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A new indicator of the oral hygiene habits of disabled persons: relevance of the carer's personal appearance and interest in oral health

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Limeres J, Martínez F, Feijoo JF, Ramos I, Liñares A, Diz P. A new indicator of the oral hygiene habits of disabled persons: relevance of the carer's personal appearance and interest in oral health.

Abstract: *Objective:* To investigate whether there is a relationship between the oral hygiene habits of individuals with severe disability the carer's personal appearance and interest in oral health. *Patients and methods:* The study group was formed of 60 disabled persons and their respective carers who came for the first time to consultation in the Special-Needs Dentistry Unit of the University of Santiago de Compostela, Spain. All the carers answered a standardised questionnaire of 28 questions divided into four sections: disabled individual's demographic data, disabled individual's general medical details, social aspects of the carer (personal appearance of the carer and interest in oral health), and disabled individual's oral hygiene habits. The personal appearance of the carers and their interest in the disabled individual's oral health were evaluated using independent scales designed specifically for the study, with five binary items in each scale. *Results:* The carer's personal appearance and interest in the disabled individual's oral health showed a statistically significant relationship with the individual's oral hygiene habits, particularly with respect to the frequency and duration of toothbrushing, need for physical restraint during toothbrushing, use of a manual toothbrush and use of toothpaste. *Conclusions:* The carer's personal appearance and interest in the disabled individual's oral health are good indicators of the oral hygiene habits of an individual with severe disability. Consideration should be given to the inclusion of these aspects as a complementary element of the dental record.

Key words: dental hygiene; disability; motivation; oral hygiene habits

Introduction

The World Health Organization warns that disabled persons have lower levels of general health than the rest of the population (1). In this context, it has been reported that there is an association between disability and the risk of oral health problems (2). The higher prevalence of the accumulation of dental biofilm, gingivitis, periodontitis and caries (3–5) means that the need for dental treatment is particularly high among the disabled population. Furthermore, the treatment of these individuals in the dental clinic is not always easy and can sometimes be a challenge for dentists; if to this we add other barriers, which may be of a physical, behavioural, health, social or economic nature, we can understand the problems associated with finding appropriate dental services for these individuals (6). As a result, the oral hygiene habits, especially tooth-

brushing, are of particular interest to safeguard the oral health of disabled individuals and to minimize as far as possible the need for dental treatment. Toothbrushing is a particularly difficult task; it has been reported that 40% of disabled persons do not brush their teeth on a daily basis and that a large number of them eat a diet with a high cariogenic potential (7). Individuals with specific conditions, such as Down's syndrome, present a lower frequency of application of oral hygiene habits than the general population (8); in other populations, such as autistic persons, it has been reported that only 25% of individuals know how to brush their teeth unassisted (9).

It has been demonstrated that providing education in oral hygiene and performing daily supervision can significantly improve the frequency and efficiency of toothbrushing in disabled individuals (10). The removal of bacterial biofilm requires the participation and supervision of the carers, who must be instructed individually according to the oral requirements and abilities of the individual. As a result, the motivation of carers could influence the efficacy of oral hygiene measures and dental biofilm removal.

The objective of this study was to analyse the oral hygiene practices of severely disabled individuals coming for the first time to a specialist dental unit and to evaluate whether the personal appearance of the carer and the interest shown by the carer in the explanations given in the clinic could help to predict the individual's oral hygiene habits.

Study population and methodology

A non-interventional observational study was performed on disabled persons coming for the first time to the Special-Needs Dentistry Unit of the University of Santiago de Compostela (USC), Spain, for dental consultation, accompanied by their usual carers. Between October 2011 and March 2012, a study group was created with the inclusion of 60 subjects and their respective carers. In all cases, the carers and the disabled individual's legal guardians voluntarily agreed to participate in the study.

All the carers filled in a standardized questionnaire (with a duration of approximately 7 min), made up of 28 questions divided into four sections: disabled individual's demographic details, disabled individual's general medical details, social details of the carer (personal appearance and interest in oral and dental health) and the disabled individual's oral hygiene.

The 'carer's personal appearance' (CPA) was evaluated on the basis of 5 items: hygiene of the anterior dental sector, hair hygiene, nail hygiene, shoe cleanliness and cleanliness of clothes. Each item was scored in a binary fashion (0 = dirty; 1 = clean). The final CPA score was obtained from the sum of the values obtained in each item, giving a range of 0 to 5 points (very poor, 0–1; poor = 2; fair = 3; good = 4; very good = 5).

