalence of periodontitis will continue to increase [13]. In Iraq, there is a lack of studies determining the correlation between increased age and gender on periodontal status. Therefore, this study aims to evaluate the impact of age and gender on periodontal health among selected groups of the Iraqi population.

METHODS

Study design and setting

This cross-sectional retrospective study analyzed the periodontal records of 508 systemically healthy patients from October 2021 to June 2023 at the Department of Dentistry, Al-Rafidain University College in Baghdad, Iraq. The sample comprised 508 cases of chronic gingivitis and chronic periodontitis (221 females and 287 males) recruited from the Periodontics Department and Dentistry divisions at Al-Rafidain University College.

Ethical considerations

The ethical approval of the study was received from the research ethics committee of Al-Rafidain University College, reference number 42124, on May 20, 2024, in agreement with the efficient version of the Helsinki Declaration.

Sample selection

The sample was divided into age and gender categories: (10-19 years), (20-29 years), (30-39 years), (40-49 years), (50-59 years), and (60-69 years), as shown in Table 1.

Table 1: Distribution of subjects by age and gender

Variables		n(%)
Age (years)	10-19	68(13.39)
	20-29	267(52.56)
	30-39	92(18.11)
	40-49	39(7.68)
	50-59	35(6.89)
	60-69	7(1.38)
Gender	Male	287(56.50)
	Female	221(43.50)

The clinical parameters employed in this investigation were plaque index (PLI), gingival index (GI), probing pocket depth (PPD), and clinical attachment loss (CAL). The sample size is determined using G power 3.0.10 (a tool designed by Franz-Faul at the University of Kiel in Germany). With a power of 85%, an alpha error of probability of 0.05, a two-sided design, a Cohen's D effect size of 0.3 (small effect size), and two genders, the sample size is approximately 500 subjects.

Outcomes measurement

The Plaque Index System (PLI) measures the amount of dental plaque on each tooth's four surfaces: mesial, distal, buccal, and lingual [14]. The authors' recommended ratings and criteria for this system were used. Score 0 indicates no plaque in the gingival region. Score 1: Plaque adheres to the tooth's free gingival margin and surrounding areas. The only approach to detect plaque is to run a probe down the tooth surfaces. Score 2: The naked eye can see a moderate accumulation of soft deposits within the gingival pocket, as well as the gingival edge and adjacent tooth surface. Score 3: The gingival pocket, gingival edge, and neighboring tooth surfaces all have an abundance of soft matter. The gingival index (GI) was assessed on all four sides of each tooth using gingival index system criteria [15]. Scores criteria: Score 0 indicates normal gingiva. Score 1 indicates mild inflammation with modest color changes and edema. However, there is no bleeding when

probing; Score 2: Probing causes moderate irritation, redness, edema, and bleeding. In addition, the skin appears glazed. Score 3: Severe inflammation with redness, swelling, ulceration, and an increased risk of spontaneous bleeding. A calibrated periodontal probe (William probe) was used to measure pocket depth at six places around each tooth: mesio-buccal, disto-buccal, mesio-lingual, disto-lingual, mid-lingual, and mid-buccal. No pressure was applied, and the probe was permitted to fall by its own weight. The distance between the gingival edge and the deepest point of the probe put into the gingiva crevice, as close as possible to the tooth's long axis, was measured to the closest millimeter. In the investigation, we used a calibrated probe (William's probe) to precisely measure the distance between the cementoenamel junction (CEJ) and the base of the probing pocket depth. We assessed CAL at six tooth surfaces, with the exception of third molars. The distance was estimated indirectly by subtracting the gingival margin to the CEJ from the probing pocket depth. No pressure was applied, allowing the probe to fall with its weight. The intraclass correlation coefficients (ICC) for PLI, GI, PPD, and CAL tests performed by the researcher and another professional are 0.815, 0.855, 0.910, and 0.875, respectively. For the same periodontal characteristics, the ICC of tests performed by the same person is 0.910, 0.923, 0.887, and 0.957.

Statistical analysis

Data description, analysis, and presentation were performed using Statistical Package for Social Science (SPSS version -22, Chicago, Illinois, USA), frequency, percentage, minimum, maximum, mean, standard error (SE), Student t-test, and one-way ANOVA with a Games-Howell *post hoc* test. The level of significance is when the *p*-value less than 0.05.

RESULTS

The study found a substantial variation in plaque index between age groups. Furthermore, there was a substantial difference in plaque index between males and females, as illustrated in Table 2.

Table 2: Descriptive and statistical test of PLI among age and gender

Variable	Category	Range	PLI	*p*-value
Age	10-19	0.0-2.56	1.1±0.06	0.028*
	20-29	0.14-2.55	1.16±0.03	
	30-39	0.0-2.58	1.29±0.05	
	40-49	0.0-3.0	1.19±0.1	
	50-59	0.52-2.56	1.46±0.09	
	60-69	0.73-2.93	1.54±0.29	
Gender	Male	0.0-3.0	1.25±0.03	0.014†
	Female	0.0-2.93	1.14±0.03	

Values were expressed as mean±SE. * One-way ANOVA; † unpaired t-test.

