

## Prevalence of the periodontal status in Germany: results of the 6th German Oral Health Study (DMS • 6)

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**Objectives:** The 6th German Oral Health Study (DMS • 6) reports on the periodontal status in population-based cohorts of younger adults (35- to 44-year-olds) and younger seniors (65- to 74-year-olds). **Method and materials:** Participants answered questionnaires regarding oral health behavior, and general and oral health status. Probing depth (PD), clinical attachment level (CAL), and bleeding on probing (BOP) were measured on all teeth except third molars. Number of teeth, BOP, mean PD, mean CAL, the stages of the 2018 classification of periodontal diseases, the prevalence of Community Periodontal Index (CPI), and the Centers for Disease Control and Prevention (CDC)/American Academy of Periodontology (AAP) case definition were reported. **Results:** In total, 9.2%/20.6% of younger adults/younger seniors had a low education status, 25.6%/14.1% of younger adults/younger seniors were current smokers, and 2.1%/15.4% of younger adults/younger seniors had type 2 diabetes. Of all younger adults/younger seniors, 24.4%/38.7% stated that they performed interdental cleaning at least daily. The mean number of teeth in dentate younger adults/younger seniors was 26.6/20.4, of which 5.6/8.3 teeth had PD  $\geq$  4 mm and only 0.6/1.7 teeth had PD  $\geq$  6 mm. The mean number of teeth

with CAL  $\geq$  5 mm was 1.1/3.6 in younger adults/younger seniors. Mean PD in younger adults/younger seniors was 2.1 mm/2.6 mm; correspondingly, mean CAL was 1.1 mm/2.4 mm. A CPI score of 4 occurred in 16.2%/42.4% of younger adults/younger seniors. In total, 13.6%/26.3% of younger adults/younger seniors were classified as having stage III periodontitis, while 3.9% and 26.4% were classified as having stage IV periodontitis according to the 2018 case classification, respectively. **Conclusion:** The periodontitis prevalence according to the 2018 classification (including all stages) was very high at 95.1%/85.2% in younger adults/younger seniors. In total, 31.6%/8.3% of younger adults/younger seniors were classified as stage I (ie, interdental CAL 1 to 2 mm), which, from a clinical point of view, appears to be a transitional phase between gingivitis and periodontitis, which can probably be managed with preventive rather than therapeutic measures. In younger adults and younger seniors, the prevalence of periodontitis in Germany is high, with severe periodontitis (stages III and IV) in 17.5%/52.7% of younger adults/younger seniors. (*Quintessence Int* 2025;56(Suppl):S40–S47; doi: 10.3290/j.qi.b5981979)

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Periodontitis is characterized by attachment and bone loss as well as bleeding on probing (BOP) and periodontal pockets, which extend from the gingival margin to the most coronal extension of the periodontal attachment. The respective coronal landmark for attachment loss is the cementoenamel junction (CEJ). Probing depth (PD) is used to assess the current periodontal status and

treatment burden, whereas clinical attachment levels (CAL) indicate the cumulative periodontal disease experience. On a subject level, both measurements can be aggregated and expressed as prevalence (at least one diseased site), extent (number [corresponding to treatment needs] and percentage of affected sites/teeth), and severity (mean PD/CAL).<sup>1</sup> However, health administra-

tors and the general public need a categorical case classification. The current classification, which was introduced by the European Federation of Periodontology (EFP) and the American Academy of Periodontology (AAP) in 2018, characterizes cases of periodontitis according to their severity (complexity, extent) and progression rate using a two-vector system defined by stage and grade.<sup>2</sup>

In 2015, the DMS V study revealed a high prevalence of periodontitis.<sup>3</sup> In turn, the National Association of Statutory Health Insurance Dentists has developed new treatment strategies to address the need for periodontal treatment that is yet to be met. In 2021, a new treatment directive and new treatment codes were added to the code book by the joint committee of care providers and statutory health insurance,<sup>4</sup> based on the EFP/AAP case definition. However, it should be noted that the present data reported do not yet reflect the new directive.