The 'interest of the carer in oral health' was also evaluated using five binary items (0 = negative; 1 = positive): interest in participating in a survey of oral hygiene habits, coherence of the carer's responses with the oral findings in the disabled individual, attention paid to the investigator's explanations about oral hygiene, questions asked by the carer about oral hygiene and attention paid to the explanations provided by the investigator during the oral examination of the disabled individual. The final score was obtained from the sum of the values obtained in each item, and the following categories of interest of the carer were established: no interest = 0–1; some interest = 2–3; high interest = 4–5.

The oral hygiene parameters recorded in each disabled individual were the following: frequency of toothbrushing (some days, once a day, twice a day, $\geq$3 times a day), need for physical restraint to perform toothbrushing (no, yes), type of toothbrush used (none, electric toothbrush, manual toothbrush, gauze swab), use of toothpaste (no, yes), time dedicated to toothbrushing (<1, 1–3, $\geq$3 min), use of mouthwashes (no, yes), frequency of toothbrush renewal (only when visible signs of damage, once a year, 2–3 times per year, $\geq$4 times per year) and carer's previous education in oral hygiene (none, non-specific, specific).

A simplified oral examination technique that only included procedures for cross-infection control and the use of an extra-oral light source was applied. The following variables were recorded: number of decayed (D), missing (M) and filled (F) teeth; DMF index; dental biofilm accumulation (yes/no); and gingivitis (yes/no). Moreover, carers were asked about gingival bleeding (never/sometimes/always) and halitosis (yes/no).

The results were analysed using the SPSS statistical software, version 15.0, for Windows (SPSS, Chicago, IL, USA). The analysis of categorical variables was performed using Pearson's chi-squared test. A P value less than 0.05 was considered statistically significant.

The carers (legal guardians) of all participants provided signed informed consent to the use and dissemination of the data obtained for scientific or educational purposes. The study was approved by the Institutional Review Board of the University of Santiago de Compostela. (Comité de Investigación Clínica de Galicia ref. 2012/000172-13).

Results

The study group was formed of 34 males and 26 females with a mean age of 21.6 $\pm$ 14.1 years (range, 5–50 years). The most prevalent systemic pathology was intellectual disability (36.7%), followed by autism (21.7%), low-prevalence syndromes and rare diseases (20%), and Down's syndrome (13.3%).

The majority of carers presented a 'very good' or 'good' CPA (63.3 and 21.7%, respectively). With regard to the interest of the carer in the individual's oral and dental health, 71.7% showed a high level of interest, whereas 8.3% showed no interest.

The frequency of toothbrushing was twice a day in 19 individuals (31.7%) and three or more times a day in 18 (30%). In 10 individuals (16.7%), toothbrushing was only performed sporadically. Physical restraint was necessary to perform

toothbrushing in 40% of subjects. A manual toothbrush was used to remove dental biofilm in 48 subjects (80%) and an electric toothbrush in seven (11.7%). Other auxiliary methods, such as gauze swabs, were used in the remainder of the individuals. The time dedicated to toothbrushing was less than 1 min in 22 subjects (36.7%), between one and 3 min in 21 (35%) and three or more minutes in only 17 (28.3%). Toothpaste was used by 80% of the sample and 28.3% complemented the toothbrushing with the use of a mouthwash. Toothbrush renewal was performed four or more times a year in 45% of cases, whereas the carers indicated that toothbrushes were only changed when they showed signs of damage in 13 cases (21.6%). Almost a third of subjects (30%) brushed their teeth unassisted, whereas this was performed by the carers in 31.7% of cases; in the remaining 38.3%, the individuals performed toothbrushing themselves but with the supervision and aid of the carers. Only 20% of carers had received previous specific training in techniques of oral hygiene for the disabled, 46.7% had gathered information on oral hygiene techniques designed for the general public, and 33.3% had not received any type of training in this area.

Oral examination required physical restraint in about 30% of the individuals. The mean DMF index was 6.4 ± 7.6. Dental biofilm accumulation was detected in 36 (60%) subjects. Gingivitis was observed in 29 (48.3%) individuals. Everyday gingival bleeding was described in 21 (35%) individuals and persistent halitosis in 18 (30%).

