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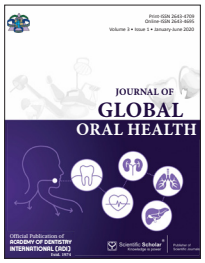

Research Article

Knowledge regarding periodontal disease and related systemic diseases among university students: A cross-sectional study

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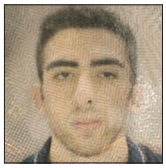

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ABSTRACT

Objectives: Periodontal disease attained global concern especially after several studies linked periodontal disease with systemic diseases such as cardiovascular disease, diabetes mellitus, and cancer. Moreover, the prevalence of these systemic diseases among Lebanese population is considerably high. However, the knowledge regarding the periodontal health and related systemic diseases is unknown. The purpose of this questionnaire-based cross-sectional study was to examine Lebanese University students' knowledge concerning periodontal health and related systemic diseases.

Materials and Methods: In total, 461 students out of 520 took part between November 22, 2022, and December 1, 2022, with a 88.6% response rate and were asked to complete an online survey that included questions concerning healthy periodontium and its relation with systemic diseases.

Results: The data revealed a poor knowledge regarding the relationship between periodontal disease and systemic diseases such as diabetes (27.5%), cardiovascular complications (28.9%), adverse pregnancy outcomes (27.5%), cancer (39.5%), respiratory problems (30.2%), and arthritis (22.1%). However, participants were aware of the healthy color and consistency of the periodontium (83.5%), (66.2%), and the need for dental check-ups (68.1%); moreover, public university and senior health-related students appeared with higher knowledge, compared with private and junior university students ($P = 0.035$, $P = 0.048$, and $P < 0.001$, respectively).

Conclusion: Knowledge regarding oral health in general and periodontal health specifically must be improved among university students. Therefore, awareness campaigns must be held to increase knowledge among them and consequently among their families regarding periodontal health.

Keywords: Periodontium, Periodontal disease, Periodontitis, Gingivitits, Systemic diseases

INTRODUCTION

The oral cavity is composed of mucosal and dental surfaces, which are inhabited by certain bacterial colonies. Imbalance of the bacterial flora in the oral cavity creates a disequilibrium that leads to certain infections such as caries and periodontitis.[1] Studies showed that a high prevalence of the dentate adults over 30 years old in the USA suffer from periodontitis.[2]

Just like any other body organ, the periodontium can be affected by diseases and gets infected and inflamed. The most common periodontal diseases are gingivitis and periodontitis.[3] Gingivitis, the less severe form of periodontal disease, is the inflammation of the gingiva without causing

any damage to the tooth's underlying attachment apparatus, so no attachment loss will occur; thus, periodontal pockets will not be present.[4] If left untreated, gingivitis can lead to an advanced form of periodontal disease called periodontitis, which is characterized by the loss of the tooth's underlying supporting structures (bone, cementum, and periodontal ligament); therefore, it can eventually lead to tooth loss.[5] The main etiological factor of periodontal disease is dental plaque.[6] Some risk factors such as age, gender, and poor oral hygiene can attribute to its formation as well,[7] or it can be a manifestation of certain systemic diseases such as diabetes and Crohn's disease.[8,9] Different studies have shown a link between periodontal diseases and systemic conditions.[10] It has been shown that periodontal pathogens could directly or indirectly be linked to systemic diseases such as cardiovascular disease,[11] type 2 diabetes,[12] rheumatoid arthritis,[13] cancer,[14] respiratory tract infection,[15] and adverse pregnancy outcomes.[16] Philstrom *et al*. found that periodontal disease is strongly associated with cardiovascular diseases such as ischemic heart disease and heart failure.[17] The prevalence of these systemic diseases among the Lebanese population is considerably high. According to Jelwan *et al*., cardiovascular diseases have attributed to around 47% of all mortalities in Lebanon.[18]