The aim of this publication was to report the periodontal status of younger adults and younger seniors in Germany. As periodontal disease is driven by key risk factors, the health care system must correlate the periodontal status to the exposure profiles, which will help explain existing differences in periodontal status.

## Method and materials

The general methodology of the study is presented in separate articles.<sup>5,6</sup> The 6th German Oral Health Study (DMS • 6) has been approved by the Institutional Review Board (IRB) of the Witten/Herdecke University, Witten, Germany (registration number S-249/2021). This study is registered at the German Clinical Trials Register (registration number DRKS00028701).

### Sample

In total, 927 younger adults (35- to 44-year-olds) and 797 younger seniors (65- to 74-year-olds) received a clinical examination. Of those, one younger adult and 37 younger seniors were edentulous. Fifteen younger adults and 42 younger seniors met other exclusion criteria for periodontal examination (ie, heart disease record card; hemophilia, immunosuppression after organ transplantation). Therefore, periodontal variables were available for 911 younger adults and 718 younger seniors.

### Covariates

Further information was collected in interviews (see Table 1 for parameters). The body mass index was calculated based on height and weight.

## Clinical examination

Measurements of PD, CAL, and BOP were recorded with a manual periodontal probe (PCPUNC 15, Zantomed) at six sites per tooth, excluding third molars. PD and CAL measurements were mathematically rounded. PD was measured as the distance between the free gingival margin (FGM) and pocket base. If the CEJ was subgingival, CAL was calculated as PD minus the distance between FGM and CEJ. If recession was present at the examined site, CAL was measured directly as the distance between CEJ and the pocket base. If the CEJ was indistinct (wedge-shaped defects, fillings, crown margins), CAL was not recorded.

## Periodontal status reporting and statistical analysis

For dentate participants, the number of teeth (excluding third molars), percentage of sites with BOP, mean PD/CAL, prevalence of PD  $\geq 4$  /  $\geq 6$  mm (individuals with at least one site), numbers of teeth and percentages of sites with PD  $\geq 4$  /  $\geq 6$  mm, prevalence of CAL  $\geq 3$  /  $\geq 5$  mm, and numbers of teeth and percentages of sites with CAL  $\geq 3$  /  $\geq 5$  mm were calculated. The 2018 EFP/AAP periodontitis classification<sup>7</sup> was used for assessment, including information about the number of teeth extracted due to periodontitis (participants were asked whether extractions were due to periodontal treatment or high tooth mobility), flaring of maxillary anterior teeth, and the number of occluding pairs of natural teeth. CAL measurements were not available in four younger adults and 61 younger seniors due to crowning (registered as “non-classified”). To obtain population-representative prevalence data, edentate subjects were included in the prevalence calculation. In addition, the Centers for Disease Control and Prevention (CDC)/AAP case definition<sup>8</sup> and the Community Periodontal Index (CPI)<sup>9</sup> were recorded.

Prevalence estimates were weighted using sampling weights to adjust for different probabilities of subject selection and differences in gender, age, and region with respect to the German base population. Numbers (n) are provided without weighting. Detailed information on data handling and statistical methods were described previously.<sup>10</sup>

## Results

### Baseline characteristics

Approximately 9% of younger adults and 20.6% of younger seniors had a low education status, 25.6% of younger adults and 14.1% of younger seniors were current smokers, and 2.1% of

**Table 1** Baseline characteristics of study participants for younger adults (35- to 44-year-olds) and younger seniors (65- to 74-year-olds)