The correlation obtained between the CPA and the oral hygiene habits is shown in Table 1. Statistically significant differences were observed with respect to the use of physical restraint during toothbrushing ($P = 0.0009$), type of toothbrush ($P = 0.0102$), duration of toothbrushing ($P = 0.0141$) and use of toothpaste ($P = 0.0211$). When the CPA was 'very good', 73.6% of subjects brushed their teeth without the need for physical restraint, 89.4% of the study group used a manual toothbrush, 70.9% brushed their teeth for a least 1 min and 89.4% used toothpaste.

We found a statistically significant correlation between the interest of the carer and the individual's oral hygiene habits, particularly with respect to the frequency of toothbrushing ($P = 0.0022$), the use of physical restraint for toothbrushing ($P = 0.0200$), the type of toothbrush used ($P = 0.0476$) and the time dedicated to toothbrushing ($P = 0.0001$) (Table 2). When the interest of the carer was 'high', 74.4% of individuals brushed their teeth two or more times a day, 69.7% of the sample did not require physical restraint to perform toothbrushing, 86% used a manual toothbrush and 79% brushed their teeth for 1 min or longer.

The correlation between the CPA and the interest of the carer, and the oral health status is shown in Table 3. There was a statistically significant correlation between the CPA and the number of filled teeth ($P = 0.0223$). There was a statistically significant correlation between the interest of the carer and the individual's oral health status, particularly with respect to the DMF index ($P = 0.0180$), the number of missing teeth ($P = 0.0001$) and the presence of halitosis ($P = 0.0267$).

Table 1. **Correlation between the carer's personal appearance and the variables related to oral hygiene habits ($n = 60$)**

	Personal appearance of the carer *n* (%)			
Oral hygiene habits	Bad/ Fair*	Good	Very good	Statistical significance
Toothbrushings per day				
Some days	3 (30.0)	4 (40.0)	3 (30.0)	ns
Once a day	2 (15.4)	5 (38.5)	6 (46.2)	
Twice a day	3 (15.8)	1 (5.3)	15 (78.9)	
≥3 times per day	1 (5.6)	3 (16.7)	14 (77.8)	
Need for physical restraint during toothbrushing				
No	6 (16.7)	2 (5.6)	28 (77.8)	0.0009
Yes	3 (12.5)	11 (45.8)	10 (41.7)	
Type of toothbrush				
No toothbrushing	2 (66.7)	0 (0.0)	1 (33.3)	0.0102
Electric	1 (14.3)	3 (42.9)	3 (42.9)	
Manual	6 (12.5)	8 (16.7)	34 (70.8)	
Gauze swab	0 (0)	2 (100)	0 (0)	
Duration of toothbrushing				
<1 min	5 (22.7)	9 (40.9)	8 (36.4)	0.0141
1–3 min	3 (14.3)	3 (14.3)	15 (71.4)	
>3 min	1 (5.9)	1 (5.9)	15 (88.2)	
Renewal of toothbrush				
Visible damage	3 (23.1)	5 (38.5)	5 (38.5)	ns
Once a year	2 (40.0)	1 (20.0)	2 (40.0)	
2–3 times per year	0 (0.0)	3 (20.0)	12 (80.0)	
≥4 times per year	4 (14.8)	4 (14.8)	19 (70.4)	
Use of toothpaste				
No	2 (16.7)	6 (50.0)	4 (33.3)	0.0211
Yes	7 (14.6)	7 (14.6)	34 (70.8)	
Use of mouthwash				
No	8 (18.7)	9 (20.9)	26 (60.5)	ns
Yes	1 (5.9)	4 (23.5)	12 (70.6)	
Previous training in oral hygiene				
No	4 (20.0)	5 (25.0)	11 (55.0)	
Non-specific	4 (14.3)	6 (21.4)	18 (64.3)	ns
Specific	1 (8.3)	2 (16.7)	9 (75.0)	

ns, not significant.
*For the statistical analysis, the values 'Very bad', 'Bad' and 'Fair' were grouped together into the category 'Bad/Fair'.

Discussion

This study has certain methodological limitations that must be taken into account. First, we were unable to find any validated scale in the scientific literature to quantify 'personal appearance' or 'interest of the carer'; we therefore had to design a specific scale. Another potential bias is that the reliability of the information provided by the carers could not be checked. In addition, when an individual came to the clinic with more than one carer, we could not be certain that the survey was performed on the person with the most reliable information, although the interviewer always insisted on this point.

