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Multiple sclerosis: oral health, behaviours and limitations of daily oral hygiene — a questionnaire study

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ABSTRACT

Clinical rationale for the study. Neurological deficits and progressing disability in patients with multiple sclerosis (MS) may hamper daily oral hygiene, but their relations with oral problems have not yet been clearly determined.

Aim of the study. The aim of this study was to identify the most significant dental problems and limitations of daily oral hygiene in Polish patients with MS.

Material and methods. 199 patients with diagnosed MS (median age 37 years) treated in the neurological outpatient clinic were interviewed using a paper-based questionnaire. They provided answers on oral health, behaviours and the limitations of their daily oral hygiene. Clinical information regarding symptoms, MS phenotype, relapses, medication and degrees of disability was based on medical records.

Results. The most frequent symptoms were dry mouth (43.2%) and bleeding from gums (28.1%). Dry mouth was more frequent in patients with secondary-progressive MS (SPMS) than relapsing-remitting MS (65.4% *vs* 41.3%, p = 0.023). Patients with bleeding from gums had had MS for a longer duration (median 6 *vs* 4 years, p = 0.002). Difficulties in daily oral hygiene were more frequent in patients with SPMS (24.0% *vs* 8.1%; p = 0.016). Greater proportions of patients with muscle weakness of limbs, imbalance or pain brushed their teeth irregularly. Frequent (i.e. at least every six months) visits to the dentist's surgery were uncommon in patients with SPMS (12.0% *vs* 39.7%, p = 0.010).

Conclusions and clinical implications. Dry mouth and bleeding from gums are more frequent in patients with longer lasting and more advanced types of MS. Daily oral hygiene and oral health self-control is limited in patients with MS, mainly due to motor deficits, balance problems and pain, and this becomes worse with disease duration.

To minimise the burden of the disease, patients with MS require better education and improvement in their awareness regarding proper oral health control, such as the use of electric toothbrushes. In addition, patients with chronic and progressive disability from multiple sclerosis may benefit from better organised access to dental care.

Key words: multiple sclerosis, oral health, oral hygiene, questionnaire

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Introduction

Multiple sclerosis (MS) is a chronic, inflammatory, demyelinating and neurodegenerative disease of the central nervous system (CNS), which damages myelin sheaths, oligodendrocytes, as well as nerve cells and axons. It is characterised by gradual and progressive limitation of functional abilities, consequently leading to disability. The first symptoms of the disease usually appear between the ages of 20 and 40 years, and therefore MS is considered the most common cause of disability in younger people [1].

Individual clinical presentations, and the rate of accumulation of disability, may be different in each patient and depend on the location and the amount of demyelinating lesions in the CNS. Clinical symptoms of MS include, but are not limited to, motor deficits, sensory disturbances, visual disorders, bulbar symptoms, cognitive dysfunction, dysautonomia and mental disorders [2–8], which individually or in combinations may hamper oral hygiene. Progressive functional disability and medication used for the treatment of MS may also be associated with greater incidences of oral diseases and dental problems [9–13].

Daily oral hygiene, frequency of visits to the dentist's surgery, and mouth discomfort have been identified as the main dental problems requiring medical attention in patients with MS [9–15]. To date, there has been no study of oral problems or difficulties in oral hygiene in patients with MS in Poland. Therefore, the purpose of this study was to identify the most significant limitations of daily oral hygiene in Polish patients with MS, to assess the incidence and type of dental problems, and to evaluate their association with clinical features, as well as social and economic factors.

Material and methods

Consecutive subjects were recruited among patients with MS diagnosed according to the 2010 McDonald criteria [16], who were treated in the Neurological Outpatient Clinic at the Department of Neurology of Medical University of Silesia (Zabrze) between 1 July 2014 and 31 January 2015. The study was conducted according to the principles of the Declaration of Helsinki and all participants provided written informed consent. The protocol of the study was reviewed and approved by Ethics Committee of our institution.

