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·牙周医学专栏　综述·

老年群体牙周病流行现状及影响因素的研究进展

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【摘要】 牙周疾病负担与经济水平有关，经济水平较高的欧洲和西太平洋地区的牙周病负担低于非洲和东南亚地区，但都表现为65岁以上老年人群的牙周疾病负担更重。而我国目前是全球口腔疾病负担最重的国家，伤残调整生命年（disability adjusted life years，DALYs）占比18.69%，且牙周状况分布存在地域性差异，这与不同地区的社会经济条件、饮食生活习惯等因素有关。有调查结果出现45～64岁中年群体的牙周病患病率高于65岁以上老年群体的现象，这是由于牙齿脱落等原因导致老年群体的口腔状况在统计时易发生偏倚。老年群体牙周病的发生发展与多种因素有关：衰老引发牙周组织生理性退化和免疫功能衰退；行动能力减弱以及口腔健康意识淡薄使得口腔日常清洁不足；糖尿病、骨质疏松和认知障碍等全身性疾病会加重牙周组织炎症；吸烟、高热量饮食、营养素缺乏等对牙周组织有累积影响。目前我国老龄化的加剧意味着口腔疾病负担加重，对社会医疗资源的分配提出更高要求，因此老年群体的牙周疾病防治显得尤为重要。本文将65岁以上的老年人作为研究群体，搜集并总结国内外该群体牙周病的流行情况，探讨老年群体牙周病的影响因素，以期为老年群体牙周病的早期预防、疾病控制和疾病防治提供依据。

【关键词】 老年群体；　牙周病；　吸烟；　饮食；　糖尿病；　骨质疏松；　认知障碍；　知信行
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Research progress on prevalence status and influencing factors of periodontal disease in the elderly

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【Abstract】 Periodontal disease burden is related to economic level. The burden of periodontal disease in Europe and the Western Pacific, which have higher economic levels, is lower than that in Africa and Southeast Asia. The burden of periodontal disease is mostly concentrated in people over 65 years of age. China currently has the heaviest burden of oral disease in the world; the country's disability adjusted life years account for 18.69%. There are regional differences in the distribution of periodontal conditions that are related to socioeconomic conditions, dietary habits, and other factors of different regions. Some survey results show that the prevalence of periodontal disease among those in the middle-aged group (45 – 64 years old) is higher than that among the elderly group (over 65 years old). This is because the oral condition of the elderly group is prone to bias in statistics due to tooth loss and other reasons. The occurrence and development of periodontal disease in the elderly is related to a variety of factors: aging triggers physiological degeneration of periodontal tissue and decline in immune function; weakened mobility and weak oral health awareness lead to insufficient daily oral cleaning; certain systemic diseases can aggravate periodontal tissue inflammation, such as diabetes, osteoporosis, and cognitive impairment; and the cumulative impact of factors such as smoking, high-calorie diet, and nutri-

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ent deficiencies on periodontal tissue. At present, China has entered the stage of aging, which means that there is an increase in the burden of oral disease, and this puts higher requirements for the allocation of social medical resources in the future. Therefore, the prevention and treatment of periodontal disease in the elderly population is particularly important. This article, which takes the elderly over 65 years old as the research group, collects and summarizes the prevalence of periodontal disease in this group at home and abroad, and explores the influencing factors of periodontal disease in the elderly. In order to provide a basis for the early prevention of periodontal disease in the elderly, a focus must be placed on disease control and prevention as well as treatment of specific susceptible groups.

【Key words】 elderly; periodontal disease; smoking; diet; diabetes mellitus; osteoporosis; cognitive impairment; knowledge, attitude, practice

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牙周病是一种慢性多因素炎症性疾病[1]，在全球范围内广泛流行[2]。牙周疾病主要破坏牙龈、牙槽骨和牙周韧带，分为牙龈炎和牙周炎两大类。牙龈炎具有可逆性，炎症仅局限于牙龈组织，可通过良好的口腔清洁和相应的治疗来治愈；牙周炎则具有不可逆性[3]，临床上的治疗手段仅可以控制炎症的进程，很难恢复已经被炎症破坏侵袭的牙周组织。2012年疾病控制与预防中心（Centers for Disease Control and Prevention，CDC）和美国牙周病学会（American Academy of Periodontology，AAP）提出将牙周炎分为轻度、中度和重度3类[4]，老年牙周病主要以中重度牙周炎为主[5]。

