ACTA ODONTOLOGICA SCANDINAVICA, 2017
VOL. 75, NO. 6, 429–436
https://doi.org/10.1080/00016357.2017.1331373

Taylor & Francis
Taylor & Francis Group

ORIGINAL ARTICLE

Knowledge and competence in temporomandibular disorders among Swedish general dental practitioners and dental hygienists

Maja Gnauck[a], Tomas Magnusson[b] and EwaCarin Ekberg[c]

[a]Department of Stomatognathic Physiology, Specialist Dental Care Center, Public Dental Service, Växjö, Sweden; [b]School of Health and Welfare, Jönköping University, Jönköping, Sweden; [c]Department of Orofacial Pain and Jaw Function, Faculty of Odontology, Malmö University, Malmö, Sweden

ABSTRACT

Objective: The aim of this study was to investigate knowledge and competence in temporomandibular disorders (TMD) among dentists and dental hygienists working in the public dental service (PDS) in Sweden.

Materials and methods: The study population comprised all general dentists ($n = 110$) and dental hygienists ($n = 80$) working in the PDS in two Swedish counties: Kronoberg (K) and Blekinge (B). The participants filled out a questionnaire comprised of 15 questions.

Results: The results of these questions are presented. The overall response rate for the general dentists was 87%, while the rate for the dental hygienists was 71%. Statistically significant differences between the general dentists in the two counties were found regarding the following: education in the field of TMD over the last 5 years (K: 37%, B: 73%), evaluation of occlusion when examining patients with suspected TMD ('always': K: 61%, B: 82%), and a desire for consultation of the OFP (orofacial pain)/TMD specialist by telephone (K: 71%, B: 44%). Regarding the dental hygienists, there was a statistically significant difference concerning the use of the treatment modality 'reassurance' (K: 41%, B: 7%).

Conclusions: The majority of the dental care providers in both counties – irrespective of professional category – had a positive attitude towards patients with TMD. Knowledge and competence in the field are sparse and require postgraduate education. There is a great need of an OFP/TMD specialist for more complicated patients and a need to implement updated knowledge and competence in the PDS in these two counties.

ARTICLE HISTORY
Received 17 October 2016
Revised 27 March 2017
Accepted 11 May 2017

KEYWORDS
Orofacial pain; temporomandibular joint disorder; specialist; competencies; knowledge

Introduction

Temporomandibular disorders (TMD) is an umbrella term for musculoskeletal pain conditions related to the joints and muscles in the masticatory system and its supporting tissues, including pain and dysfunction. Because TDM is estimated to be prevalent amongst 5–12% of the population, including both children and adults, it is therefore a significant public health problem [1,2].

The need for TMD treatment varies greatly (from 1.5% to 30%) in different studies [3–5]. According to statistics from Sweden's statutory health insurance organization, only 0.5–1.5% of the adult population receive treatment for TMD [6]. Consequently, only a minority of the patients in need of TMD treatment are identified and treated.

General dentists are of utmost importance for the identification and treatment of subjects with orofacial pain/TMD (OFP/TMD). It has been shown that trained dentists can manage OFP/TMD satisfactorily and that only a minority of TMD patients are in need of a specialist in OFP/TMD [7]. Thus, it is of great importance that the general dentists follow the development and implementation of new knowledge in this field. Dentists' knowledge, attitudes and beliefs regarding TMD have been the aim of investigations for some decades [8,9] until recently [10,11], and they have been conducted in many different countries with different organizations within the health care system and specialist system [12] (USA), [13] (Sweden), [14] (Iran), [15] (Korea), [10] (Brazil), [16,17] (Germany).

In Sweden, it has become more common that dental hygienists also examine patients when they come for their dental check-ups. However, to the best of our knowledge, no studies regarding dental hygienists' knowledge of and competences towards TMD have been performed.

In addition to progressive knowledge in the field of OFP/TMD, there has been a paradigm shift regarding epidemiology, diagnosing and treatment during the past decades [18,19]. For a long time, occlusion was considered to be the primary – or even the only – cause of OFP/TMD. The etiological approach to OFP/TMD today is a multifactorial one. That means that local factors such as trauma against the temporomandibular joint, and general health problems such as arthropathies or connective tissue diseases, and psychological factors act together. Hence, it is of great importance to transfer new knowledge from scientists and specialists to dental care providers working in general dental practice.