Each patient was interviewed using a questionnaire devised by ourselves, and provided answers to several general and specific questions. General questions concerned age, sex, education, professional activity, familial status, course of the disease (age of first symptoms and diagnosis, phenotype of MS, current symptoms, number and frequency of relapses during the disease course, previous and current medication) and comorbidities. Clinical information about relapses, medication and disability degree measured with Expanded Disability Status Scale (EDSS) [17] was verified with the outpatient's neurological documentation. Specific questions concerning dental health status and dental care included: frequency of visits to the dentist's surgery, time since the last visit, behaviours and habits of oral hygiene, problems with daily oral hygiene, oral sensations, preferences for specific foods or drinks, and history of smoking.

Statistical analysis was performed using STATISTICA 12 software (Stat Soft, Poland) and R 3.3.2 (GNU General Public License). Data were presented as means with standard deviation (± SD), median with minimum and maximum values or as percentages. After checking for normality with the Shapiro-Wilk test, to analyse the between-groups differences Student's t-test or Mann-Whitney *U* test were used and chi-square or Fisher's exact tests were used for categorical data. A p value < 0.05 was considered significant.

Results

The study included 199 patients (143 women; 71.9%) with diagnosed MS (median age 37 years, range 18–67 years) and with a median duration of 4 years (range 0–27 years) since diagnosis. Socioeconomic and clinical data of the studied group are given in Table 1. In general, patients with secondary progressive MS (SPMS) were older than those with the relapsing-remitting form of MS (RRMS) (median age 48.5 years, 29–67 years *vs* 36 years, 18–65 years, respectively; $p < 0.001$) and on average had had the disease for longer (median 6 years from diagnosis, 1–24 years, *vs* 4 years, 1–27 years, respectively), but this difference was not statistically significant ($p = 0.076$).

Oral and dental problems

Dry mouth and bleeding from gums were the most frequent symptoms reported by 86 (43.2%) and 56 (28.1%) patients with MS, respectively. The incidence of oral and dental problems, limitations and behaviours of oral hygiene is summarised in Table 2. The most frequent symptoms (dry mouth and bleeding from gums) were not related to the age of the patient ($p = 0.392$ and $p = 0.877$, respectively). However, the incidence of dry mouth was higher in patients with SPMS than in patients with RRMS (65.4% *vs* 41.3%, respectively; $p = 0.023$). The incidence of bleeding from gums was not different between patients with SPMS or RRMS ($p = 0.873$), but patients with bleeding from gums had had their disease for longer than patients without (median 6 years, 0–27 years, *vs* 4 years, 0–24 years, respectively; $p = 0.002$).

There was no difference in the incidence of dry mouth and bleeding from gums between patients using Disease Modifying Drugs (DMD) or not ($p = 0.994$ and $p = 0.662$, respectively), nor they were associated with the use of any specific DMD ($p = 0.230$ and $p = 0.363$, respectively). Dry mouth was more frequent in patients who reported that they had received at least one course of steroids in the past (50.0% *vs* 31.3%; $p = 0.013$). On the other hand, it was not associated with any type of symptomatic treatment for MS, in which dry mouth may

Table 1. Socioeconomic and clinical data of 199 patients with multiple sclerosis (MS)