截至2019年，全球60岁以上老年人群的口腔疾病负担已达到890万伤残调整生命年（disability adjusted life years，DALYs）[6]。在我国，仅9.3%的老年人没有明显的牙周问题，该值显著低于其他年龄组[7]。Eke等[8]发现，美国30岁以上成年人的牙周病患病率为42.2%，65～79岁人群的牙周病患病率却达到了59.8%。主要原因是年龄增长会对口腔健康造成影响，此影响来源于诸多方面，如机体衰老、全身性疾病、药物史、认知功能、行为习惯等[9]。欧洲牙周病学会（European Federation of Periodontology，EFP）与欧洲龋齿研究组织（Organization of Caries research，ORCA）联合研讨会第4组共识报告中曾提出，建议将65~74岁和75岁以上的人群作为口腔健康调查的代表性样本[10]。因此，本文将以65岁以上老年人作为研究群体，旨在总结国内外该群体的牙周病的流行情况，从多方面归纳总结老年牙周病的常见影响因素，为预防控制老年群体牙周病的发生发展提供参考。

1　国内外老年群体牙周病流行现状

1.1　国外流行现状

世界卫生组织（World Health Organization，WHO）2022年发布的《口腔卫生全球状况报告》[11]中提出，全球近19%的成年人患有严重的牙周病，全球病例数超过10亿例。在WHO 6个区域内，非洲地区的重度牙周炎患病率最高，达到了22.80%，西太平洋地区患病率最低，为16.28%。然而在1990至2019年间，西太平洋地区的患病率的涨幅最大，高达39.19%，低收入国家（如非洲地区）的患病率几乎没有变化[11]。在WHO的194个成员国里，丹麦的患病率最高，为33.5%；所罗门群岛的患病率最低，仅2.3%[12]。

牙周病主要累及老年人群。有研究者对17个国家的牙周病患病率进行汇总评估时发现，65岁以上的人群的患病率汇总估计值最高，达79.3%[13]。美国96.4%的老年人（≥65岁）存在3 mm以上的临床附着丧失（clinical attachment loss，CAL），所有州的老年人牙周病患病率为62.1%～74.2%，重度牙周炎患病率为9.5%～16.3%[14]。印度成年人的牙周病总体患病率为51%，65岁以上的老年人患病率达63.6%，并且有32.7%的老年人患有重度牙周炎[15]。巴西65～74岁年龄组的牙周病患病率为83%，远高于15～19岁的68%和35～44岁的72%[16]。2021年全球疾病负担（Global Burden of Disease，GBD）数据库显示，在WHO 6个区域内65岁以上人群牙周疾病负担最重的为东南亚地区，DALYs高达64万，欧洲地区和西太平洋地区疾病负担最小，DALYs不到东南亚地区的1/10[17]。

1.2　国内流行现状

《2019年全球疾病负担研究》报告了我国是全球口腔疾病负担最重的国家，DALY占比18.69%[18]。虽然这可能与我国是世界人口最高的国家（人口占比18.59%，与DALY数值相似）有关，但我国口腔疾病负担整体还是呈上升趋势，并且DALY值仍以年均3%的增速上升，这说明全民口腔健康状况不容乐观。

第四次全国口腔健康流行病学调查显示，我国35～44岁、55～64岁和65～74岁3个年龄组的牙周炎患病率分别为52.8%、69.3%和64.6%，且65～74岁的重度牙周炎的患病率最高（43.5%）[7]。2021年GBD数据库显示[17]，我国牙周疾病负担主要集中于45岁以上人群，50～54岁年龄段最严重，在60岁以上人群出现下降趋势，这是因为60岁以上的老人牙齿脱落率较高，导致牙周病的患病风险被低估[19-21]。

中国老年群体的牙周状况存在地区差异。65～74岁老年人在不同省份的牙周病患病率分别为：云南省75.7%[22]，甘肃省66.9%[23]，江苏省85.43%[24]，四川省80.78%[25]，山西省69.8%[26]。并且在山西省内，忻州市可高达到81.1%，而运城市却仅有47.8%[26]。这种差异可能与不同的社会经济条件、饮食生活习惯有关，同时牙周病不同的诊断标准也会影响调查结果[27]。因此，在流行病调查分析中采用统一的诊断标准显得尤为重要[28]。

2　老年群体牙周病的影响因素

2.1　衰老

衰老是指包括口腔在内的多脏器系统完整性的渐进性恶化，在生物学上的表现是细胞衰老、干细胞耗竭和免疫衰老[29]。有研究表明，衰老与牙周稳态受损和牙周病的病理生理学有关，也与牙周终生健康和更多的牙齿保留相关[14]。同时，细胞衰老的加快可能是导致牙周病发展的潜在机制[29]。

