

Periodontal health literacy in Germany—Results of a telephone survey

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Abstract

Objective: Assess the periodontal health literacy of German adolescents, adults and senior residents.

Background: The prevalence of periodontitis is high. One explanation for this may be that people lack periodontal health literacy (PHL).

Methods: This was a cross-sectional descriptive study. Former participants of the 5th German Oral Health Study ($n = 333$ 16-year-olds, $n = 307$ 39–48-year-olds, $n = 332$ 69–78-year-olds) participated in a computer-assisted telephone interview. Open-ended questions (OEQs) were used to assess the participants' current knowledge. Corresponding single- and multiple-choice questions (SCQs and MCQs) supplemented the OEQs to allow detailed analyses of the nature of the knowledge gaps.

Results: Less than 10% of the participants in the three age groups could explain the term 'periodontitis' or select the correct answer in an SCQ. Responding to the OEQs, 89% of 16-year olds, 64% of 39–48-year-olds, and 59% of 69–78-year-olds, could not name any consequence of periodontitis, and 83%, 51%, and 60%, respectively, could not name any risk factors. The OEQs regarding proper oral hygiene behaviour revealed that participants lacked awareness regarding important aspects of oral hygiene (e.g., systematics) or areas to which they should pay attention to (e.g., interdental spaces and gingival margins).

Conclusions: The survey revealed PHL deficits in German adolescents, adults, and seniors and a need for community-based measures to improve PHL in all age groups. Dental teams should be aware that their patients might lack the PHL necessary for understanding and adherence to professional dental advice, and that they might even lack PHL regarding the proper use of oral hygiene devices.

KEYWORDS

dental health education, health literacy, oral health, oral hygiene, periodontal diseases, surveys and questionnaires

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1 | INTRODUCTION

Periodontitis is one of the most prevalent chronic diseases worldwide¹ and entails high direct and indirect healthcare costs.² Therefore, the implementation of effective preventive measures against periodontitis is of primary importance at the personal and the societal levels. Furthermore, the representative 5th German Oral Health Study (DMS V; Deutsche Mundgesundheitsstudie V) reported, considerable prevalence rates for both severe and moderate periodontitis, similar to other health surveys.^{1,3}

Oral health education plays a key role in preventing periodontal disease.^{4,5} People must know about the nature of periodontitis, its most important risk factors (i.e., dental plaque, insufficient oral hygiene, gingivitis, smoking, and diabetes), and its potential consequences (i.e., persistent damage to the periodontium and tooth loss). Furthermore, knowledge of potential systemic implications (e.g., cardiovascular disease) may help people better understand the significance of proper prevention and have more awareness of the important role that oral hygiene plays. They should understand the significance of interdental hygiene, of plaque removal at the gingival margin, and the systematics required to access all teeth and surfaces (mesial, distal, lingual, palatal, buccal, labial, occlusal) while brushing. They should also be informed about special cleaning requirements for certain restorations, such as bridges or implants if they are concerned.

A recent systematic review identified significant deficits in periodontitis-related knowledge at the population level in different regions of the world.⁶ Therefore, the present study aimed to assess the current status of knowledge of periodontitis and proper oral hygiene behaviours in Germany. A better understanding of the common conceptions and misconceptions of this disease entity and oral hygiene behaviour may help direct oral health education toward increased oral health literacy at both the dental practice and community levels.

2 | MATERIALS AND METHODS

The following description of the methods corresponds to the suggestions of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement^{7,8} and the Checklist for Reporting of Survey Studies (CROSS).⁹

2.1 | Study design and ethics approval

This was an observational cross-sectional descriptive study. The study protocol was approved by the Institutional Review Board of the Medical Association North Rhine, Düsseldorf, Germany (No. 2013384), which confirmed that the study was conducted in accordance with the principles of the Declaration of Helsinki.