Due to the relations previously mentioned, precaution regarding periodontal diseases is essential to prevent systemic and dental outcomes. Periodontal diseases avoidance is realized by individual performance of important plaque control methods. The most efficacious method is the mechanical and chemical elimination of dental plaque.[19] Inadequate oral hygiene and bad habits (such as smoking, drinking alcohol, and aggressive teeth brushing) are factors that can aggravate periodontal diseases and speed up their progression.[20]

Guo *et al*. showed that there is a link between bad oral health and bad health literacy. Therefore, in addition to plaque control, knowledge about periodontal health and its diseases as well as the systemic consequences triggered by periodontal diseases is essential, and patients must be educated and motivated to maintain regular oral hygiene to subsequently avoid the development of periodontal diseases and its systemic outcomes.[21] At the American University of Beirut, Kassak *et al*. conducted a study that showed poor oral hygiene and dietary habits among students and found a correlation between them and different lifestyle behaviors. Therefore, they focused on the significant need to educate students on the importance of improving those habits. Therefore, knowledge and awareness are essential factors for good oral health. So far, knowledge regarding oral health remains vague among university students from developing countries such as Lebanon in comparison to those from developed countries.[22]

After an in-depth search, we noticed a lack of studies concerning the level of knowledge regarding periodontal health and periodontal diseases in our region, mainly in Lebanon where zero studies were conducted on the periodontal health and diseases students.[23-27] To learn more about this issue, we have decided to conduct a study among university students in Lebanon, which are considered a representative sample of the Lebanese population since they have different socioeconomic conditions, and levels of education, and they come from all Lebanese districts.

MATERIALS AND METHODS

Setting and study design

This is a cross-sectional study conducted on university students in Lebanon, between November 22, 2022, and December 1, 2022 with ethical clearance obtained from Institutional Review Board and Research Committees at Sahel General Hospital (Ref.num:23/2021). In Lebanon, there are around 180,000 university students distributed among nine relatively large universities, each one of them including more than 5000 students. The Lebanese University being the only public university out of them includes more than 40% of the total number of the enrolled students. An online questionnaire was generated using Google Forms and spread through social media platforms, applying the snowball method, to obtain a larger sample.

Participants

This study included 461 participants that met the following inclusion criteria and were eligible for the study: University students and are residing in Lebanon. All participants were provided with full explanation of the study and the questionnaire.

Data source measures

The questionnaire was composed of several multiple-choice questions along with a few open-ended ones related to the students' demographical data such as age, gender, residence area, name of the university that the applicant attends, academic year, as well as the applicant's major. Thirteen questions were divided into four subgroups related to the description of a healthy-looking periodontium, the initiating factor and signs of periodontal diseases, and the best method to prevent periodontal diseases were also proposed, similar to a study conducted by Alzammam and Almalki among university students,[28] in addition, the relationship between periodontal diseases and systemic diseases such as cardiovascular disease,[11] type 2 diabetes,[12] rheumatoid arthritis,[13] cancer,[14] respiratory tract infection,[15] and adverse pregnancy outcomes.[16] Pihlstrom *et al*. found that periodontal disease is strongly associated with cardiovascular diseases such as ischemic heart disease and heart failure.[17]

Statistical analysis

The Statistical Package for the Social Sciences (SPSS) software version 11.0 (SPSS®: Inc., Chicago, IL, USA) was used to enter and analyze the data. Percentages and means and standard deviations (SDs) were calculated. In addition to that, Chi-square test was used to do a comparison between subgroups.

A multiple linear regression was conducted using the knowledge scale as dependent variable. The ENTER method was used and adjusted beta coefficients were calculated based on the model. $P < 0.05$ was considered significant.

RESULTS

[Table 1] shows that the mean SD age of participants was 20.37 years (±2.03). Female participants occupied more than 85% of all participants. North Lebanon district and urban area accounted for more than half (57.2% and 70.1%, respectively) of the study sample. Approximately 72.9% of respondents were students enrolled in non-health-related majors, and more than half of participants were between 1st and 3rd year students (1st year 21.9%, 2nd year 17.6%, and 26.5% 3rd year students). Moreover, 65.9% of students were enrolled in the public university.