Variable	35- to 44-year-olds	65- to 74-year-olds
No. of participants (n)	912	755
Age, years	40.1 ± 2.9	69.7 ± 2.8
Gender	Male	453 (49.7%)
	Female	458 (50.2%)
	Diverse	1 (0.1%)
Education group	Low	79 (9.2%)
	Medium	401 (46.8%)
	High	376 (43.9%)
Migration history	Yes	199 (23.5%)
	No	649 (76.5%)
Smoking status	Never smoked	497 (54.8%)
	Former smoker	178 (19.6%)
	Current smoker	232 (25.6%)
Body mass index, kg/m <sup>2</sup>		26.2 ± 5.5
	< 25	406 (47.7%)
	25 – < 30	283 (33.3%)
	≥ 30	162 (19.0%)
Diabetes mellitus	No diabetes	874 (96.7%)
	Gestational diabetes	7 (0.8%)
	Type 1 diabetes	4 (0.4%)
	Type 2 diabetes	19 (2.1%)
Tooth brushing (frequency)	> 2 times daily	45 (5.0%)
	2 times daily	698 (77.0%)
	Once daily	138 (15.2%)
	< once daily	26 (2.9%)
Interdental cleaning (frequency)	≥ once daily	221 (24.4%)
	≥ once a week	195 (21.5%)
	< once a week	188 (20.7%)
	Never	303 (33.4%)
Dental floss use (frequency)	≥ once daily	172 (19.0%)
	≥ once a week	176 (19.4%)
	< once a week	172 (19.0%)
	Never	387 (42.7%)
Interdental brushes use (frequency)	≥ once daily	65 (7.2%)
	≥ once a week	53 (5.8%)
	< once a week	68 (7.5%)
	Never	721 (79.5%)
Tooth sticks use (frequency)	≥ once daily	17 (1.9%)
	≥ once a week	20 (2.2%)
	< once a week	10 (1.1%)
	Never	860 (94.8%)
Electric toothbrush use (frequency)	≥ once daily	483 (53.3%)
	≥ once a week	18 (2.0%)
	< once a week	3 (0.3%)
	Never	403 (44.4%)
Dental visits (frequency)	≥ once a year	780 (86.5%)
	< once a year	39 (4.3%)
	Only in case of problems	83 (9.2%)

**Table 1** Baseline characteristics of study participants for younger adults (35- to 44-year-olds) and younger seniors (65- to 74-year-olds)

Variable		35- to 44-year-olds	65- to 74-year-olds
Dental service utilization	Complaint-oriented	120 (13.2%)	92 (12.3%)
	Control-oriented	787 (86.8%)	657 (87.7%)
Professional tooth cleaning (utilization)	Yes	711 (78.9%)	587 (78.8%)
	No	188 (20.9%)	155 (20.8%)
	Don't know	2 (0.2%)	3 (0.4%)
Professional tooth cleaning (frequency)	Never	188 (21.0%)	155 (21.8%)
	Usually no professional tooth cleaning	105 (11.7%)	90 (12.7%)
	< once every 2 years	60 (6.7%)	43 (6.0%)
	≥ once every 2 years	54 (6.0%)	30 (4.2%)
	≥ once a year	314 (35.0%)	207 (29.1%)
	≥ once every 6 months	175 (19.5%)	186 (26.2%)
PD measurement during professional tooth cleaning	Yes	227 (36.1%)	215 (44.1%)
	No	303 (48.2%)	208 (42.6%)
	Don't know	99 (15.7%)	65 (13.3%)
Lifetime periodontal treatment (utilization)	Yes	112 (12.4%)	241 (32.3%)
	No	766 (84.9%)	478 (64.0%)
	Don't know	24 (2.7%)	28 (3.7%)

Data are presented as number (percentage) or mean ± standard deviation based on unweighted data for edentate and dentate participants with complete periodontal findings. PD, probing depth.

younger adults and 15.4% of younger seniors had type 2 diabetes (Table 1). At least daily interdental cleaning was stated by 24.4% of younger adults and 38.7% of younger seniors, respectively. Professional tooth cleaning at least every 6 months was reported by 19.5% of younger adults and 26.2% of younger seniors, while periodontal treatment during their lifetime was reported by 12.4% of younger adults and 32.3% of younger seniors.