2.2 | Setting and recruitment of participants

Subjects were recruited from former participants of the 5th German Oral Health Study (DMS V [Deutsche Mundgesundheitsstudie V]³). The DMS V³ included representative samples of adolescents (aged 12; $N=1468$, now 16-year-olds), younger adults (aged 35–44; $N=966$, now aged 39–48), and seniors (aged 65–74; $N=1042$, now aged 69–78). Most participants (91%) agreed to be contacted for further studies and were thus eligible for the current study. A company (Telquest GmbH Parchim, Germany) specializing in computer-assisted telephone interviews (CATI) drew the current sample based on random numbers and conducted interviews from April to June 2018.

2.3 | Variables

Supplementary File 1 shows the entire structure of the interview, including the interviewer's instructions, and highlights the questions considered in the present analysis. It consisted of open-ended questions (OEQs) and single- and multiple-choice queries (SCQs and MCQs). Questioning of a specific topic began with an OEQ. If there were corresponding SCQs or MCQs, they followed the respective OEQ and used the same wording but provided a list of possible answers.

The main variables of the present descriptive study were answers to the OEQs referring to the abovementioned areas of knowledge and their specifications:

- Explanation of the term periodontitis: inflammation of the periodontium
- Potential consequences: persistent damage to the periodontium, tooth loss, and an increased risk of cardiovascular disease
- Risk factors: dental plaque, insufficient oral hygiene, gingivitis, smoking
- Oral hygiene behaviour: regular oral hygiene, interdental hygiene, plaque removal at the gingival margins, and systematics

Interviewers categorized the answers to the OEQs during the interviews by allocating them to pre-specified categories. The categories were derived from pilot studies with independent participants in the forefield of the first study¹⁰ and the present study. If SCQs or MCQs followed the OEQs, then categories corresponded to the choices presented in those questions. Interviewers set aside answers that did not correspond with any of the pre-specified categories in text form. The authors (ARJ and RD) jointly discussed whether these answers could be recategorized into one of the prespecified categories, summarized within a new category, or kept as 'miscellaneous' answers.

2.4 | Data sources

Information regarding age, sex, and the highest degree of education were available from the data entered in the DMS V. All other data reported here represent the results of the CATI.

2.5 | Measures to minimize the bias

To minimize bias due to unknown telephone numbers, participants with unknown numbers were contacted twice by other means, resulting in a 2037 telephone numbers available for this study. To avoid bias due to the participant availability, efforts were made to obtain access to the primarily selected participants by contacting them at different times of the day.

To minimize bias added by the interviewers, only long-term permanently employed professional interviewers specializing in CATIs conducted the interviews. They received detailed face-to-face training regarding questioning techniques and the categorization of answers given to OEQs and performed several test interviews prior to interviewing real participants. They were blinded to the correct or expected answers and information about the individual participants other than their names. None of the interviewers had any education in dentistry. For quality assurance, the supervisor at the CATI studio monitored 10% of the interviews.

2.6 | Study size

The sample size of 1000 participants across the three age groups in the former DMS V study was considered reasonably large to yield representative data within the temporal and financial restrictions of the present study. Thus, this study aimed to assess the random selection of 333 participants within each age group. This would cover 20%–33% of the respective age groups within the original DMS V sample.

2.7 | Statistical analyses

The study results are descriptive and the answer frequencies of the respective age groups represent the main outcome statistics. They are presented with 95% confidence intervals (CIs)¹¹ (the recommended method for single samples). To determine the effect size regarding differences between age groups, between males and females, and between highly educated and less educated participants within age groups, Cramer's *V* was computed using the cross-tables procedure of SPSS 26 (IBM, Armonk, USA). The effect sizes of Cramer's *V*=0.1, Cramer's *V*=0.3, and Cramer's *V*=0.5 are considered small, medium and large, respectively. No further analyses were conducted on these differences when the frequency was below 10% or above 90%. Only effect sizes exceeding Cramer's *V*=0.3 are reported.