Table 1: Demographics data from participants.

Categories	Factors	*n*	%
Age (Mean±Standard deviation)		20.37±2.03	
Gender	Male	65	14.1
	Female	395	85.9
Lebanese district residency	Akkar	31	6.7
	Baalbek-Hermel	20	4.3
	Beirut	47	10.2
	Beqaa	12	2.6
	Mount Lebanon	66	14.3
	North Lebanon	266	57.2
	Nabatiyeh	9	2
	South Lebanon	10	2.2
Residence area	Urban	323	70.1
	Rural	138	29.9
Post or undergraduate	Undergraduate	391	84.4
	Postgraduate	70	15.2
Academic year	First year	101	21.9
	Second year	81	17.6
	Third year	122	26.5
	Fourth year	97	21
	Fifth year	37	8
	>Fifth year	23	5
University	Public	304	65.9
	Private	157	34.1
Major	Health-related	125	27.1
	Non-health-related	336	72.9

n: Total number of individuals

[Table 2] shows that a high number of students could identify the correct color of a healthy gingiva (83.5%). Likewise, most of them were able to determine that the normal gingival consistency was firm (66.2%). However, the case was not the same regarding the gingival texture, where only 15.8% of the students believed it to have an orange peel appearance, while the majority of them (65.7%) thought that it was smooth. More than half of the students (54.7%) were aware that dental plaque is the initiating factor of periodontal disease, while the rest thought that the main factor was a systemic cause or did not know. About 60% of the students failed to recognize all the indicated signs of periodontal disease, and only 39.3% of them were able to identify all three signs. When it came to the questions related to the relationship between periodontal and systemic diseases, almost all questions had similar results where around half knew while the other half failed to answer correctly. An average of around one-third of the students recognized a relationship between periodontal disease and diabetes (27.5%), cardiovascular complications (28.9%), adverse pregnancy outcomes (27.5%), cancer (39.5%), respiratory problems (30.2%), and arthritis (22.1%). The majority of students are knowledgeable about the best method to prevent periodontal disease since 70.9% of them chose proper brushing and flossing as the correct answer. A great number of students (68.1%) claim to go to the dentist for a check-up whenever they experience periodic gingival bleeding.

Knowledge was frequently associated with health-related majors (mean = 7.704 ± 2.865) compared to non-health-related majors (mean = 5.012 ± 2.505) ($P < 0.001$); moreover, the past third years of college students appeared with the highest knowledge score, respectively, (>5th year) (mean = 6.739 ± 2.947), fourth year (mean = 6.227 ± 3.296), fifth year (mean = 6.135 ± 2.879) compared with the 1st year (mean = 5.66 ± 2.188), 2nd year (mean = 5.086 ± 2.637), and 3rd year (mean = 5.549 ± 3.045) ($P = 0.048$). Furthermore, public university students expressed high knowledge scores (mean = 5.944 ± 2.597) compared with private university students (mean = 5.350 ± 3.301) ($P = 0.035$); in addition, North Lebanon residents appeared with the lower knowledge result (mean = 5.244 ± 2.736) and Beqaa presented the higher knowledge scores (mean = 7.500 ± 2.431) ($P = 0.001$) [Table 3].

In [Table 4], the multivariable analysis of the knowledge-related scale is presented; a significantly lower knowledge scale is shown in second (beta = −0.999) and third (beta = −0.709) years at the university (compared to first years), particularly in private universities (beta = −0.54) and in non-health-related majors (beta = −2.543). There was a trend toward a better knowledge among students from Mount Lebanon and Beirut, compared to the North ($P < 0.1$). Other variables did not significantly affect the knowledge score.

Table 2: Knowledge regarding periodontal health, periodontal disease, relation with systemic diseases, and prevention of periodontal diseases.