CONTACT Maja Gnauck maja.gnauck@kronoberg.se Department of Stomatognathic Physiology, Specialist Dental Care Center, Klostergatan 16B, SE-352 31 Växjö, Sweden

The aim of this study was to investigate knowledge and competence in OFP/TMD among dentists and dental hygienists working in the public dental service (PDS) in two Swedish counties with the purpose to identify the need for education and specialist help. These two counties were selected for convenience reasons since one of the authors works in the counties. Our hypotheses were as follows:

1. There is a lack of knowledge and competency in the field of TMD because there has been no OFP/TMD-specialist in these counties during the past years.
2. There is only a limited need for a specialist in OFP/TMD.

Material and methods

Material

All general dentists and dental hygienists working in the PDS in two counties out of 20 in Sweden, Kronoberg and Blekinge, were invited to participate in the study. These two counties are representative for PDS in Sweden. At the time of the study, 53 general dentists and 41 dental hygienists were employed at the PDS in the County of Kronoberg. The corresponding figures for Blekinge were 57 and 39, respectively. On 31 December 2013, the County of Kronoberg had 187.156 inhabitants, while the county of Blekinge had 152.757 [20].

Method

A questionnaire was developed to evaluate dentists' and dental hygienists' attitudes towards TMD, their knowledge of TMD, and their need of an OFP/TMD-specialist. The questionnaire comprised 15 questions developed in cooperation with a scientist at the Department of Research and Development, Region Kronoberg, and with the aid of earlier published studies investigating general dentists' knowledge and beliefs. Five general dentists working at the PDS completed a pilot version of the questionnaire to determine the acceptance and comprehensibility of the questions. After a few minor corrections, the questionnaire was sent to all general dentists and dental hygienists working in PDS in the two counties in October 2013 together with a cover letter highlighting the aim and procedure of the study. A reminder letter was sent 2 weeks later. The questionnaire included demographic factors such as profession (0 = dentist, 1 = hygienist), County (K = Kronoberg, B = Blekinge), years in profession, and age (0 = <30 years, 1 = 30–45 years, 2 = 46–65 years). The participants indicated their last education in the field of TMD (0 = last year, 1 = during the last 1–5 years, 2 = during the last 6–10 years, 3 = more than 10 years ago, 4 = never got any education). A description of 11 other questions is presented in Table 1.

Statistics

Demographic variables are presented in mean ± standard deviation (SD). To test differences between groups, the chi-square test was used. A p value less than .05 was regarded as statistically significant. The analyses were performed using the software SPSS version 20 (SPSS Inc., Chicago, IL).

Results

As there are distinct differences regarding education and role when taking care of patients between dentists and dental hygienists, not all questions were relevant for the dental hygienists.

Table 1. Description of 11 questions and possible answers included in the questionnaire to dentists and dental hygienists in the general dental care.

Questions	Answers
Taking care of patients with TMD is:	0 = interesting, 1 = requires a lot of time, 2 = requires a lot of spiritedness
At the annual visit: I take a short history … I perform a short examination … TMD treatment is evaluated …	0 = always, 1 = often, 2 = sometimes, 3 = never
I use	0 = specific questions when taking history, 1 = a specific TMD examination form, 2 = I use the recommendations made by the national guidelines regarding TMD treatments
During a TMD examination I perform:	0 = measurement of opening capacity, 1 = register joint sounds, 2 = palpation of the TMJs, 3 = palpation of the masticatory muscles, 4 = palpation of selected neck muscles, 5 = assess the occlusion, 6 = register oral parafunctions
I mainly use the following TMD treatments:	0 = information and reassurance, 1 = stabilization appliance, 2 = resilient appliance, 3 = jaw exercises, 4 = pharmacological treatment, 5 = occlusal adjustment, 6 = intramuscular injections, 7 = referral to a physiotherapist
When taking care of TMD patients, I routinely:	0 = take history, 1 = do an examination, 2 = diagnosing, 3 = therapy decision, 4 = occlusal splint therapy, 5 = jaw exercises, 6 = pharmacological treatment, 7 = occlusal adjustment, 8 = prognoses, 9 = evaluation of the treatment
I am in need of theoretical TMD treatment in:	0 = functional anatomy, 1 = etiology, 2 = take history, 3 = do an examination, 4 = diagnosing, 5 = therapy decision, 6 = occlusal splint, 7 = exercises, 8 = occlusal adjustment, 9 = pharmacological treatment, 10 = prognoses, 11 = evaluation of the treatment
I am in need of practical TMD treatment in:	0 = examination technic, 1 = treatment with splint therapy, 2 = treatment with exercises, 3 = treatment with occlusal adjustment
I am in need of an OFP/TMD specialist	0 = as telephone consulting, 1 = for visit at my clinic, 2 = for auscultation, 3 = for referral when treatment planning, 4 = for referral when I failed in TMD treatment outcome, 5 = for referral in patients with difficulties in diagnosing the pain, 6 = for examination and treatment of all kinds of TMD problems