The frequency of toothbrushing was lower than that described for the general Spanish population, in which it has been reported that 78% brush their teeth two or more times a day (11). However, our results were better than those reported by Orellana *et al.* (9), although their study was performed only on persons with autism disorder, who are usually more

Table 2. **Correlation between carer's interest in oral hygiene and the variables related to oral hygiene (n = 60)**

	Interest in the oral health of the individual *n* (%)		
Oral hygiene habits	Low*	High	Statistical significance
Toothbrushings per day			
Some days	7 (70.0)	3 (30.0)	0.0022
Once a day	5 (38.5)	8 (61.5)	
Twice a day	1 (5.3)	18 (94.7)	
≥3 times per day	6 (33.3)	14 (77.8)	
Need for physical restraint during toothbrushing			
No	6 (16.7)	30 (83.3)	0.0200
Yes	11 (45.8)	13 (54.2)	
Type of toothbrush			
No toothbrushing	2 (66.7)	1 (33.3)	0.0476
Electric	2 (28.6)	5 (71.4)	
Manual	11 (22.9)	37 (77.1)	
Gauze swab	2 (100.0)	0 (0.0)	
Duration of toothbrushing			
<1 min	13 (59.1)	9 (40.9)	0.0001
1–3 min	4 (19.1)	17 (81.0)	
>3 min	0 (0.0)	17 (100.0)	
Renewal of toothbrush			
Visible damage	7 (53.8)	6 (46.2)	ns
Once a year	1 (20.0)	4 (80.0)	
2–3 times per year	5 (33.3)	10 (66.7)	
≥4 times per year	4 (14.8)	23 (85.2)	
Use of toothpaste			
No	6 (50.0)	6 (50.0)	ns
Yes	11 (22.9)	37 (77.1)	
Use of mouthwash			
No	12 (27.9)	31 (72.1)	ns
Yes	5 (29.4)	12 (70.6)	
Previous training in oral hygiene			
No	9 (45.0)	11 (55.0)	ns
Non-specific	7 (25.0)	21 (75.0)	
Specific	1 (8.3)	11 (91.7)	

ns, not significant.
*For the statistical analysis, the values 'No interest' and 'Some interest' were grouped together into the category 'Low'.

conflictive in these types of tasks (12). In a study performed on individuals with intellectual disability (7), which was the predominant diagnosis in our series, it was found that 40% brushed their teeth a maximum of once a day; our results are similar to the finding of that study. With respect to the type of toothbrush, there is marked variability in the percentage use of electric toothbrushes in the Spanish population (4–50%, depending on the study), and the choice is influenced by age group, purchasing power and geographical region (11, 13). We obtained similar results to those of a study of autistic persons in Spain, with 80% use of a manual toothbrush (9). The need for physical restraint to perform toothbrushing is a relatively common measure that is just one of the difficulties for performing this type of task at home (14). The percentage of subjects in our study who required physical restraint to perform toothbrushing was somewhat lower than the 65% reported by Marshall *et al.* (15). This was presumably a relevant factor in explaining why we recorded short toothbrushing times (less than 1 min) in more than a third of the individuals in our series. However, it has been shown that carers dedicate a mean of three or more minutes to toothbrushing in institutionalized disabled individuals (16), a clearly higher value than that detected in our study. With regard to toothbrush renewal, a survey of the general Spanish population reported that 30% of persons renew their toothbrush every 3 months and 40% 'only with visible signs of damage' (17). Our results show a higher rate of toothbrush renewal than in the general population. In our study, 20% of disabled persons did not use toothpaste; this differs considerably from the report of 4% in the general population who brush without toothpaste (11). This finding could be related to certain protocols that do not recommend the use of toothpastes in disabled persons to avoid their possible ingestion (18). Something similar occurred with the use of mouthwashes, as only a third of individuals in the present study used any type of mouthwash compared with 62% in the general population (11). The protocols mentioned above also warn about the use of mouthwashes in disabled individuals (18). In the literature, we found numerous publications that insist on the need to train the parents, tutors or carers of disabled persons in matters of oral hygiene (10, 19–23). However, 30% of carers in our study had not received any training in oral hygiene, either in general terms or specific to disabled persons.