3 | RESULTS

This section depicts the main results concerning the research questions. Tables S1–S8 show all answer frequencies and their respective CIs that are not presented in the main text.

3.1 | Participants and description of the sample

Table 1 shows the sample characteristics of age groups regarding sex and education. Data from one senior participant were flawed and thus not reported. Figure S1 shows the flow diagram of participant recruitment.

The current subsample shows a very low but statistically significant advantage regarding education compared to participants of DMS V who did not contribute to the current survey (adults: 49.2% vs. 42.8%, $p=0.007$, Cramer's *V*=0.088; seniors: 30.7% vs. 25.8%, $p=0.015$, Cramer's *V*=0.077). All the geographical regions represented in DMS V were also represented in the present survey. However, a small but significant preference for a residence in Western Germany was found in the current subsample of adolescents (76.6% vs. 66.8%, $p=0.001$, Cramer's *V*=0.089) and seniors (72.6% vs. 66.5%, $p=0.048$, Cramer's *V*=0.061). No statistically significant differences were found between the current subsample and the remaining DMS V participants in terms of sex (all $p>0.05$). Regarding oral hygiene behaviour, more than 96% of each age group in the total DMS V sample and the current sample stated that they brushed their teeth at least daily.³

3.2 | Relationship between sociodemographic factors and survey results

The effect sizes of the differences between males and females were small (all Cramer's *V* values were <0.218). Similarly, the effect sizes for the educational groups only once exceeded the conventional threshold for medium effect sizes (Cramer's *V*=0.30) and remained below Cramer's *V*=0.225 in all other cases. The effect sizes for the differences between age groups tended to be larger, although medium effect sizes were rare (see Tables 2–4; Tables S1–S8).

3.3 | Periodontitis-related knowledge

3.3.1 | Explanation of the term periodontitis

At the beginning of each interview, the interviewers identified the topic periodontitis. They also used the more ancient but still common alternative German term, 'Parodontose'. Then, they asked the

TABLE 1 Sample characteristics.

	Adolescents (16 years)	Adults (39 years– 48 years)	Seniors (69–78 years)
N	333	307	332
% women	47.4	57.3	57.2
% at least UED	/	49.2	30.7 ^a

^aData of 10 seniors are missing.

Abbreviation: UED, University entrance diploma.

participants, 'What is periodontitis?' Less than 3% of the participants gave the correct answer to this OEQ. Of those who could provide an answer, the majority provided an answer related to gingivitis. When the same question was presented in the SCQ format, 6% selected the correct answer (Table 2; for better illustration see also Figure S2).

3.3.2 | Consequences of periodontitis

When asked about the possible consequences of periodontitis in the OEQ format, most participants could not provide an answer (adolescents: 89%, CI: 85%–92%; adults: 64%, CI: 58%–69%; seniors: 59%, CI: 54%–64%). The consequence mentioned most often by adolescents was tooth loss (2%; CI: 1%–4%), whereas adults and seniors mentioned cardiovascular disease most frequently (adults: 20%, CI: 16%–25%; seniors: 27%; CI: 22%–32%). When the same question was presented in the MCQ format, more than 80% of all age groups selected persistent damage to the jawbone and tooth loss, and approximately 60% selected cardiovascular diseases. However, they also chose several wrong alternatives, most often sore throat and persistent damage to the temporomandibular joint (for further details, see Table S1).