	Categories	Factors	*n*	%
Knowledge regarding periodontal health	What is the color of a healthy gingiva?	Pink	385	83.5
		Red	28	6.1
		I do not know	48	10.4
	What is the texture of a healthy gingiva?	Orange peel appearance	73	15.8
		Smooth	303	65.7
		I do not know	85	18.4
	What is the consistency of a healthy gingiva?	Firm	305	66.2
		Smooth	38	8.2
		I do not know	118	25.4
Knowledge regarding periodontal disease	What is the initiating factor of periodontal disease?	Dental plaque	252	54.7
		Diabetes	99	21.5
		Infection		
		Malnutrition		
		I do not know	110	23.9
	What are the indicating signs of periodontal disease? (Multiple answers)	Gingival bleeding+Gingival swelling+Gingival redness	181	39.3
		Gingival bleeding	215	46.6
		Gingival swelling		
		Gingival redness		
		I do not know	65	14.1
Knowledge regarding relationship between periodontal disease and systemic diseases	Can periodontal disease lead to diabetes?	Yes	127	27.5
		No	102	22.1
		I do not know	232	50.3
	Can periodontal disease lead to heart complications?	Yes	133	28.9
		No	98	21.3
		I do not know	230	49.9
	Can periodontal diseases lead to adverse pregnancy outcomes?	Yes	127	27.5
		No	94	20.4
		I do not know	240	52.1
	Can periodontal disease lead to cancer?	Yes	182	39.5
		No	86	18.7
		I do not know	193	41.9
	Can periodontal disease cause respiratory problems?	Yes	139	30.2
		No	109	23.6
		I do not know	213	46.2
	Can periodontal disease cause arthritis?	Yes	102	22.1
		No	122	26.5
		I do not know	237	51.4
Knowledge regarding prevention of periodontal disease	What is the best method to prevent periodontal disease?	Proper brushing and flossing	327	70.9
		Consuming soft foods	77	16.7
		Intake of vitamin C		
		Using mouthwash		
		I do not know	57	12.4
	After experiencing regular gingival bleeding, do you go to the dentist for a check-up?	Yes	314	68.1
		No	147	31.9

n: Total number of individuals

DISCUSSION

Our study aimed to inform us about the level of knowledge regarding periodontal health and diseases in hopes of raising awareness and showing the importance of maintaining healthy periodontal conditions throughout one's life.

According to our study, there has been no significant difference between males and females regarding the level of knowledge. Likewise, neither did the residency area, whether urban or rural, nor the level of education, whether undergraduate or postgraduate, have an effect on the level of knowledge among university students. However, certain

Table 3: Knowledge regarding periodontal health and systemic diseases.

Categories	Factors	Mean±Standard deviation	*P*-value
Gender	Male	5.615±2.376	0.68
	Female	5.772±2.939	
Lebanese district residency	Akkar	5.871±2.405	0.001
	Baalbek-Hermel	6.200±3.365	
	Beirut	6.277±2.857	
	Beqaa	7.500±2.431	
	Mount Lebanon	6.621±2.996	
	North Lebanon	5.244±2.736	
	Nabatiyeh	7.111±3.100	
	South Lebanon	6.00±3.621	
Residence area	Urban	5.752±2.907	0.905
	Rural	5.717±2.782	
Post or undergraduate	Undergraduate	5.747±2.895	0.93
	Postgraduate	5.714±2.725	
Academic year	First year	5.663±2.188	0.048
	Second year	5.086±2.637	
	Third year	5.549±3.045	
	Fourth year	6.227±3.296	
	Fifth year	6.135±2.879	
	>Fifth year	6.739±2.942	
University	Public	5.944±2.597	0.035
	Private	5.350±3.301	
Major	Health-related	7.704±2.865	0.000
	Non-health-related	5.012±2.505	

*$P<0.05$: Statistically significant difference, the values highlighted in pink are <0.005

other demographical factors had a major significance regarding the issue.