In comparisons of PLI among ages using Games-Howell, there was only a significant difference between the age groups (10–19 years) and (50–59 years). There was no significant difference between the other age groups, as shown in Table 3.

Table 3: Multiple pairwise comparisons of PLI among ages using Games-Howell

Age (year)		Mean difference	*p*-value	95% CI
10-19	20-29	-0.057	0.953	-0.246 to 0.133
	30-39	-0.186	0.163	-0.409 to 0.038
	40-49	-0.084	0.979	-0.424 to 0.256
	50-59	-0.354	0.033	-0.69 to -0.018
	60-69	-0.438	0.693	-1.596 to 0.72
20-29	30-39	-0.129	0.250	-0.299 to 0.041
	40-49	-0.027	0.999	-0.338 to 0.284
	50-59	-0.298	0.061	-0.604 to 0.009
	60-69	-0.38155	0.779	-1.545 to 0.781
30-39	40-49	0.10225	0.943	-0.229 to 0.433
	50-59	-0.16834	0.652	-0.495 to 0.158
	60-69	-0.25237	0.947	-1.412 to 0.907
40-49	50-59	-0.27059	0.392	-0.681 to 0.12
	60-69	-0.35462	0.849	-1.506 to 0.797
50-59	60-69	-0.08403	0.999	-1.235 to 1.067

The gingival index did not differ significantly between age groups or between males and females, as demonstrated in Table 4.

Table 4: Descriptive and statistical test of GI among age and gender

Variables	Category	Range	GI	*p*-value
Age (year)	10-19	0.0-2.0	1.16±0.06	0.265*
	20-29	0.0-3.0	1.14±0.04	
	30-39	0.0-2.84	1.25±0.06	
	40-49	0.39-2.0	1.38±0.08	
	50-59	0.23-2.35	1.37±0.09	
	60-69	1.0-2.0	1.3±0.14	
Gender	Male	0.0-3.0	1.21±0.03	0.511†
	Female	0.0-2.36	1.18±0.04	

Values were expressed as mean±SE. * One-way ANOVA; † unpaired t-test.

Furthermore, Table 5 shows that there was no significant variation in PPD between age groups or males and females.

Table 5: Descriptive and statistical test of PPD among age and gender

Variable	Category	n	Range	PPD	*p*-value
Age (year)	10-19	11	4.0-6.5	4.87±0.3	0.134*
	20-29	64	4.0-7.8	4.77±0.13	
	30-39	31	4.0-6.0	4.340.09	
	40-49	18	4.0-6.39	4.39±0.15	
	50-59	21	4.0-6.5	4.49±0.17	
	60-69	5	4.0-9.0	5.2±0.97	
Gender	Male	82	4.0-9.0	4.61±0.11	0.925†
	Female	68	4.0-7.8	4.63±0.11	

Values were expressed as mean±SE. * One-way ANOVA; † unpaired t-test.

There was a significant variation in CAL between age groups, but not between males and females, as indicated in Table 6. Multiple pairwise comparisons of CAL among ages with Games-Howell revealed significant variations in CAL between age groups (10-19 years) and (30-39, 40-49, 50-59, and 60-69 years). Furthermore, there were substantial disparities between the age groups 20-29 years, 30-39, 40-49, 50-59, and 60-69 years. Furthermore, CAL differed significantly between the age groups 30-39 and 50-59 years. Table 7 shows that there were no significant differences in CAL among the other age groups.

Table 6: Descriptive and statistical test of CAL among age and gender

Variable	Category	Range	CAL	*p*-value
Age (year)	10-19	0.0-6.25	0.57±0.16	0.000*
	20-29	0.0-6.5	0.75±0.09	
	30-39	0.0-9.0	1.91±0.19	
	40-49	0.0-6.23	2.57±0.3	
	50-59	0.0-7.44	3.16±0.27	
	60-69	1.88-5.22	3.49±0.49	
Gender	Male	0.0-9.0	1.22±0.10	0.375†
	Female	0.0-7.0	1.36±0.12	

Values were expressed as mean±SE. * One-way ANOVA; † unpaired t-test.