	Patients; n (%)
Education	
Elementary	4 (2.0)
Secondary	68 (34.2)
High	90 (45.2)
Undergraduate	36 (18.1)
Professionally active	116 (58.3)
Number of children	
0	77 (38.7)
1	58 (29.2)
2	56 (28.1)
≥3	8 (4.0)
Marital status	
Single	75 (37.7)
Married or in partnership	124 (62.3)
Economic status (income)	
Above high	14 (7.0)
High	93 (46.3)
Average	89 (44.7)
Low	2 (1.0)
Phenotype of MS	
Relapsing-remitting MS	151 (75.9)
Secondary progressive MS	26 (13.1)
No data	22 (11.0)
EDSS score (mean ± SD)	3.2 ± 1.9
Number of relapses per year (mean ± SD)	1.3 ± 0.9
Time from last relapse; months (mean ± SD)	21.5 ± 23.7
Reported symptoms of MS	
Muscle weakness in at least one limb	143 (71.9)
Sensory disturbances	134 (67.3)
Balance problems	111 (55.8)
Pain (different localisations)	54 (27.0)
Visual disturbances	13 (6.5)
Fatigue	4 (2.0)
Disease Modifying Drugs (DMD) received	
Interferon beta	112 (56.3)
Glatiramer acetate	19 (9.5)
Fingolimod	19 (9.5)
Natalizumab	4 (2.0)
No DMD	37 (18.7)
No data	8 (4.0)
Methylprednisolone (at least once in a lifetime)	92 (46.2)
Main symptomatic MS treatment (indication)	
Myorelaxants (spasticity)	9 (4.5)
Antiepileptic drugs (sensory disturbances)	8 (4.0)
Amantadine (fatigue)	4 (2.0)
Oxybutynin (urine urgency)	3 (1.5)
Comorbidities	
Thyroid disease	27 (13.7)
Arterial hypertension	25 (12.6)
Coronary artery disease	5 (2.5)
Chronic urinary tract infection	4 (2.0)
Mental disorders	4 (2.0)
Liver diseases	4 (2.0)
Diabetes mellitus	2 (1.0)
Oral contraceptives (women only)	4 (2.8)
Active cigarette smokers	55 (28)
Alcohol consumption	
Regular	124 (62.3)
At least once a week	8 (4%)

Note: Unless otherwise indicated, presented data are numbers of patients in the studied group (with respective percentages given in brackets). SD – standard deviation; EDSS – Expanded Disability Status Scale

be one of the side effects (mainly myorelaxants, antiepileptic drugs, amantadine, oxybutynin, oral contraceptives or antidepressants) (p = 0.127). Bleeding from gums was not associated with steroid use or any concomitant medication (p = 0.660).

Daily oral hygiene

Difficulties with daily oral hygiene were reported more often by patients with SPMS than by patients with RRMS (24.0% *vs* 8.1%; p = 0.016). Patients with selected neurological focal deficits related to MS also more frequently reported difficulties with daily oral hygiene than did patients without them: 1) muscle weakness of limbs (23.4% *vs* 5.8%, respectively; p < 0.001); 2) imbalance (27.3% *vs* 6.8%, respectively; p < 0.001); and 3) pain (25.0% *vs* 8.9%, respectively; p = 0.030). Additionally, insufficient brushing of the teeth – once a day or less – was significantly more frequent in patients with muscle weakness of limbs, imbalance or pain, than in those without these specific symptoms – two or three times per day (29.8% *vs* 15.0%, p = 0.007; 33.3% *vs* 15.0%, p = 0.029 and 35.0% *vs* 16.4%, p = 0.046, respectively). Patients with bleeding from gums less often used an electric toothbrush (8.9% *vs* 22.5%; p = 0.028) and brushed their teeth less frequently, but this difference was not significant (p = 0.067). Reported problems with oral hygiene were not associated with gender, age, education,

Table 2. Oral problems, behaviours and limitations of oral hygiene reported by 199 patients with multiple sclerosis (MS). Data presented as n (%)

	Patients; n (%)
Oral and dental problems	
Dry mouth	86 (43.2)
Bleeding from gums	56 (28.1)
Metallic flavour in the mouth	21 (10.6)
Dysgeusia	20 (10.1)
Pain during brushing the teeth	10 (5.0)
Burning in the mouth	8 (4.0)
Difficulties in daily oral hygiene	
Minor	17 (8.5)
Moderate	4 (2.0)
Help from another person	1 (0.5)
No data	4 (2.0)
Brushing of teeth	
Three or more times a day	34 (17.1)
Twice a day	123 (61.8)
Once a day	36 (18.1)
Occasionally	2 (1.0)
No data	4 (2.0)
Toothbrush used	
Traditional	159 (79.9)
Electric	36 (18.1)
No data	4 (2.0)
Additional behaviours of oral hygiene	
Mouth fluid	84 (42.2)
Dental floss	79 (39.7)
Irrigator	3 (1.5)
Visits to the dentist's office	
Every six months	69 (34.7)
Once a year	68 (34.2)
Less than once a year	30 (15.1)
Only in an emergency	26 (13.1)
No data	6 (3.0)
Last visit to the dentist	
Less than six months ago	49 (24.6)
Between six and 12 months ago	79 (39.7)
More than 12 months ago	39 (19.6)
No data	32 (16.1)
Fear of dentists	56 (28.1)
Nutritional preferences (regular consumption)	
Sparkling water	137 (68.8)
Meat	134 (67.3)
Vitamin supplements	120 (60.3)
Fruit juices	90 (45.2)
Flour products	81 (40.7)
Sweet drinks	29 (40.6)
Sweets	76 (38.2)
Sweets in the evening after teeth brushing	52 (26.1)
Still water	48 (24.1)