Table 2. Comparison of answers in per cent between dentists and dental hygienists (within professional category) in Kronoberg and Blekinge working in PDS.

	General dentists			Dental hygienists		
Total number of employees	Kronoberg 53	Blekinge 57	*p* Value	Kronoberg 41	Blekinge 39	*p* Value
Last education	*n* = 52	*n* = 44		*n* = 34	*n* = 17	
During the last year	2 (4)	13 (30)	.001	2 (6)	0	.508
During the last 1–5 years	17 (33)	19 (43)		6 (18)	4 (24)	
During the last 6–10 years	11 (21)	5 (11)		4 (12)	1 (6)	
More than 10 years ago	19 (37)	6 (14)		7 (21)	3 (18)	
No education	3 (6)	1 (2)		15 (44)	9 (53)	
Theory	*n* = 52	*n* = 43		*n* = 34	*n* = 16	
Functional anatomy	15 (29)	7 (16)	.148	24 (71)	9 (56)	.318
Aetiology	28 (54)	17 (40)	.164	26 (77)	13 (81)	.704
Case history	24 (46)	13 (30)	.113	22 (65)	10 (62)	.880
Clinical examination	22 (42)	13 (30)	.225	29 (85)	14 (88)	.834
Diagnostics	34 (65)	26 (61)	.621	19 (56)	9 (56)	.981
Therapy decision	36 (69)	28 (65)	.670	23 (68)	10 (63)	.720
Occlusal appliance therapy	14 (27)	11 (26)	.882	15 (44)	6 (38)	.658
Jaw exercises	26 (50)	14 (33)	.087	26 (77)	14 (88)	.363
Occlusal adjustment	30 (58)	17 (40)	.078	12 (35)	2 (13)	.094
Pharmacological therapy	34 (65)	27 (63)	.793	11 (32)	2 (13)	.135
Prognostic estimation	33 (64)	31 (72)	.372	14 (41)	9 (56)	.318
Evaluation of treatment results	28 (54)	23 (54)	.972	17 (50)	11 (69)	.213
Practice	*n* = 47	*n* = 34		*n* = 33	*n* = 16	
Examination technique	27 (57)	18 (53)	.687	32 (97)	15 (94)	.593
Occlusal appliance therapy	13 (28)	10 (29)	.863	11 (33)	6 (38)	.774
Jaw exercises	23 (49)	12 (35)	.221	25 (76)	13 (81)	.666
Occlusal adjustment	33 (70)	20 (59)	.287	7 (21)	4 (25)	.766

'I need further education in the following subject/s …'. More than one answer is possible. Percentages within brackets.

The overall response rate for dental hygienists was lower compared to that of dentists, especially for the group of dental hygienists working in Blekinge (Table 2). Table 2 also presents the dentists' and dental hygienists' answers regarding their last education in the field of TMD and their wishes regarding further education – both theoretically and practically.

Dentists

The overall response rate was 87% (K: 98%, B: 77%). There were no statistically significant differences between the counties regarding the professional experience after graduation from dental school [K: mean 14.7 ± 12.5 (SD) years vs. B: mean 14.2 ± 12.7 (SD) years], neither was there any difference in age distribution.

The majority of the dentists expressed that taking care of patients with TMD is both interesting and satisfying (K: 78%, B: 79%) but that it requires a lot of time (K: 55%, B: 60%) and effort (K: 37%, B: 31%).