Ikegami等[30]发现细胞衰老是通过产生各种分泌因子来引起慢性疾病的，又称为衰老相关分泌表型（senescence - associated secretory phenotype，SASP）。慢性牙周炎是由衰老的牙周韧带细胞介导的，此类人的牙周韧带细胞在体外表现出不可逆的细胞周期停滞和SASP样表型，通过产生SASP蛋白来加剧牙周组织的炎症和破坏。老年群体牙龈成纤维细胞中与愈合相关的细胞反应也低于其他群体，如胶原蛋白合成、细胞迁移、增殖和胶原收缩等[29]。衰老还会使巨噬细胞介导炎症消退的过程受损，影响牙周病的进程[29]。在患有牙周病的老年人中，牙周组织的未成熟树突状细胞和脱颗粒肥大细胞会显著表达，导致免疫功能减弱[31]。此外，氧化应激和细胞衰老的积累会推动骨质疏松症的进展，进而加速牙槽骨吸收，导致牙周病的恶化[32]。目前，抗衰老药物和细胞疗法越来越多地被评估可用于恢复口腔健康状态[33]。

2.2　吸烟

香烟含有7 000多种化学物质[34]，大量数据显示吸烟与牙周病存在联系，与牙周病影响因素有关的研究也将是否吸烟作为主要的检查指标。吸烟会使牙周病的患病风险增加85%[35]。并且吸烟的持续时间和吸烟量与牙周炎的严重程度呈正相关[36]。Sun等[37]对来自中国31个省的9 054名55～74岁成年人的牙周病调查数据进行二元回归分析，发现吸烟是牙周病的危险因素（*OR* = 1.269；95%*CI*：1.116-1.443）。吸烟不仅会增加牙周病的患病率，还会影响牙周治疗的效果和预后[38]。尼古丁收缩血管的作用常常使吸烟者牙龈出血的症状小于非吸烟者[39]，从而延误此类患者的最佳治疗时机。经统计，2019～2020年我国≥60岁年龄组的吸烟率为24.2%，40～59岁组为29.0%，并且≥40岁吸烟人群的平均开始吸烟年龄为20.0岁[40-41]，这意味着吸烟对该群体的负面影响已累积几十年。

针对吸烟影响牙周病发生发展的机制有多种假设。Silva[39]认为，吸烟会使口腔微循环发生形态变化，造成牙周组织营养不良、细菌代谢产物难以排出，使局部炎症向深处扩散；吸烟还会抑制牙周组织的免疫反应，使其更易受到细菌的侵犯。Zhang等[36]认为吸烟可以促进牙周病原菌的定植，尤其是与牙周炎关系最密切的红色复合体微生物，如牙龈卟啉单胞菌。烟草烟雾还会改变病原菌的基因型，增强其致病性[42]。因此，吸烟应作为考察牙周病影响因素的一项重要指标，并将控烟作为预防牙周病的重点内容。

2.3　膳食结构

有研究发现牙周病的发生发展与高脂肪、高碳水化合物及某些营养素的摄入有关。并且我国老年群体仍存在食用过量食用油和食用盐等不健康饮食的问题[43-44]。随着年龄的增长，机体器官利用脂质消耗能量的能力逐渐下降，脂质在衰老人群中更易于积累[45]。消化系统功能衰退、疾病、长期服药等因素的相互作用也会使老年人难以获取足够的

营养，进而造成营养素缺乏、营养不良的后果[46-47]。

2.3.1　热量　高热量饮食会提高包括牙周病在内的慢性炎症疾病的患病风险。采用健康饮食（如地中海饮食，一种以蔬菜、谷物和优质蛋白为主的低卡路里饮食模式）可以显著改善牙周病患者的牙周状态[48-49]。接近此饮食模式个体的CAL水平为不接近此模式个体的一半（CAL ≥ 3 mm的位点数量占比分别为8.1%和19.0%）[50]。相关机制可能是低卡路里可以提高细胞的抗损伤的潜力，减少线粒体产生自由基的数量，减轻氧化应激的程度，同时卡路里限制还可以降低炎症介质的水平，增强免疫细胞的活性，调节机体免疫功能，从而达到控制牙周病和提高牙周组织抵抗力的作用[48]。Mainas等[51]也提出节食可以减少牙周病患者牙龈出血、牙龈炎症和骨质丧失。对于中重度牙周炎患者，在非手术牙周治疗的同时控制卡路里的摄入，可以有效地促进牙周组织的愈合和功能重建[22]。