professional activity, marital, familial and economic status, degree of disability (EDSS), comorbidities, used MS therapy or mean number of relapses per year.

Oral health self-control

Regular (at least every six months) visits to the dentist's surgery were reported by a greater proportion of patients with RRMS than those with SPMS (39.7% *vs* 12.0%), and therefore a greater proportion of patients with SPMS visited the dentist less frequently than patients with RRMS (52.0% *vs* 33.6% at least once a year and 28.0% *vs* 11.6% less than once a year, respectively; p = 0.010). Women and patients with a better level of education visited the dentist's more often than others (p = 0.010 and p = 0.001, respectively). The frequency of visits was not associated with age, professional activity, marital, familial and social status, degree of disability, reported symptoms, concomitant diseases, type of therapy used or the annual number of relapses.

Discussion

In the presented study, the main reasons for oral discomfort in Polish patients with MS were xerostomia (43.2%) and gingival bleeding (28.1%). The prevalence of xerostomia in the general population ranges significantly, from 0.9% to 64.8% [18], depending on the population studied and the methodology used. In our study, the frequency of xerostomia in patents with MS was considered high, because our patients were on average younger than the overall general population, and problems with a dry mouth are usually more prevalent among the elderly [19].

Dry mouth was more frequent in patients with the secondary progressive MS phenotype and those who had used steroids in the past. In our opinion, this is less likely to be a specific side effect of steroids use and more likely to be part of this type of MS, because patients with SPMS are older, have had their disease for longer, have more neurological symptoms, and there is a higher chance that they were treated with steroids in the past [20]. It is possible that dysautonomia and sensory disturbances in long-lasting MS may be the cause of xerostomia in these patients, but such a hypothesis requires further investigation. On the other hand, steroids are recommended in the treatment of Sjögren's syndrome, an autoimmune disease in which the main symptoms are dry eyes and mouth, so a short course of steroids (even repeated) can be beneficial for xerostomia [21].

Dry mouth was not associated with the use of DMD, nor with any specific medication. This is consistent with the general risk profile of most newer-generation DMDs – e.g. interferons, glatiramer acetate, fingolimod or natalizumab – compounds that were used in our patients. Against this, teriflunomide has been reported to raise the risk of tooth loss [22], but none of our patients was receiving this treatment. Medication used in the symptomatic management of MS may have the potential to cause dry mouth and other oral diseases [9, 13]. Individual patients in our group were taking baclofen, amantadine,

oxybutynin or contraceptive drugs, but the overall incidence of xerostomia was not higher, probably because of the significant heterogeneity of the group and only single patients receiving such treatment. Tobacco use is often the cause of dry mouth [23], but in the studied group the proportion of active cigarette smokers was comparable to that in the general population.

Bleeding from gums was reported by less than 28.1% of patients with MS, compared to a 50% incidence of gingival bleeding in healthy Poles [24]. The average age of responders in that study was higher, by more than a dozen years, than in our group and gingival bleeding was largely related to the fact of brushing the teeth and the type of toothbrush bristles (soft, medium, hard). In our group, patients with bleeding from gums significantly less often brushed their teeth using an electric toothbrush (2.5 times less frequently), therefore a manual toothbrush could be the one of the risk factors for gingival bleeding. In other populations of patients with MS, this incidence of gingival bleeding has been estimated as being 5–15% [12, 25]. This difference could be the result of a different methodology of acquisition of data, as we questioned patients about any possible incident of gingival bleeding, whereas in other studies this symptom could be actually confirmed during an intraoral examination.