3.3.3 | Risk factors for periodontitis

The majority of participants were unable to provide an answer to the OEQ on the risk factors for periodontitis (adolescents: 83%, CI: 78%–87%; adults: 51%, CI: 46%–57%; seniors: 60%, CI: 55–65%). The risk factor most frequently mentioned by all age groups was oral hygiene (adolescents: 13%, CI: 9%–17%; adults: 35%, CI: 30%–41%; seniors: 23%, CI: 19%–28%). Less than 15% of all age groups mentioned gingivitis or smoking. When the same question was asked in the MCQ format, more than 80% of all groups chose oral hygiene, gingivitis, and nicotine use; however, they also often chose incorrect alternatives, such as excessive sugar consumption (for further details, see Table S2). Furthermore, 43% (CI: 38%–49%) of adolescents, 30% (CI: 25%–35%) of adults, and 16% (CI: 12%–20%) of seniors disagreed with the statement that periodontitis is caused by dental plaque. Similarly, 34% (CI: 30%–40%), 53% (CI: 48%–59%), and 39% (CI: 34%–44%) of adolescents, adults, and seniors, respectively, disagreed with the statement that one will not suffer from periodontitis if one manages to maintain very good oral hygiene (for further details, see Table S3).

3.4 | Knowledge regarding proper oral hygiene behaviour

3.4.1 | Oral hygiene devices and frequency of use

One OEQ asked participants to name all devices they considered indispensable for proper oral hygiene. More than 85% of all age groups mentioned toothbrush and/or toothpaste, 73% (CI: 68%–78%) of adolescents, 85% (CI: 81%–89%) of adults, and 58% (CI: 52%–63%)

of seniors mentioned tooth floss and/or interdental brushes. This percentage increased when participants were able to select devices from a predefined list (for further details, see Table S4).

If participants named or selected a device, they were also asked an OEQ regarding how often the device should be used. More than 80% of all age groups mentioned at least 2 times a day for brushing, and more than 79% suggested at least 1 time a day for flossing (for further details, see Table S5).

3.4.2 | Important aspects of oral hygiene performance

One OEQ asked participants to specify what they should pay attention to regarding oral hygiene. Table 3 presents the responses (for better illustration see also Figure S4). The participants most frequently mentioned their brushing technique, brushing sites, and duration of brushing. Participants were also asked to specify their answers as appropriate. Tables S6–S8 show the results.

3.4.3 | Areas of particular importance

Another OEQ asked participants in which area or areas it is particularly important to clean the teeth and remove plaque (Table 4; for better illustration see also Figure S4). Less than 25% mentioned proximal sites and less than 11% named the gingival margin. Similarly, many agreed with the statement, 'To avoid periodontitis, it is of particular importance to brush the chewing surfaces' (adolescents: 75%, CI: 70%–79%; adults: 48%, CI: 43%–54%; seniors: 73%, CI: 68%–77%; see Table S3).

4 | DISCUSSION

The composition of the current subsample is similar to that of the entire DMS V sample in terms of gender, education, and residence in Western or Eastern Germany. However, regarding the latter two aspects, small but significant differences emerged, with a tendency for the subsample to favour higher education levels and Western residence. Furthermore, participant recruitment was complicated; thus, the present subsample may have overestimated those who were motivated and eager to emphasize oral health issues (see Figure S1). Once these factors are considered to produce a bias, it is most likely that the present results will overestimate the level of knowledge compared with the true existing level of knowledge in the respective age groups of the German population.

The main variables of the current analysis and discussion were the answers that the participants provided to the OEQs. These answers represented knowledge that was immediately available to the participants without any further assistance. This knowledge is more likely to guide daily actions than the ability to recognize correct answer alternatives in SCQs or MCQs. However, the latter may help better understand the underlying nature of the deficits retrieved



TABLE 2 Answers to the question 'What is a periodontitis' when asked in OEQ- and SCQ-format, respectively^a.