### Periodontitis prevalence, extent, and severity

The mean number of teeth in dentate patients was 26.6 in younger adults and 20.4 in younger seniors, of which 5.6/8.3 teeth had PD ≥ 4 mm and 0.6/1.7 teeth had PD ≥ 6 mm (Table 2). The mean number of teeth with CAL ≥ 5 mm was 1.1/3.6 in younger adults/younger seniors. The mean PD was 2.1 mm/ 2.6 mm; the mean CAL was 1.1 mm/2.4 mm.

According to the EFP/AAP classification (Table 3), 4.3% of younger adults were periodontally healthy or had gingivitis. Fourteen per cent of younger adults (grade B: 36.3%; grade C: 63.7%) and 26.3% of younger seniors (grade B: 80.5%; grade C: 18.1%) were classified as having stage III periodontitis, respectively. Stage IV periodontitis was present in 3.9% of younger adults (grade B: 21.0%; grade C: 79.0%) and in 26.4% of younger seniors (grade B: 71.2%; grade C: 28.8%), respectively.

The prevalence, severity, and extent of periodontitis were consistently higher in men than in women (Table 2).

A CPI score of 4 occurred in 16.2%/42.4% of younger adults/younger seniors (Table 4). Breaking it down by tooth, molars and premolars were more often extracted than incisors. Percentages of present teeth with PD ≥ 4 mm were highest for molars, followed by premolars and incisors (Appendix 1). Patterns were similar in the maxilla and mandible.

### Distribution pattern according to periodontal risk factors

Both in younger adults and younger seniors, the prevalence of stage IV periodontitis was higher in people with a low education status, smokers, and diabetics but lower in people with favorable oral hygiene behavior (Appendix 2).

## Discussion

According to the 2018 EFP/AAP classification, the prevalence of periodontitis was very high at 95.1% in younger adults and 85.2% in younger seniors, and periodontal health and gingivitis were rare. In total, 17.5% of younger adults and 52.7% of younger seniors were classified as stage III or IV. This is a conservative estimate because the proportion of non-classifiable

**Table 2** Prevalence, severity, and extent of periodontitis in dentate younger adults (35- to 44-year-olds) and younger seniors (65- to 74-year-olds)