Substantial difficulties and limitations of daily oral hygiene were reported by about 11% of patients with MS, and they were three times more frequent in patients with SPMS than in RRMS (24% *vs* 8%). Patients with SPMS may have more severe neurological deficits and higher degrees of disability to interfere with oral hygiene and access to dental services [20]. We identified weakness of limbs, imbalance and pain to be the main factors limiting daily oral hygiene. In other studies in patients with MS, visual disturbances, facial pain, trigeminal neuralgia, paresthesia, spasticity, spasms, tremor, fatigue and depression have also been found [9, 13], but our group consisted of younger participants and with a shorter disease duration than the general population of patients with MS, therefore with less disease-related burden.

Oral hygiene in patients with MS rarely attracts the attention of neurologists, but dental problems should be expected and explored, particularly because of the chronic character of the disease and the progressive disability of patients. In our study, 61.8% of patients with MS said that they brushed their teeth twice a day, which is a higher proportion than estimated in the general Polish population (54.7%) [26]. A similar proportion was observed in a British population of patients with MS (66%), although this was less often than in the general population in the UK (74%) [27]. Individual neurological deficits reported by studied patients, mainly weakness of limbs, imbalance and pain, were significant factors contributing to irregular (once a day or less) brushing of the teeth.

Additional aids can help in maintaining proper oral health in individuals with significant neurological deficits. Unfortunately, in the studied group a hygiene fluid was used less frequently (42.2%) than in healthy Poles (67%), as was dental floss (39.7% *vs* 57%) [26]. Electric brushes can reduce plaque by 7–57.9%, gingival inflammation by 17–19.8%, and bleeding of gingiva by 85.2%, and they are more effective compared to manual brushes [28]. In our study, almost 80% of patients with MS used manual toothbrushes (in this group was more gingival bleeding), which is 13% more than in the general Polish population. Neurologists should educate patients about proper oral hygiene, because immunosuppressive therapy or corticosteroids may additionally raise the risk of oral infections in patients with MS [29].

Active participation of individuals in dental health self-control was significantly limited in our patients with MS. Only 24.6% of patients reported that they had visited the dentist within the last six months, compared to 56% of adult healthy Poles [26]. Patients with SPMS visited dentists significantly less frequently than patients with RRMS, therefore functional disability could be one of the reasons for worse oral health self-care. However, we suspect that not only neurological deficits were responsible, because in the comparable group in the UK, 81% of MS patients and 71% of non-MS subjects claimed to visit the dentist at least once a year [27], which was reported only by 34.2% patients from the studied group. This means that dental care in Poland is less available, probably because of architectonical barriers, insufficient awareness of healthy behaviours or anxiety regarding the dentist. This finding was surprising, because patients with MS in our study were younger than the overall population with MS and so would be expected to be more proactive in such behaviours.

The advantage of the presented study is the quite large studied group and clinical data verification with clinical neurological documentation. However, limitations to the study are one-time observation and the collection of data only by questionnaire and without a dentist's visual evaluation. Enrolled patients were younger than the general population, younger than the general population of patients with MS, and with a shorter disease duration. We see this study as a preliminary report. Research will be continued, especially in older MS patients, and also in those with primary progressive MS.

Conclusions and clinical implications

Patients with MS may complain about similar conditions causing oral discomfort as healthy individuals, such as dry mouth and bleeding from gums, but these symptoms are more frequent and more pronounced in patients with longer lasting and more advanced types of the disease. Daily oral hygiene, as well as regular oral health self-control, is substantially limited in patients with MS, mainly due to motor deficits, balance problems and pain, and this becomes worse with disease duration. To minimise the burden of the disease, patients with MS require better education and improved awareness about proper oral health control, such as the use of electric toothbrushes. In addition, patients with chronic and progressive disability from multiple sclerosis may benefit from better organised access to dental care.

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Conflict *of interest*

KKB, EK, KP received travel support and/or compensation for lectures and/or participation in advisory boards from Biogen, Genzyme, Merck Serono, Novartis, Roche, and Teva, which have been exclusively used for the support of research activities. BLR received travel support and/or compensation for lectures and/or participation in advisory boards from Teva, which have been exclusively used for the support of research activities. MA is an employee of Novartis. The other authors declared no conflict of interest.

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