Answer	Age group: years (n)	Open-ended format (OEQ) ^b				Single-choice format (SCQ)			
		n Who gave that answer	% Who gave that answer	CI lower limit	CI upper limit	n Who gave that answer	% Who gave that answer	CI lower limit	CI upper limit
		Correct answer	Adolescents: 16 (333) Adults: 39-48 (307) Seniors: 69-78 (332)	1 6 4	0.3% 2.0% 1.2%	0.1% 0.9% 0.5%	1.7% 4.3% 3.0%	19 25 14	5.7% 8.1% 4.2%
Answer relates to alveolar bone loss	Adolescents: 16 (333) Adults: 39-48 (307) Seniors: 69-78 (332)	1 1 6	0.3% 0.3% 1.8%	0.1% 0.0% 0.8%	1.7% 1.8% 3.9%	16 5 31	4.8% 1.6% 9.3%	3.0% 0.7% 6.6%	7.7% 3.7% 12.9%
Answer relates to exposed tooth-necks	Adolescents: 16 (333) Adults: 39-48 (307) Seniors: 69-78 (332)	7 54 69	2.1% 17.6% 20.8%	1.0% 13.7% 16.8%	4.3% 22.3% 25.5%	53 142 126	15.9% 46.3% 38.0%	12.4% 40.8% 32.9%	20.2% 51.9% 43.3%
Answer relates to gingivitis	Adolescents: 16 (333) Adults: 39-48 (307) Seniors: 69-78 (332)	24 162 163	7.2% 52.8% 49.1%	4.9% 47.2% 43.8%	10.5% 58.3% 54.5%	240 133 154	72.1% 43.3% 46.4%	67.1% 37.9% 41.1%	76.6% 48.9% 51.8%
Don't know/No answer	Adolescents: 16 (333) Adults: 39-48 (307) Seniors: 69-78 (332)	302 95 107	90.7% 30.9% 32.2%	87.1% 26.0% 27.4%	93.4% 36.3% 37.4%	5 2 7	1.5% 0.7% 2.1%	0.6% 0.2% 1.0%	3.5% 2.4% 4.3%

Note: Italic values indicate Cramer's $V > 0.3$ for the difference between age groups for OEQ query; and Cramer's $V = 0.23$ for SCQ query.

^aAnswer relating to gingivitis, and answers relating to alveolar bone loss were grouped.

^bMultiple answers possible.

TABLE 3 Answers to the question: 'What should you look out for if you want to clean your teeth particularly thoroughly, i.e., remove all plaque?' when asked in the OEQ format.

Answer	Age group: years (n)	n Who gave that answer	% Who gave that answer	CI lower limit	CI upper limit
Brushing technique	Adolescents: 16 (333)	130	39.0%	33.9%	44.3%
	Adults: 39–48 (307)	158	51.5%	45.9%	57.0%
	Seniors: 69–78 (332)	147	44.3%	39.1%	49.7%
Where to brush	Adolescents: 16 (333)	170	51.1%	45.7%	56.4%
	Adults: 39–48 (307)	124	40.4%	35.1%	46.0%
	Seniors: 69–78 (332)	76	22.9%	18.7%	27.7%
Duration	Adolescents: 16 (333)	114	34.2%	29.3%	39.4%
	Adults: 39–48 (307)	148	48.2%	42.7%	53.8%
	Seniors: 69–78 (332)	101	30.4%	25.7%	35.5%
Systematics	Adolescents: 16 (333)	94	28.2%	23.6%	33.3%
	Adults: 39–48 (307)	67	21.8%	17.5%	26.8%
	Seniors: 69–78 (332)	46	13.9%	10.6%	18.0%
Pressure	Adolescents: 16 (333)	76	22.8%	18.6%	27.6%
	Adults: 39–48 (307)	69	22.5%	18.2%	27.5%
	Seniors: 69–78 (332)	32	9.6%	6.9%	13.2%
Proximal hygiene	Adolescents: 16 (333)	53	15.9%	12.4%	20.2%
	Adults: 39–48 (307)	50	16.3%	12.6%	20.8%
	Seniors: 69–78 (332)	37	11.1%	8.2%	14.9%
No answer	Adolescents: 16 (333)	14	4.2%	2.5%	6.9%
	Adults: 39–48 (307)	11	3.6%	2.0%	6.3%
	Seniors: 69–78 (332)	37	11.1%	8.2%	14.9%

Note: None of the differences between the age groups is greater than Cramer's $V=0.3$.

by responding to OEQs.^{12,13} The following discussion, therefore, focuses on the results of the OEQs, but will also discuss them in light of the respective SCQs and/or MCQs.