Variable	35- to 44-year-olds			65- to 74-year-olds			
	Total	Male	Female	Total	Male	Female	
No. of participants (n)	911	452	458	718	327	391	
BOP (% sites)	14.2 (13.1; 15.3)	13.8 (12.2; 15.3)	14.7 (13.1; 16.3)	20.4 (18.9; 22.0)	20.8 (18.7; 22.9)	20.0 (17.8; 22.3)	
PD	Mean PD, mm	2.1 (2.1; 2.2)	2.2 (2.2; 2.3)	2.1 (2.0; 2.1)	2.6 (2.6; 2.7)	2.8 (2.7; 2.9)	2.5 (2.4; 2.5)
	PD ≥ 4 mm (prevalence)	73.2% (70.3; 76.0)	76.0% (71.8; 79.7)	70.3% (66.0; 74.2)	91.3% (88.9; 93.1)	93.4% (90.4; 95.7)	89.4% (86.1; 92.3)
	PD ≥ 6 mm (prevalence)	16.2% (13.9; 18.7)	21.0% (17.3; 24.9)	11.8% (9.1; 14.9)	44.8% (41.1; 48.4)	55.2% (49.9; 60.5)	35.7% (30.8; 40.4)
	Number of teeth with PD ≥ 4 mm	5.6 (5.2; 6.1)	6.7 (6.0; 7.4)	4.5 (4.0; 5.1)	8.3 (7.8; 8.8)	9.8 (9.1; 10.5)	7.0 (6.4; 7.6)
	Number of teeth with PD ≥ 4 mm in periodontally diseased persons*	7.9 (7.3; 8.4)	9.0 (8.1; 9.8)	6.7 (6.0; 7.5)	9.4 (8.9; 9.9)	10.7 (9.9; 11.4)	8.2 (7.6; 8.9)
	Number of teeth with PD ≥ 6 mm	0.6 (0.5; 0.8)	0.9 (0.7; 1.1)	0.4 (0.2; 0.5)	1.7 (1.5; 1.9)	2.4 (2.0; 2.8)	1.0 (0.8; 1.3)
	Percentage of sites with PD ≥ 4 mm (%)	7.9 (7.0; 8.8)	9.6 (8.3; 11.0)	6.3 (5.2; 7.5)	19.0 (17.4; 20.5)	23.3 (20.9; 25.8)	15.2 (13.3; 17.0)
	Percentage of sites with PD ≥ 6 mm (%)	0.7 (0.5; 0.9)	1.0 (0.7; 1.4)	0.4 (0.2; 0.5)	3.1 (2.6; 3.7)	4.3 (3.4; 5.2)	2.0 (1.4; 2.7)
CAL	Mean CAL, mm	1.1 (1.1; 1.2)	1.2 (1.1; 1.3)	1.0 (0.9; 1.1)	2.4 (2.3; 2.5)	2.7 (2.5; 2.9)	2.1 (2.0; 2.3)
	CAL ≥ 3 mm (prevalence)	80.2% (77.5; 82.7)	83.6% (79.9; 86.8)	76.9% (72.9; 80.6)	95.7% (94.0; 97.1)	96.2% (93.6; 97.9)	95.2% (92.4; 97.0)
	CAL ≥ 5 mm (prevalence)	25.3% (22.5; 28.2)	30.5% (26.4; 35.0)	20.4% (16.8; 24.1)	66.6% (63.0; 70.2)	76.8% (71.9; 81.3)	57.3% (52.0; 62.4)
	Number of teeth with CAL ≥ 3 mm	6.9 (6.5; 7.4)	7.9 (7.2; 8.6)	5.9 (5.3; 6.5)	9.7 (9.2; 10.2)	11.1 (10.3; 11.9)	8.4 (7.8; 9.1)
	Number of teeth with CAL ≥ 5 mm	1.1 (0.9; 1.3)	1.6 (1.2; 1.9)	0.7 (0.5; 0.8)	3.6 (3.2; 3.9)	4.8 (4.2; 5.4)	2.4 (2.0; 2.8)
	Percentage of sites with CAL ≥ 3 mm (%)	11.5 (10.3; 12.8)	13.5 (11.6; 15.5)	9.4 (7.8; 10.9)	38.8 (36.3; 41.2)	45.7 (42.0; 49.4)	32.5 (29.3; 35.7)
	Percentage of sites with CAL ≥ 5 mm (%)	1.5 (1.1; 1.8)	2.1 (1.5; 2.8)	0.8 (0.5; 1.2)	12.7 (11.1; 14.4)	17.5 (14.8; 20.3)	8.4 (6.6; 10.2)
Number of teeth	26.6 (26.5; 26.8)	26.6 (26.4; 26.8)	26.6 (26.4; 26.9)	20.4 (19.9; 20.9)	20.8 (20.0; 21.5)	20.1 (19.4; 20.8)	

Data are presented as unweighted numbers (n) and weighted percentages or weighted means (with 95% confidence intervals) for dentate participants with complete periodontal findings. One gender-diverse individual is included in the total column, but not in the gender categories.

\*Defined as periodontitis cases according to the 2018 gingivitis and periodontitis classification schemes (Stage I-V) having ≥ 1 tooth with PD ≥ 4 mm.

BOP, bleeding on probing; CAL, clinical attachment level; PD, probing depth.

subjects is included as a valid category in the prevalence calculation, and it is not to be expected that these individuals will consistently have no periodontal disease. In comparison, lower prevalences of stage III/IV periodontitis were reported for mainland China (2015 to 2016; 10.6% and 43.5% in 35- to 44- and 65- to 74-year-olds, respectively).<sup>11</sup> Among studies reporting prevalences for the total population only, prevalences of stage III/IV were 35.1% in ≥ 30-year-old Americans (2009 to 2014),<sup>12</sup> and 17.6% in ≥ 19-year-olds in Norway (HUNT4; 2017 to 2019).<sup>13</sup> However, it should be noted that severity and complexity factors considered for staging differed among the studies, which may partly explain differences in prevalence.