2.3.2　营养素　有研究发现维生素（维生素A、B、C、D、E）、矿物质（钙、铁、锌、钾、铜、锰、硒）、omega-3脂肪酸等营养素对牙周病的预防和管理具有重要意义[52]。例如，抗坏血酸（Vitamin C，VitC）调节机体许多生化反应，参与蛋白质的合成，是胶原蛋白稳定过程的重要元素。VitC的缺乏可能会导致牙周韧带功能减弱，加速牙齿脱落。此外，VitC还能通过抑制氧化应激和促炎介质的合成在牙周组织中发挥抗炎作用[53]。Li等[54]对5 145名成年人进行研究时发现，VitC摄入量低的群体更易患牙周病，并且VitC日摄入量为158.49 mg时，牙周状态最好，摄入量过多或过少都会增加牙周病患病率。维生素D（Vitamin D，VitD）作为一种类固醇衍生物，它可以促进牙周组织的骨形成，增强骨密度，从而加强牙周组织稳定性[53]。同时VitD还可以调节免疫反应，抑制牙周组织细胞促炎因子的表达并促进其自噬功能，有利于清除病原菌，减轻牙龈炎症，从而对牙周健康起到保护作用[55]。

2.4　全身性疾病

牙周病与心血管疾病、呼吸系统疾病、肾脏疾病、癌症、阿尔茨海默病等疾病有关，且彼此之间的双向关系已得到认可[56]。由于生理和代谢特征的变化，老年群体是多种系统性疾病的高危易感人群。因此，对老年群体中全身性疾病与牙周病之间的潜在机制审查，对于优化这些患者的口腔和全身健康管理策略具有重要意义。

2.4.1　糖尿病　全世界已有4.15亿成年人患有糖尿病，以2型糖尿病为主，50岁以上人群患病率最高。Stöhr等[57]对15项队列研究进行Meta分析时发现糖尿病会使牙周病的发病率增加24%（95% *CI*：13%-37%）。其潜在机制包括：糖尿病诱导的蛋白质糖基化可通过增加牙龈卟啉单胞菌从血红蛋白中获取血红素的能力来增强牙龈卟啉单胞菌的毒力，使其致病性增强[58]。糖尿病患者牙周组织中的白介素-17的含量和中性粒细胞的数量高于正常人，但增加的中性粒细胞的趋化和吞噬能力明显降低，导致牙周组织抵御致病菌的能力下降[59]。此外，长期高血糖会增加牙龈组织中衰老细胞的负担，使其更易受到细菌的侵害[60]。因此，糖尿病患者更应保持良好的口腔卫生，定期进行口腔检查和专业清洁[61]。对不同程度的糖尿病患者，临床医生应该制定相应的个性化治疗方案[62]。

2.4.2　骨质疏松　骨质疏松是老年人的常见疾病，特别是绝经期的妇女，雌激素的减少与骨质流失有着密切的联系[63]。对19 611例患者进行28项观察性研究时发现，骨质疏松组的CAL水平、探诊深度、牙龈退缩、简化口腔卫生指数、探诊出血部位百分比均高于非骨质疏松组[64]。韩国一项研究也发现骨质疏松症与牙周病有关联（*OR* = 1.25，95% *CI*：1.00-1.56）[65]。目前对两者之间关系较多的解释是骨质疏松和牙周病拥有相似的影响因素，如：年龄、遗传、炎症和激素等。年龄增长带来的氧化应激积累和细胞衰老会促进两者的发展，吸烟和VitD缺乏也会增加氧化应激和损伤宿主对炎症的反应[66]。炎症及其对骨重建的影响在骨质疏松症和牙周炎的发病机制中起着关键作用，并且可以作为这些疾病之间的中心机制联系。细胞因子增加和炎症反应升高会加剧破骨细胞骨吸收，并抑制成骨细胞，导致骨流失[32]。

2.4.3　认知障碍　2021年GBD数据库统计显示全球疾病负担最重是神经系统类疾病，其中认知障碍及其他痴呆症的DALYs达到了3.63亿，死亡人数有1 950万[67]。有研究认为牙周病与认知障碍和痴呆之间存着较强的关系[68]，它可通过细菌引起的慢性炎症反应对大脑产生负面影响，同时还可通过影响心血管功能来增加认知障碍的风险[69]，但具体的作用机制仍需要进一步的研究。牙周病与认知障碍之间并非是单向联系，患有痴呆或认知障碍的患者通常会逐渐丧失自主生活的能力，不再能充分坚持良好的口腔卫生习惯，从而导致口腔卫生变差，口腔生态失调，进而加重口腔慢性炎症[70]。Maldonado等[71]对此进行Meta分析发现，痴呆患者的牙周状态与全身健康的个体相