The first three years showed lower knowledge and attitude toward periodontal health, diseases, relation with general health, and prevention compared with higher education level students (4^{th}, 5^{th}, $>5^{th}$). Higher education students might experience and receive more dental care and thus increase their knowledge of oral health and periodontal diseases. According to Márquez-Arrico *et al*., the knowledge regarding oral health increased for higher education students.[29]

Our findings also revealed that public university students showed better knowledge than their counterparts in private universities (5.944 ± 2.597, 5.350 ± 3.301, respectively); in Lebanon, the majority of public university students are from a lower socioeconomic status compared to the private university students. According to several studies, oral health knowledge and attitude toward oral health are highly associated with the socioeconomic status.[30-32] However, the lack of awareness toward the low socioeconomic status students can be compromised by the easy access to the internet and obtaining more knowledge regarding oral health. A study conducted by Maharani *et al*. showed that the majority of their population used the internet as a source of oral health knowledge.[33]

According to our findings, health-related majors students showed better knowledge concerning the periodontal health, initiating factor of periodontal diseases and the relationship between periodontal diseases and systemic diseases, in comparison to non-health-related majors (7.704 ± 2.865 and 5.012 ± 2.505, respectively); this variation might be explained by the curiosity of health-related students to increase their oral health knowledge and overall health. In addition non-health-related students receive no oral health education at all during their university study, and their curriculum contains no information regarding oral health education.

Regarding the causal agent of periodontal disease, 54.7% of the students were aware that plaque is the initiating factor of periodontal disease, this coincides with the finding of El-Qaderi among Jordanian university students 51%,[34] and approximately three quarters (70.09%) acknowledge that the best preventing method of periodontal disease is proper brushing and flossing. However, on the other hand, this finding does not guarantee the validity of their claims nor does it prove that they use an adequate brushing technique or brush for a sufficient duration.

Concerning the relationship between periodontal disease and general health diseases, the majority of students scored very low in this section. Lebanese Universities and especially dental faculties in Lebanon are to blame for such results since it is their responsibility to ensure the spread of awareness and knowledge regarding periodontal and oral health in

Table 4: Multivariable analysis.

Parameter	B	Standard error	95% Wald confidence interval		Sig.
			Lower	Upper	
Gender=Female vs. Male	0.054	0.3503	−0.632	0.741	0.876
Lebanese district=Nabatiye vs. North	1.444	0.8921	−0.304	3.193	0.105
Lebanese district=South Lebanon vs. North	0.035	0.8315	−1.595	1.664	0.967
Lebanese district=Beqaa vs. North	1.000	0.7839	−0.536	2.537	0.202
Lebanese district=Baalbek vs. North	0.299	0.6182	−0.913	1.511	0.629
Lebanese district=Mount Lebanon vs. North	**0.686**	**0.3666**	**−0.032**	**1.405**	**0.061**
Lebanese district=Beirut vs. North	**0.730**	**0.4090**	**−0.071**	**1.532**	**0.074**
Lebanese district=Akkar vs. North	0.528	0.5429	−0.536	1.592	0.330
Residence area=Rural vs. Urban	−0.237	0.2954	−0.816	0.341	0.421
Are you a UG or PG student?=PG vs. UG	−0.045	0.4002	−0.829	0.739	0.911
What year are you in?= >5 vs. 1st year	−0.797	0.7703	−2.308	0.713	0.301
What year are you in?=Fifth vs. 1st year	−0.699	0.5964	−1.868	0.470	0.241
What year are you in?=Fourth vs. 1st year	−0.636	0.4550	−1.528	0.256	0.162
What year are you in?=Third vs. 1st year	**−0.709**	**0.3882**	**−1.470**	**0.051**	**0.068**
What year are you in?=Second vs. 1st year	**−0.999**	**0.4129**	**−1.808**	**−1.89**	**0.016**
Which university do you attend?=Private vs. Public	**−0.540**	**0.2664**	**−1.062**	**−0.18**	**0.043**
What is your major?=Non-health-related vs. health-related	**−2.543**	**0.3025**	**−3.136**	**−1.950**	**0.000**
Age	0.123	0.0826	−0.038	0.285	0.135