In view of the high prevalence of periodontitis in the DMS • 6, the question arises as to whether it makes sense to classify a condition that occurs in more than 80% of the population as a disease. In DMS • 6, 31.6% of younger adults and 8.3% of younger seniors were classified as stage I (ie, interdental CAL 1 to 2 mm). Depending on the degree of periodontal inflammation, the probe will penetrate beyond the apical termination of

the junctional epithelium into the inflamed adjacent connective tissue, and the true periodontal pocket will be overestimated.<sup>14</sup> Furthermore, the measurement error of clinical measurements of PD and CAL ranges between 0.5 and 1 mm.<sup>15</sup> Reliability data from the DMS • 6 showed that only 32.6% and 35% of repeated PD and CAL measurements, respectively, deviated by ± 1 mm, indicating even higher variability. In addition, the CEJ is located apical to the gingival margin in subjects with incipient periodontitis, making CEJ detection difficult and CAL assessment even more challenging. Due to this overestimation in inflamed sites and a CAL measurement error of approximately ± 1 mm, it is very likely that a high proportion of stage I in DMS • 6 was not periodontitis but gingivitis. In addition, only 47.9% of younger adults and 63.1% of younger seniors had at least one tooth with a PD ≥ 4 mm, although they were classified as having stage I periodontitis. Thus, 52% of younger adults and 37% of younger seniors with stage I periodontitis would not qualify for comprehensive periodontal treatment according to the German directive for the systematic treatment of

**Table 3** Categorization according to the 2018 EFP/AAP periodontitis classification in younger adults (35- to 44-year-olds) and younger seniors (65- to 74-year-olds)

Age group	Variable	Prevalence cases	% Cases with $\geq 1$ tooth with PD $\geq 4$ mm	% Cases with grade A	% Cases with grade B	% Cases with grade C	
35- to 44-year-olds	No. of participants (n)	912	NA	NA	NA	NA	
	Periodontal health	3.8% (2.7; 5.2)	NA	NA	NA	NA	
	Gingivitis	0.5% (0.2; 1.5)	NA	NA	NA	NA	
	Periodontitis cases	All stages	95.1% (85.6; 100.0)	NA	NA	NA	NA
		Stage I	31.6% (28.6; 34.7)	47.9 (42.4; 53.9)	17.3 (13.3; 22.0)	77.9 (72.8; 82.3)	4.8 (2.8; 7.8)
		Stage II	46.0% (42.8; 49.2)	80.9 (76.8; 84.3)	0.0 (NA)	84.2 (80.4; 87.3)	15.8 (12.7; 19.6)
		Stage III	13.6% (11.5; 15.9)	98.8 (96.3; 99.9)	0.0 (NA)	36.3 (28.2; 45.0)	63.7 (55.0; 71.8)
	Stage IV	3.9% (2.7; 5.2)	97.9 (93.1; 100.0)	0.0 (NA)	21.0 (9.4; 35.3)	79.0 (64.7; 90.6)	
	Edentulous	0.1% (0.0; 0.5)	NA	NA	NA	NA	
	Non-classified*	0.5% (0.1; 1.0)	NA	NA	NA	NA	
65- to 74-year-olds	No. of participants (n)	755	NA	NA	NA	NA	
	Periodontal health	0.0% (NA)	NA	NA	NA	NA	
	Gingivitis	0.0% (NA)	NA	NA	NA	NA	
	Periodontitis cases	All stages	85.2% (74.4; 97.0)	NA	NA	NA	NA
		Stage I	8.3% (6.5; 10.5)	63.1 (51.2; 74.6)	87.2 (77.5; 93.8)	5.8 (2.2; 14.4)	6.9 (2.2; 14.4)
		Stage II	24.2% (21.3; 27.4)	91.2 (86.5; 94.7)	0.0 (NA)	93.8 (89.2; 96.4)	6.2 (3.2; 10.2)
		Stage III	26.3% (23.2; 29.4)	96.7 (93.9; 98.7)	1.5 (0.4; 4.0)	80.5 (74.3; 85.4)	18.1 (13.3; 24.0)
	Stage IV	26.4% (23.4; 29.7)	97.4 (93.9; 98.7)	0.0 (NA)	71.2 (64.4; 77.0)	28.8 (23.0; 35.6)	
	Edentulous	5.3% (3.9; 7.1)	NA	NA	NA	NA	
	Non-classified*	9.5% (7.5; 11.6)	NA	NA	NA	NA	