4.1 | Periodontitis-related knowledge

4.1.1 | Explanation of the term 'periodontitis'

Less than 10% of the participants gave the right answer to the question 'What is periodontitis?' even when having the chance to choose an answer from a list with alternative definitions (see Table 2). This is a remarkable number since 50% of the adults and 70% of the seniors from the DMS V sample suffered from periodontitis.³ The majority, however, could merely mention inflammation of the gums, answering the OEQ. Several participants continuously chose the same answer looking at the list with alternative statements, although some preferred 'exposed tooth necks' when they detected this alternative (Table 2). This observation indicates that participants may underestimate the consequences of periodontitis as a disease entity that affects both the alveolar bone and the gums.

This deceptive interpretation of the term 'periodontitis' should be kept in mind when analysing the answers to the further survey questions. Only a minority appeared to possess exact knowledge

about the true meaning of periodontitis, the majority associated the disease with gingivitis and/or exposed tooth necks.

4.1.2 | Consequences of periodontitis

The next question began with the statement that people with periodontitis are at an increased risk of other diseases. Participants were requested to name these diseases. The majority could not answer the OEQ, but one-fifth of the adults and one-quarter of the seniors mentioned cardiovascular disease (CVD). This finding indicates that information regarding the potential association between periodontitis and cardiovascular disease is gradually being dispersed in the population.¹⁴ The results for the respective MCQ support this notion.

Very few participants mentioned tooth loss, and even fewer mentioned irreversible damage to the jawbone, although these alterations are considered the most common and immediate consequences of periodontitis. These two were the most frequently preferred answers in the respective MCQ. However, intentionally misleading statements such as 'soreness of the throat' and 'persistent damage of the temporomandibular joint' ranged third and fifth in the preference scale of the participants (see Table S2). The participants appeared to have selected alternatives addressing

TABLE 4 Answers to the question: 'In which area or areas is it particularly important to clean teeth and remove plaque?' when asked in the OEQ format.

Answer	Age group: years (n)	n Who gave that answer	% Who gave that answer	CI Lower limit	CI Upper limit
Posterior teeth	Adolescents: 16 (333)	126	37.8%	32.8%	43.1%
	Adults: 39–48 (307)	82	26.7%	22.1%	31.9%
	Seniors: 69–78 (332)	58	17.5%	13.8%	22.0%
Proximal sites	Adolescents: 16 (333)	51	15.3%	11.8%	19.6%
	Adults: 39–48 (307)	72	23.5%	19.1%	28.6%
	Seniors: 69–78 (332)	43	13.0%	9.8%	17.0%
Occlusal surfaces	Adolescents: 16 (333)	82	24.6%	20.3%	29.5%
	Adults: 39–48 (307)	31	10.1%	7.2%	14.0%
	Seniors: 69–78 (332)	28	8.4%	5.9%	11.9%
Inner surfaces	Adolescents: 16 (333)	62	18.6%	14.8%	23.1%
	Adults: 39–48 (307)	36	11.7%	8.6%	15.8%
	Seniors: 69–78 (332)	36	10.8%	7.9%	14.6%
Frontal teeth	Adolescents: 16 (333)	86	25.8%	21.4%	30.8%
	Adults: 39–48 (307)	20	6.5%	4.2%	9.8%
	Seniors: 69–78 (332)	28	8.4%	5.9%	11.9%
Gingival margin	Adolescents: 16 (333)	26	7.8%	5.4%	11.2%
	Adults: 39–48 (307)	31	10.1%	7.2%	14.0%
	Seniors: 69–78 (332)	25	7.5%	5.1%	10.8%
Unspecific answer	Adolescents: 16 (333)	85	25.5%	21.1%	30.4%
	Adults: 39–48 (307)	129	42.0%	36.6%	47.6%
	Seniors: 69–78 (332)	172	51.8%	46.4%	57.1%

Note: None of the differences between the age groups is greater than Cramer's $V=0.3$.

issues close to the mouth because they considered them the most plausible. These choices further demonstrate ignorance and support the evidence that people's comprehension of periodontitis is poor.