vs.: Versus. Sig: Statistical significance, B: unstandardized beta, This value represents the slope of the line between the predictor variable and the dependent variable. The bold values are the ones that corresponds to the significant values, UG: Undergraduate, PG: Postgraduate

general among university students. This can be improved with the aid of multiple social media platforms, performing interactive lectures with non-dental students, and spreading brochures on campus. In addition, the lack of knowledge within the students' households might have played a huge role in achieving such results as well. A great number of those students' parents or the students themselves may suffer from diseases that may be correlated to periodontal disease, but their insufficient knowledge regarding this topic would not help them to recognize severity of the issue. Therefore, awareness campaigns must be held among university students to increase knowledge among them and consequently among their families regarding periodontal health, in hopes of decreasing the number of people in Lebanon suffering from periodontal diseases and their effect on the general health as well.

Limitations

Our study possesses several strong points, mainly by being the first cross-sectional study regarding knowledge of periodontal disease and related systemic diseases among university students in Lebanon. Due to lockdown and online courses, online surveys were used in data collection. Hence, it was possible that responders could search for information before answering, this would lead to an information bias. Further studies are suggested to confirm our findings.

CONCLUSION

The study showed lack of knowledge and awareness concerning the texture of healthy gingiva and the initiating factor and signs of periodontal disease. Furthermore, there is a very poor knowledge regarding the presence of the relationship between periodontal disease and systemic diseases.

Declaration of patient consent

Patient's consent not required as there are no patients in this study.

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Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Gao L, Xu T, Huang G, Jiang S, Gu Y, Chen F. Oral microbiomes: More and more importance in oral cavity and whole body. Protein Cell 2018;9:488-500.
2. Eke PI, Thornton-Evans GO, Wei L, Borgnakke WS, Dye BA, Genco RJ. Periodontitis in US adults: National health and