Data are presented as unweighted numbers (n) and weighted percentages (with 95% confidence intervals) for edentate and dentate participants with complete periodontal findings.

EFP/AAP, European Federation of Periodontology/American Academy of Periodontology; NA, not available.

\*Periodontitis case definition not applicable.

periodontal disease.<sup>4</sup> Stage I periodontitis appears to be a transitional phase between gingivitis and incipient periodontitis that is likely to be managed with preventive measures (ie, improved individual oral hygiene and professional mechanical plaque removal) rather than subgingival instrumentation. If clinically diagnosed stage I periodontitis progresses to stage II (interdental CAL 3 to 4 mm) despite preventive measures, it can be detected by monitoring the patient, and comprehensive treatment can still be initiated at an early stage. With 86.8% of younger adults and 87.7% of younger seniors showing a control-oriented dental service utilization (Table 1), the likelihood of preventing progression to stages III and IV is high.

In contrast to the present epidemiologic study, most dental practitioners in German clinical practice determine the periodontal stage based on radiographs and not based on CAL. On radiographs, only a significant amount of bone destruction can be detected.<sup>16</sup> The difference between CAL and radiographic crest height can range from 0 to 1.6 mm. Physiologic bone levels range from 1.0 to 3.0 mm apical to the CEJ.<sup>17</sup> Therefore, an

overestimation of incipient stage I periodontitis in general dental practice is unlikely.

Over the last decade, the change in the threshold between health and disease has triggered heated debates in many medical fields. On the one hand, the threshold for hypertension was lowered from 140 to 120 mmHg for systolic and from 90 to 80 mmHg for diastolic blood pressure. However, it has been questioned whether the mortality of patients with such low blood pressure is really reduced by the required lifelong medication.<sup>18</sup> On the other hand, the strict threshold of 6.5% HbA1c for diagnosis of type 2 diabetes was raised to 8.5% in older diabetes patients, as no life-prolonging effect was found.<sup>19</sup> As CAL was the decisive factor in the EFP/AAP classification (Appendix 3), a CAL threshold of  $\geq 5$  mm in the elderly may be too strict for classification of stage III and IV periodontitis, as teeth with CAL  $\geq 5$  mm are not extracted exclusively due to periodontitis.<sup>20</sup> These examples clearly illustrate that medical thresholds are subject to ongoing evaluation and adaptation. ■■

**Table 4** Community Periodontal Index and CDC/AAP case definition in younger adults (35- to 44-year-olds) and younger seniors (65- to 74-year-olds)