During a routine dental examination, 63% of the dentists in Kronoberg stated that they always or often conducted a TMD-examination, compared to 59% of the dentists in Blekinge. Regarding always or often performing an abbreviated TMD-examination in their daily routine, 41% of the dentists in Kronoberg answered positively, compared to 29% in Blekinge. No statistically significant differences were found regarding history taking and examination. In total, 65% of the dentists in Kronoberg declared that they used standardized questions when taking case history. The corresponding figure in Blekinge was 43% ($p = .031$). Less than 15% (K: 14%, B: 13%) of the dentists used a standardized schedule for the registration of examination findings. There were no regional differences between how often the dentists examined different clinical variables in patients with suspected TMD, except for the evaluation of occlusion ('always': K: 61%, B: 82%, $p = .038$) (Table 3).

The national guidelines for TMD-treatment were applied by 61% of the K-dentists and 63% of the B-dentists. The distribution of the most common TMD-treatment modalities used by the dentists is described in Table 4. The results regarding self-evaluation of clinical competence and skills concerning good routines and confidence in the performance of different forms of treatment are shown in Table 5. More than 80% of the dentists in both counties evaluated the TMD-treatment outcome on a regular basis.

Almost all dentists (K: 98%, B: 100%) expressed a need for an OFP/TMD-specialist. The most frequent reason was to refer patients (K: 100%, B: 95%), primarily patients with unclear pain conditions (K: 94%, B: 100%) and patients not responding to treatment (88% in both groups). About 50% of the dentists requested education in TMD as well as the possibility to auscultate at a specialist clinic in OFP/TMD. Statistical significantly ($p = .01$), more dentists in Kronoberg (71%) were interested in consultation by telephone compared to their colleagues in Blekinge (44%).

Dental hygienists

The overall response rate was 71% (K: 83%, B: 59%). There were no statistically significant differences between the groups regarding their professional experience after graduation [mean 10.7 ± 10.1 (SD) years vs. mean 14.0 ± 9.8 (SD) years] or age distribution.

Table 3. Frequency of general dental practitioners (dentists) and dental hygienists performing different steps of a clinical examination when suspecting a TMD patient in the PDS, according to the counties Kronoberg and Blekinge.

	Kronoberg $n = 45–52$				Blekinge $n = 40–44$				
Clinical variables	Always	Often	Sometimes	Never	Always	Often	Sometimes	Never	*p*- Value
Dentists									
Registration of mouth opening capacity	18 (37)	17 (35)	10 (20)	4 (8)	19 (44)	8 (19)	15 (35)	1 (2)	.127
Registration of TMJ sound	36 (70)	9 (18)	6 (12)	0	33 (75)	7 (16)	4 (9)	0	.875
Palpation of the TMJ	45 (86)	3 (6)	4 (8)	0	35 (79)	6 (14)	3 (7)	0	.419
Palpation of jaw muscles	40 (80)	4 (8)	6 (12)	0	29 (67)	9 (21)	4 (9)	1 (2)	.206
Palpation of selected neck muscles	10 (22)	7 (16)	16 (36)	12 (27)	5 (13)	8 (20)	15 (38)	12 (30)	.688
Evaluation of occlusion	30 (61)	12 (25)	6 (12)	1 (2)	36 (82)	2 (5)	6 (14)	0	.038
Registration of oral parafunction	28 (57)	8 (16)	11 (22)	2 (4)	25 (60)	9 (21)	6 (14)	0	.761
	$n = 26–30$				$n = 12–15$				
Dental hygienists									
Registration of mouth opening capacity	4 (15)	3 (11)	9 (33)	11 (41)	2 (14)	3 (21)	4 (29)	5 (36)	.850
Registration of TMJ sound	9 (30)	12 (40)	6 (20)	3 (10)	5 (33)	5 (33)	5 (33)	0	.497
Palpation of the TMJ	9 (32)	6 (21)	8 (29)	5 (18)	4 (27)	4 (27)	6 (40)	1 (7)	.687
Palpation of jaw muscles	5 (18)	10 (36)	8 (29)	5 (18)	2 (14)	5 (36)	6 (43)	1 (7)	.707
Registration of oral parafunction	2 (7)	6 (2)	11 (41)	8 (30)	3 (21)	6 (43)	4 (29)	1 (7)	.150

Percentages within brackets.

Table 4. Distribution of the most common TMD-treatment modalities used by general dental practitioners (dentists) and dental hygienists working in PDS, according to the counties Kronoberg and Blekinge.