4.1.3 | Risk factors for periodontitis

Once people understand that gingivitis is related to periodontitis, one would expect them to mention insufficient oral hygiene as a risk factor. However, only a minority of the respondents provided this answer to the OEQ. In the absence of such knowledge, it is difficult to implement targeted preventive actions. As mentioned previously, answer rates improved tremendously when the MCQ format allowed for the selection of answer alternatives rather than actively generating them. However, nearly as many respondents also considered excessive sugar consumption and nearly half of all participants identified toothpicks as a risk factor (see Table S2). At least half of the participants population did not know which measures play a key role in periodontitis prevention.

Thus far, these results reflect the poor health literacy regarding periodontitis in our study population. Similarly, research in other countries has revealed considerable knowledge gaps regarding periodontitis as well.^{6,15}

One explanation for these consistent and persistent deficits may be related to early childhood oral health education. It focuses on the prevention of caries, the most prevalent and pertinent oral health burden at this age. As part of this education, children learn to answer questions on these topics correctly. From this point on, they feel sufficiently and comprehensively informed about their oral hygiene and health. Accordingly, they do not pay further attention to new information on the subject. Even if they are specifically reeducated as young or older adults, they may initially tend to absorb only things that fit their old concepts of oral hygiene and health. Many of the failed answers provided by the participants indicate that in some respects, people confused caries with periodontitis.

4.2 | Knowledge about proper oral hygiene

4.2.1 | Oral hygiene devices and the frequency of their use

This part of the survey began with an OEQ on oral hygiene devices that participants considered indispensable and how often they should use them. The answers from nearly all participants corresponded with the recommendation to brush one's teeth at least

twice daily.¹⁶ Moreover, approximately 75% of adolescents, 85% of adults, and 60% of seniors mentioned interdental brushes and/or toothfloss as indispensable and suggested their daily use. Hence, knowledge of the measures required to maintain proper oral hygiene appears to be common and readily available to almost everyone without further assistance.

4.2.2 | Important aspects of oral hygiene and areas of particular importance

Most participants named some aspects they have to consider when they intend to clean their teeth particularly thorough. The aspect mentioned most often was the brushing technique. However, less than one-quarter of participants mentioned interdental hygiene measures (Tables 3 and 4). This is of particular interest because many of the participants identified interdental oral hygiene devices as indispensable. This apparent contradiction may indicate that the participants were aware that they should use these devices, and did not fully understand why. Video observational studies support this hypothesis. Such studies have shown that adults rarely use interdental hygiene devices even when performing to the best of their abilities. Those who use these devices tend to use them improperly and incompletely.¹⁷⁻¹⁹

Another important topic is brushing systematics.²⁰ Just a few participants mentioned this topic. Accordingly, video observations indicate that the toothbrushing performance among German adolescents and adults lacks systematics. Whole areas of the mouth remain neglected even when participants perform oral hygiene to the best of their abilities.^{18,19,21-23}

Plaque removal at the gingival margin is essential for sufficient maintenance of periodontal health. However, no more than 10% of the participants mentioned gingival margins as a particularly important area for cleaning. This finding is consistent with the outcomes of a series of studies involving different age groups who performed oral hygiene to the best of their abilities. Immediately afterwards, plaque deposits were still present at 50% or more of the sites assessed next to the gingival margins.^{18,19,21-27}

Altogether, the results on knowledge regarding proper oral hygiene measures indicate that people know what they are supposed to do. However, they lack appropriate knowledge of how to carry it out. These findings and the results regarding periodontitis-related knowledge may help clarify an apparent contradiction in the outcomes of epidemiological research in dentistry. While most people state, that they brush their teeth at least twice a day and apply interdental hygiene devices at least daily, the prevalence of periodontal diseases such as gingivitis and periodontitis is high.^{1,3} Thus, individuals appear motivated to perform oral hygiene measures. However, the present research demonstrates that the majority lack oral health literacy, which is necessary to empower them to do so effectively.