Variable		35- to 44-year-olds			65- to 74-year-olds		
		Total	Male	Female	Total	Male	Female
Community Periodontal Index	Score 0, 1, or 2	26.8% (24.0; 29.7)	24.0% (20.3; 28.2)	29.7% (25.8; 34.0)	8.2% (6.4; 10.3)	6.1% (4.0; 9.0)	10.2% (7.4; 13.4)
	Score 3	56.9% (53.6; 60.0)	54.9% (50.4; 59.6)	58.5% (53.9; 62.9)	44.0% (40.5; 47.5)	35.6% (30.8; 40.7)	51.7% (46.7; 56.5)
	Score 4	16.2% (13.9; 18.7)	21.0% (17.3; 24.9)	11.8% (9.1; 14.9)	42.4% (38.9; 45.9)	51.4% (46.4; 56.7)	34.3% (29.6; 39.0)
	Edentulous	0.1% (0.0; 0.5)	0.1% (0.0; 1.0)	0.0% (NA)	5.3% (3.9; 7.1)	6.9% (4.7; 9.9)	3.9% (2.2; 6.0)
CDC/AAP case definition	No or mild periodontitis	66.1% (62.9; 69.0)	62.0% (57.4; 66.4)	70.3% (66.0; 74.2)	21.7% (18.9; 24.8)	13.4% (10.1; 17.2)	29.2% (25.0; 34.0)
	Moderate periodontitis	28.1% (25.2; 31.1)	29.6% (25.6; 34.0)	26.3% (22.5; 30.5)	42.3% (38.8; 45.8)	42.7% (37.9; 48.1)	41.9% (37.2; 46.9)
	Severe periodontitis	5.3% (3.9; 6.8)	8.3% (6.0; 11.2)	2.5% (1.4; 4.3)	22.3% (19.4; 25.3)	29.9% (25.2; 34.7)	15.5% (12.1; 19.3)
	Edentulous	0.1% (0.0; 0.5)	0.1% (0.0; 1.0)	0.0% (NA)	5.3% (3.9; 7.1)	6.9% (4.7; 9.9)	3.9% (2.2; 6.0)
	Non-classified*	0.5% (0.1; 1.0)	0.0% (NA)	0.9% (0.3; 2.0)	8.4% (6.5; 10.5)	7.2% (4.9; 10.3)	9.5% (7.0; 12.8)

Data are presented as weighted percentages (with 95% confidence intervals) for edentate and dentate participants with complete periodontal findings. One gender-diverse individual is included in the total column, but not in the gender categories.

\*Dentate participants with < 2 teeth with valid information on interdental clinical attachment level.

AAP, American Academy of Periodontology; CDC, Centers for Disease Control; NA, not available.

## Conclusion

In Germany, the prevalence of periodontitis was high in both younger adults and younger seniors, with severe periodontitis (stage III and IV) diagnosed in 17.5% of younger adults and 52.7% of younger seniors. With a substantial proportion of stage I cases likely to be due to overestimation and measurement error, the classification of stage I periodontitis as a disease may be questioned.

## Disclosure

ARJ and KK are employed by the National Association of Statutory Health Insurance Dentists (KZBV). The authors declare that there are no conflicts of interest according to the Uniform Requirements for Manuscripts Submitted to Biomedical Journals. The interpretation of data and presentation of information is not influenced by any personal or financial relationship with any individual or organization.

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## Author contributions

All authors listed in the paper contributed sufficiently to fulfil the criteria for authorship according to Recommendations for the Conduct, Reporting, Editing and Publication of Scholarly Work in Medical Journals (ICMJE Recommendations). All authors read and approved the final manuscript. PE is a member of the DMS • 6 scientific advisory board, responsible for developing the clinical examinations, and the author of the manuscript. BH is a scientific advisor of the DMS • 6 and a co-author of the manuscript. KK is the deputy principal investigator of the DMS • 6, responsible for the data analysis, and a co-author of the manuscript. BD is a co-author of the manuscript. ARJ is the principal investigator of the DMS • 6, responsible for developing the clinical examinations, and a co-author of the manuscript. TK is a member of the DMS • 6 scientific advisory board, responsible for developing the clinical examinations, and a co-author of the manuscript.

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### Appendix 1 to 3

Additional data available at: <https://www.idz.institute/publikationen/online-journal-zahnmedizin-forschung-und-versorgung/prevalence-of-the-periodontal-status-in-germany-results-of-the-6th-german-oral-health-study-dms-6-online-appendix/>.