Treatment modalities	Kronoberg $n = 52$	Blekinge $n = 44$	*p* Value
Dentists			
Information/reassurance	39 (75)	39 (89)	.088
Hard appliance	49 (94)	42 (96)	.788
Soft appliance	16 (31)	7 (16)	.089
Jaw exercise	43 (83)	39 (89)	.411
Pharmacological treatment	23 (44)	14 (32)	.213
Occlusal adjustment	9 (17)	15 (34)	.058
Referral to a physiotherapist	9 (17)	3 (7)	.122
	$n = 32$	$n = 13$	
Dental hygienists			
Information/reassurance	13 (41)	1 (7)	.031
Hard appliance	10 (31)	2 (15)	.275
Soft appliance	9 (28)	3 (23)	.729
Jaw exercise	20 (63)	8 (62)	.952

Percentages within brackets.

The majority of the dental hygienists found taking care of patients with TMD to be both interesting and satisfying (K: 82% vs. B: 65%), but that it required a lot of time (K:52%, B:47%) and effort (12% in both groups).

During routine dental examinations, 35% of the dental hygienists in Kronoberg took case history always or often. The corresponding figure for dental hygienists in Blekinge was 57%. On the question how often a short TMD-examination was included in routine dental examinations, the dental hygienists answered as follows: always/often K: 39%, B: 45%; and sometimes/never K: 52%, B: 56%. No statistically significant differences were found regarding history taking and examination. Moreover, 50% of the dental hygienists in Kronoberg declared that they used standardized questions when taking the case history compared to 63% of their counterparts in Blekinge. Neither the dental hygienists in Kronoberg nor those in Blekinge used a standardized schedule for the registration of the examination findings; the most common registration made was those of TMJ sounds. The national guidelines for TMD-treatment were applied by less than 50% of the dental hygienists (K: 45%, B: 38%). There were no regional differences regarding how the dental hygienists examined patients for TMD (Table 3).

Table 4 shows the distribution of the most common TMD-treatment modalities used by dental hygienists in the two counties. There was a statistically significant difference regarding reassurance (K: 41%, B: 7%, $p = .031$).

The results of self-evaluation of clinical experience and skill concerning good routines and confidence in performance of case history, clinical examination and two different forms of treatments are shown in Table 5. The dental hygienists reported that they mostly needed an OFP/TMD specialist for education and auscultation (K: 61%, B: 82%).

Discussion

The majority of the dentists and dental hygienists had a positive attitude towards patients suffering from TMD, which confirms the results by Lindfors et al. [11], but is in contrast to the findings by Baharvand et al. [14]. More than half of the dentists in the present study reported that it takes time and energy to take care of TMD-patients. This can be explained by a lack of updated knowledge, resulting in uncertainty in identifying and taking care of patients with TMD. Interestingly, only a minority of the dental hygienists found taking care of TMD-patients to be energy consuming. In Sweden, a dental hygienist has a license to practice dental medicine. Concerning caretaking of patients with OFP/TMD he/she may examine the patient on a basic level, provide information about the condition/reassurance, introduce and follow-up jaw exercises, and adjust hard and soft appliances, all in cooperation with a responsible dentist [21–23]. In the Swedish PDS, it is common for many patients to meet dental hygienists for their regular dental check-up. However, it is alarming that between 43% and 66% of dental hygienists only sometimes or never asks patients questions regarding pain and dysfunction of the jaw and face. The general

Table 5. Self-evaluation of clinical competence and skills concerning good routine and confidence in the performance of different forms of treatment. Comparison between general dental practitioners (dentists) and dental hygienists in the counties of Kronoberg and Blekinge.