Table 7: Multiple pairwise comparisons of CAL among ages using Games-Howell

Age (years)		Mean difference	*p*-value	95% CI
10-19	20-29	-0.184	0.916	-0.72 to 0.35
	30-39	-1.337	0.000	-2.07 to -0.60
	40-49	-1.999	0.000	-2.99 to -0.99
	50-59	-2.586	0.000	-3.5 to -1.67
	60-69	-2.922	0.006	-4.87 to -0.97
20-29	30-39	-1.152	0.000	-1.78 to -0.52
	40-49	-1.815	0.000	-2.75 to -0.88
	50-59	-2.402	0.000	-3.24 to -1.56
	60-69	-2.737	0.010	-4.7 to -0.77
30-39	40-49	-0.663	0.445	-1.72 to 0.39
	50-59	-1.25	0.004	-2.22 to -0.28
	60-69	-1.585	0.124	-3.53 to 0.36
40-49	50-59	-0.587	0.688	-1.76 to 0.59
	60-69	-0.922	0.620	-2.9 to 1.06
50-59	60-69	-0.335	0.989	-2.29 to 1.63

Table 8 shows that the percentage of chronic gingivitis increased from 75% in younger ages (19-20 years) to 100% in older ages (60-69 years). Table 8 shows that men had a larger percentage of chronic gingivitis than women. The overall prevalence of persistent gingivitis was 53.94%. The prevalence of chronic periodontitis was 46.06% overall. Patients aged 60 to 69 had the greatest percentage of chronic periodontitis (100%). The 10-to-19-year-old age group had the highest percentage of patients with persistent gingivitis (75%). In terms of gender, guys had a total chronic gingivitis rate of 55.05%. In contrast, the total percentage of chronic gingivitis in females was 52.49%. The total proportion of chronic periodontitis in males was 44.95%, whereas in females it was 47.51%.

Table 8: Distribution of periodontal diseases among age and gender

Variable	Category		n(%)
Age (years)	10-19	CG	51(75)
		CP	17(25)
	20-29	CG	182(68.16)
		CP	85(31.84)
	30-39	CG	32(34.78)
		CP	60(65.22)
	40-49	CG	8(20.51)
		CP	31(79.49)
	50-59	CG	1(2.86)
		CP	34(97.14)
	60-69	CP	7(100)
Gender	Male	CG	158(55.05)
		CP	129(44.95)
	Female	CG	116(52.49)
		CP	105(47.51)
Total		CG	274(53.94)
		CP	234(46.06)

DISCUSSION

Periodontal disease, a common inflammatory disorder in humans, damages the hard and soft tissues surrounding the tooth, causing tooth loosening [15]. Age does not affect periodontal condition; rather, the cumulative effect of untreated disease reflects age's impact on disease severity [16]. In this study, the overall prevalence of chronic gingivitis was 53.94%, whereas chronic periodontitis was 46.06%. Furthermore, individuals aged 60 to 69 years had the highest percentage of chronic periodontitis (100.00%). The study's findings showed that chronic periodontitis prevalence rose with age. Additionally, the average PPD increased with age. These results were similar with [17]. This finding was consistent with [18], who noted that poor periodontal health, as well as its increased prevalence and severity, has long been linked to advancing age. The total percentage of chronic periodontitis in males was 44.95%, whereas the total percentage in females was 47.51%. This finding is congruent with a study by [19], which discovered that females have a higher prevalence of chronic periodontitis than male patients. This finding could be attributed to sex hormones, which play a crucial role in affecting periodontal disease progression and wound healing. These effects vary depending on the gender and lifetime period studied [20]. In contrast, males appear to have a higher chance of acquiring devastating periodontal disease due to their gender. This finding contradicts a prior study that found evidence for a higher frequency of destructive periodontal disease in men than in women. The reasons for these gender discrepancies have not been adequately investigated. Male periodontal diseases are thought to be more closely associated with poor mouth cleanliness, less positive attitudes toward oral health, and few dental visits than with genetic factors. It is crucial to remember that women encounter a variety of periodontal diseases as a result of hormonal swings throughout their lives [21]. Furthermore, epidemiologic studies provide broad-based evidence that men are more likely than women to develop severe periodontal disease, even after accounting for behavioral and environmental factors such as dental hygiene and smoking [22]. Despite numerous research demonstrating the link between increased incidence of periodontitis and age, one study indicated that people with poor oral hygiene had a higher frequency of chronic periodontitis than those with good oral hygiene [23]. When the individuals were divided into groups based on their oral hygiene condition, it was discovered that effective oral hygiene measures could mitigate the influence of age on the severity and progression of chronic periodontitis. Another study found that age is a correlation, not a risk factor, and that chronic periodontitis is mostly connected with the individuals' oral hygiene condition [23]. Several factors contribute to variances in periodontal disease study results: Study design [18]; population variations [24]; measuring methodologies [25]; behavioral and lifestyle characteristics [26]; study length [27]; statistical methods [28]; and funding and bias [29].

Conclusion

The percentage of chronic periodontitis increases with age, and there is a higher percentage of chronic periodontitis among females than males. Additionally, clinical periodontal parameters, including plaque index (PI), probing pocket depth (PPD), and clinical attachment level (CAL), were higher in older age groups compared to younger age groups.

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Conflict of interests

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Data sharing statement

Supplementary data can be shared based on a reasonable request.

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