nutrition examination survey 2009-2014. J Am Dent Assoc 2018;149:576-88.e6.
3. Laudenbach JM, Kumar SS. Common dental and periodontal diseases. Dermatol Clin 2020;38:413-20.
4. Trombelli L, Farina R, Silva CO, Tatakis DN. Plaque-induced gingivitis: Case definition and diagnostic considerations. J Clin Periodontol 2018;45 Suppl 20:S44-67.
5. American Academy of Periodontology Task Force report on the update to the 1999 classification of periodontal diseases and conditions. J Periodontol 2015;86:835-8.
6. Kinane DF, Stathopoulou PG, Papapanou PN. Periodontal diseases. Nat Rev Dis Primers 2017;3:17038.
7. Gasner NS, Schure RS. Periodontal Disease. Treasure Island, FL: StatPearls Publishing; 2022.
8. Jepsen S, Caton JG, Albandar JM, Bissada NF, Bouchard P, Cortellini P, *et al*. Periodontal manifestations of systemic diseases and developmental and acquired conditions: Consensus report of workgroup 3 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions. J Periodontol 2018;89 Suppl 1:S237-48.
9. Lira-Junior R, Figueredo CM. Periodontal and inflammatory bowel diseases: Is there evidence of complex pathogenic interactions? World J Gastroenterol 2016;22:7963-72.
10. Lim G, Janu U, Chiou LL, Gandhi KK, Palomo L, John V. Periodontal health and systemic conditions. Dent J (Basel) 2020;8:130.
11. Bourgeois D, Inquimbert C, Ottolenghi L, Carrouel F. Periodontal pathogens as risk factors of cardiovascular diseases, diabetes, rheumatoid arthritis, cancer, and chronic obstructive pulmonary disease-is there cause for consideration? Microorganisms 2019;7:424.
12. Firatli E. The relationship between clinical periodontal status and insulin-dependent diabetes mellitus. Results after 5 years. J Periodontol 1997;68:136-40.
13. Farquharson D, Butcher JP, Culshaw S. Periodontitis, Porphyromonas, and the pathogenesis of rheumatoid arthritis. Mucosal Immunol 2012;5:112-20.
14. Fitzpatrick SG, Katz J. The association between periodontal disease and cancer: A review of the literature. J Dent 2010;38:83-95.
15. Chung JH, Hwang HJ, Kim SH, Kim TH. Associations between periodontitis and chronic obstructive pulmonary disease: The 2010 to 2012 Korean National Health and Nutrition Examination Survey. J Periodontol 2016;87:864-71.
16. Nannan M, Xiaoping L, Ying J. Periodontal disease in pregnancy and adverse pregnancy outcomes: Progress in related mechanisms and management strategies. Front Med 2022;9:963956.
17. Pihlstrom BL, Michalowicz BS, Johnson NW. Periodontal diseases. Lancet 2005;366:1809-20.
18. Jelwan YA, Asbeutah AA, Welty FK. Comprehensive review of cardiovascular diseases, diabetes, and hypercholesterolemia in Lebanon. Cardiol Rev 2020;28:73-83.
19. Bössmann K. Plaque and plaque control. Oralprophylaxe 1988;10:18-27.
20. Genco RJ, Borgnakke WS. Risk factors for periodontal disease. Periodontol 2000 2013;62:59-94.
21. Guo Y, Logan HL, Dodd VJ, Muller KE, Marks JG, Riley JL. Health literacy: A pathway to better oral health. Am J Public Health 2014;104:e85-91.
22. Kassak KM, Dagher R, Doughan B. Oral hygiene and lifestyle correlates among new undergraduate university students in Lebanon. J Am Coll Health 2001;50:15-20.
23. Al-Zarea BK. Oral health knowledge of periodontal disease among university students. Int J Dent 2013;2013:647397.
24. Masri DE, Alsaayed B, Masri JE, Zreika B, Chanbour H, Salameh P. Contribution of Arab Countries to Familial Mediterranean Fever Research: A PubMed-based bibliometric analysis. Rheumatol Int 2022;42:95-100.
25. El Ayoubi LM, El Masri J, Machaalani M, El Hage S, Salameh P. Contribution of Arab world in transplant research: A PubMed-based bibliometric analysis. Transpl Immunol 2021;68:101432.
26. Chanbour H, Masri JE, Bsat S, Bsat A, Jiblawi A, Sunna T. A bibliometric analysis of neurosurgery research productivity in Arab countries between 2005 and 2019. World Neurosurg 2021;154:e313-9.
27. Machaalani M, El Masri J, El Ayoubi LM, Matar B. Cancer research activity in the Arab world: A 15-year bibliometric analysis. J Egypt Public Health Assoc 2022;97:26.
28. Alzammam N, Almalki A. Knowledge and awareness of periodontal diseases among Jordanian University students: A cross-sectional study. J Indian Soc Periodontol 2019;23:574-9.
29. Márquez-Arrico CF, Almerich-Silla JM, Montiel-Company JM. Oral health knowledge in relation to educational level in an adult population in Spain. J Clin Exp Dent 2019;11:e1143-50.
30. Oberoi SS, Sharma G, Oberoi A. A cross-sectional survey to assess the effect of socioeconomic status on the oral hygiene habits. J Indian Soc Periodontol 2016;20:531-42.
31. Petridou E, Athanassouli T, Panagopoulos H, Revinthi K. Sociodemographic and dietary factors in relation to dental health among Greek adolescents. Community Dent Oral Epidemiol 1996;24:307-11.
32. Whittle JG, Whittle KW. Household income in relation to dental health and dental health behaviours: The use of Super Profiles. Community Dent Health 1998;15:150-4.
33. Maharani DA, El Tantawi M, Yoseph MG, Rahardjo A. The use of internet platforms for oral health information and associated factors among adolescents from Jakarta: A cross sectional study. BMC Oral Health 2021;21:22.
34. El-Qaderi SS. Oral health knowledge and self-reported practices among a sample of university students in Jordan. Int Q Community Health Educ 2003;22:59-75.

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