比明显更差，这表明认知障碍可作为牙周病的一项影响因素。

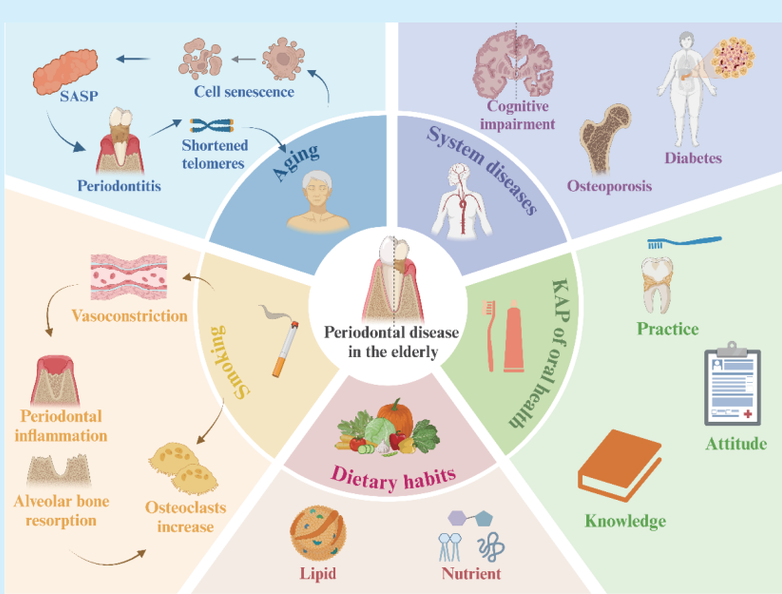
2.5　口腔健康知识、意识及口腔健康行为

口腔健康知识、意识和行为也可以影响牙周病的患病率。口腔健康意识主要体现在对口腔健康知识的知晓率和就医的主动性，口腔卫生保健意识强的人往往会有良好的口腔健康行为，也更加注重日常口腔护理。受教育程度高和经济实力较好的人通常有良好的口腔卫生保健意识，此类人群的牙周病患病率更低[72]。口腔健康行为主要表现在刷牙、使用牙线和牙签以及定期口腔检查等[73]，研究表明刷牙频率少于2次/d的老年人牙周病的患病率更高；距离上次就医小于12个月的老年人患病率更低[5]。此外，使用牙线和牙签也可减少牙周病的患病率[73]。

在我国，65～74岁年龄组口腔健康知识知晓率为47.6%，低于其他年龄组[74]。只有30.1%的老年人每天刷牙2次，0.8%的老年人使用牙线，口腔健康行为在所有年龄段中表现最差[10,75]。由于活动能力受限，老年人的口腔就诊次数与其他年龄相比更少，就诊间隔也较长，从而导致口腔疾病得不到及时的控制而向更为严重的程度进一步发展。

3　小结与展望

牙齿脱落作为牙周病的最终结局，会导致老年人咀嚼功能严重受损，影响营养摄入。牙周病发生发展与衰老、吸烟、饮食、全身疾病、口腔卫生习惯等因素有着密切的联系（图1）。然而这些影响因素并非孤立存在，例如吸烟除了会降低牙周组织的抵抗力，还会使糖尿病、高血压等与牙周病相关的全身性疾病加重，两者共同作用使牙周病发展速度加快。同时，牙周病还会促进心血管疾病、呼吸系统疾病、糖尿病等全身性疾病的发展。因此老年人更应该注重牙周健康。对于患有糖尿病、骨质疏松等全身性疾病的老年患者，临床医生在给出疾病治疗计划的同时也应建议患者注意牙周问题。老年群体的牙周病治疗以非手术治疗为主。在制定牙周系统治疗方案时，充分考虑患者的生活习惯、饮食习惯、服药史以及全身健康状况[76]。对于患有认知障碍或行动不便的老年人，临床医师可嘱托家属辅助患者进行日常口腔清洁工作。此外，应加大老年群体的口腔健康教育和口腔疾病监测力度[77]，创建并完善牙周风险评估系统[78]，从而更好地识别易感人群，制定个性化治疗方案，有效控制疾病发生发展。



The main influencing factors related to the development of periodontal disease in the elderly population are aging, smoking, dietary habits, systemic diseases, and oral health knowledge, attitude, and practice (KAP). SASP: senescence-associated secretory phenotype

Figure 1　Influencing factors for periodontal disease in the elderly

图1　老年群体牙周病的影响因素

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