In the social setting, a higher family socio-economic status has been related to better levels of oral hygiene (24, 25), whilst a low parental educational level has been associated with poorer oral hygiene habits (25, 26). The experience and beliefs of the parents can also influence their children's attitude towards oral hygiene (19). In the present study, we evaluated the family environment based on the appearance of the carer and his/her attitude during the consultation, specifically with regard to the interest shown in the investigator's explanations of matters of oral hygiene. We have not found any study in the literature that has determined the oral hygiene of disabled individuals in relation to the CPA. Some authors have suggested that the general hygiene of the carers and/or parents may be negatively affected by having a disabled person in their charge (20, 27, 28). However, in our study, only 15% of carers presented a 'bad/poor' personal appearance. Another variable studied was the interest of the carer in oral health. In the present study, more than two thirds of carers showed interest in the instructions received, a much higher proportion than that observed in a survey of a collective of Lithuanian parents with school-age children (29). Some authors have indicated that the provision of training in oral hygiene can increase the concern for this subject and improve oral hygiene habits (21). In our study, a high level of previous knowledge was associated with a greater interest for the information that was provided and vice versa.

Both, CPA and interest of the carer, seem to have an influence on some clinical variables such as DMF index and number of missing teeth. Surprisingly, they did not correlated with other oral hygiene–related clinical parameters including dental biofilm accumulation, gingivitis and number of decayed teeth.

Table 3. **Correlation between carer's personal appearance and interest in oral hygiene, and the variables related to oral health status (*n* = 60)**

	Personal appearance of the carer				Interest in the oral health of the individual		
Oral health status	Bad/Fair*	Good	Very good	Statistical significance	Low*	High	Statistical significance
DMF†	6.87 ± 7.93	7.00 ± 11.3	6.11 ± 6.48	ns	10.18 ± 11.36	4.95 ± 5.35	0.0180
Decayed	2.77 ± 2.77	0.92 ± 2.02	2.81 ± 3.09	ns	1.62 ± 2.21	2.71 ± 3.11	ns
Missing	3.78 ± 8.29	6.08 ± 10.71	2.46 ± 5.22	ns	8.43 ± 11.63	1.50 ± 2.81	0.0001
Filled	0.22 ± 0.67	0.00 ± 0.00	0.84 ± 1.68	0.0223	0.12 ± 0.50	0.73 ± 1.59	0.0747
Dental biofilm‡	8 (22.2%)	8 (22.2%)	20 (55.5%)	ns	14 (34.1%)	27 (65.8%)	ns
Gingivitis	6 (20.7%)	6 (20.7%)	17 (58.6%)	ns	10 (34.5%)	19 (65.5%)	ns
Gingival bleeding							
Never	4 (19%)	6 (28.6%)	11 (52.4%)		6 (28.6%)	15 (71.4%)	
Sometimes	1 (5.6%	4 (22.2%)	13 (72.2%)	ns	4 (22.2%)	14 (66.7%)	ns
Everyday	4 (19%)	3 (14.3%)	14 (66.7%)		7 (33.3%)	14 (66.7%)	
Halitosis							
No	6 (14.3%)	7 (16.7%)	29 (69.0%)	ns	8 (19.0%)	34 (81.0%)	0.0267
Yes	3 (16.7%)	6 (33.3%)	9 (50.0%)		9 (50.0%)	9 (50.0%)	

ns, not significant.
*For the statistical analysis, the values 'No interest' and 'Some interest' were grouped together into the category 'Low', while the values 'Very bad', 'Bad' and 'Fair' were grouped together into the category 'Bad/Fair'.
†Decayed, Missing and Filled Index.
‡Visible dental biofilm accumulation without the use of highlighting agents.

These variables were determined visually, without the use of highlighting agents and probes, and sometimes with the help of physical restraint. Consequently, some of these clinical parameters may be underestimated due to the weakness of the assessment methods.

The results obtained in the present study indicate that carer appearance and the interest of the carer in oral health constitute good indicators of the oral hygiene habits of persons with severe disability, and consideration should therefore be given to the inclusion of these details as complementary elements in the dental record.

Clinical relevance

Oral diseases affect almost the whole of the disabled population. They have been related to poor oral hygiene habits, mainly to toothbrushing.

As dependent persons, these activities could be influenced by the participation and supervision of the caretakers. This study analyses the oral hygiene practices of disabled individuals in relation to personal appearance of the caretaker and the interest shown by them towards the dental care instructions given in the clinic. The results indicate that both factors are related to the oral hygiene habits, and it could be useful to include these details as complementary elements in the dental record.

Author contributions

All authors contributed extensively to the work presented in this manuscript. JL and PD designed the study and revised the final version of the manuscript. FM and JFF performed the interviews and evaluations. AL and IR drafted the manuscript.

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