Interestingly, demographic factors appear to be of minor importance in this respect. If there were any differences between the

age groups, higher- and lower-educated participants, or females and males, they tended to be small. Furthermore, the group differences did not consistently point in the same direction. This indicates an urgent need for improved education on periodontal disease and proper oral hygiene measures across the population, regardless of age, education, or sex.

4.3 | Limitations

This was merely a descriptive, cross-sectional study. The sampling technique used was random selection, expected to yield a fairly representative sample. However, the response rate among the adults was too low to reach the intended sample size. This indicates that the adult subsample may not be indicative of German adults of the same age. Furthermore, the geographical distribution did not exactly correspond to that of the representative DMS V. This limits the representativeness of the survey. Additionally, it is difficult to extrapolate generalizable conclusions from the present German data to other nations. However, a meta-analysis by Varela-Centelles et al.⁶ indicates that results in other countries may be similar. In contrast to other studies,^{15,28,29} the present analysis did not seek to combine the answers to the interview questions into an aggregate measure of oral health literacy for periodontal disease and its prevention. This study aimed to build a basis for a better understanding of the nature of deficits in oral health literacy; thus, it focused on analysing individual answers rather than generating a comprehensive measure. It would have been beyond the scope of this analysis to relate the participants' responses to their clinical status, as measured by the DMS V, or to their self-reported oral hygiene behaviour. Such analyses are subject to further publications.

4.4 | Conclusions

The present study revealed severe deficits in the knowledge of periodontitis among German adolescents and adults. These deficits disclose limited knowledge of the nature of this disease entity, of its risk factors, consequences, and prevention. The study also identified deficits in the knowledge of how to perform oral hygiene effectively. Most people are unaware of important aspects such as the removal of plaque at the gum line, systematic brushing, and interdental hygiene.

4.5 | Future perspectives

According to the most recent definition of the U.S. government's Healthy People 2030 initiative, health literacy comprises both an understanding of health information and the capacity to use this information.³⁰ The present research and cited studies showing insufficient oral hygiene capabilities^{18,21-27} reveal severe deficits in oral health literacy among German adolescents and adults. These

deficits are not confined to Germany.⁶ Further research should aim to understand how the deficits in oral health literacy, revealed in the present study, are related to deficits in oral health and oral hygiene capabilities. The need to develop different approaches for different age groups and risk groups to improve PHL should also be evaluated. In addition, data from this and other studies⁶ calls for nationwide campaigns to improve oral health literacy at the population level. One such campaign has recently been launched in Germany, with the focus on periodontitis.³¹ Accordingly, the present data may serve as a baseline dataset for future evaluation of campaign effectiveness. From the present survey, it is clear that such campaigns should also consider different oral diseases and emphasize on the optimal use of recommended aids as important points.

5 | CLINICAL RELEVANCE

Dental teams should consider the potential deficits in the oral health literacy of their patients. The OEQs used in the present survey may serve as a starting point for individual oral health education programs. The results of the current survey contradict the use of SCQ and MCQ queries. This may mask existing deficits and thus lead to an overestimation of patients' oral health literacy.

AUTHOR CONTRIBUTIONS

Both authors designed and initiated this research, R.D. conducted the statistical analyses. Both authors interpreted the data, drafted the article, revised it and final approved its current version.

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CONFLICT OF INTEREST STATEMENT

The contents of this paper are solely the responsibility of the authors. The authors declare that there are no conflicts of interest. The interpretation of data and presentation of information is not influenced by any personal or financial relationship with any individual or organization.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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