	Kronoberg $n = 47–51$			Blekinge $n = 41–43$			
Routine	Good	Limited	Lack of	good	Limited	Lack of	*p* Value
Dentists							
Taking history	33 (66)	15 (30)	2 (4)	28 (67)	12 (29)	2 (5)	.176
Clinical examination	33 (66)	17 (34)	0	28 (65)	14 (33)	1 (2)	.554
Diagnostics	17 (33)	28 (55)	4 (8)	16 (37)	25 (58)	1 (2)	.654
Therapy decision	25 (49)	23 (45)	3 (6)	17 (40)	25 (58)	0	.175
Occlusal splint therapy	43 (84)	8 (16)	0	35 (81)	8 (19)	0	.708
Jaw exercises	26 (52)	20 (40)	4 (8)	26 (62)	14 (33)	1 (2)	.364
Pharmacological therapy	11 (22)	22 (45)	14 (29)	10 (24)	18 (44)	13 (32)	.618
Occlusal adjustment	7 (15)	18 (38)	18 (38)	9 (21)	17 (41)	16 (38)	.248
Prognosis	7 (14)	29 (59)	9 (18)	6 (14)	21 (50)	13 (31)	.527
Evaluation of treatment results	17 (35)	24 (49)	4 (8)	11 (27)	22 (54)	6 (14)	.628
	$n = 28–32$			$n = 10–11$			
Dental hygienists							
Taking history	10 (31)	10 (31)	8 (25)	5 (46)	4 (36)	2 (18)	.556
Clinical examination	7 (22)	14 (44)	7 (22)	3 (27)	7 (64)	1 (9)	.414
Occlusal splint therapy	5 (17)	10 (33)	10 (33)	0	2 (18)	8 (73)	.131
Jaw exercises	5 (16)	15 (48)	7 (23)	3 (27)	5 (46)	3 (27)	.564
Evaluation of treatment outcome	3 (10)	6 (21)	15 (52)	1 (9)	3 (27)	5 (46)	.972

Percentages within brackets.

dentists' responses reflect the same picture on the whole, despite a broader education. It is, therefore, obvious that there is a high risk of missing individuals with TMD in need of treatment. At the same time, these findings may offer an explanation to the low number of patients receiving indicated treatment according to the statutory health insurance [6]. Using a health declaration and a standardized questionnaire could help patients, dentists and dental hygienists [24].

A lack of knowledge in the field of TMD was identified, probably partially explained by the fact that there has been no OFP/TMD-specialist in the two counties during the past years. On the other hand, the dentists and dental hygienists seemed to be aware of this and did ask for a specialist resource.

Even if we did not use expert statements as a 'gold standard' for how to identify, examine, diagnose and treat OFP/TMD, as well as how to evaluate treatment outcomes, all authors are OFP/TMD-specialists and evaluated and interpreted the participants answers based on how it should be in terms of scientific evidence and clinical experience.

Lack of knowledge of TMD has even been shown in Germany [16] and in Iran [14] and the need of intensifying both undergraduate dental curricula and postgraduate training has been emphasized by these authors.

Examination

Both professional groups registered the maximal mouth opening capacity quite infrequently compared to registration of TMJ sound and palpation of the TMJ. This is unfortunate, as it has been stressed in several studies [24,25], as well as in textbooks [26], that the maximal mouth opening capacity is the most valid and reproducible clinical variable concerning jaw function [27]. Tegelberg et al. [24] also emphasized that measures of jaw mobility should be included in both dentists' and dental hygienists' routine examinations.

The dentists evaluated the occlusion more often than the maximal mouth opening capacity. This can be interpreted in different ways. One explanation might be that the paradigm shift which took place in the field of TMD over the last decades [18,19] – from an occlusion focused to a multifactorial approach – has not yet reached many general dental care providers. On the other hand, this may reflect an uncertainty on the changed focus regarding occlusion and may be seen as a desire for an updating of education in OFP/TMD.

Diagnostics and treatment

Several international studies have reported a considerable discrepancy between practicing dentists and OFP/TMD specialists on the pathophysiology of TMD and how to best diagnose and treat TMD [9,12,15]. In addition, the dentists participating in our investigation declared an uncertainty regarding diagnostics, choice of adequate treatment modality, pharmacological treatment, occlusal adjustment, prognosis and evaluation of treatment outcome.

Hard interocclusal appliance, jaw exercises and information/reassurance were the most frequent treatments used by the general dentists in this study. This shows a change towards reversible treatments as a first choice when treating TMD, and it confirms our findings in an earlier study [25]. In the 1990s, interocclusal appliances and occlusal adjustment were the most frequent treatment procedures in general practice [8,28]. However, still in 2010 Ommerborn et al. [16] highlighted that a considerable number of German general dental practitioners used irreversible techniques, and Aldrigue et al. [10] reported that 18.1% of the dentists in a city in Southern Brazil used occlusal adjustment when treating patients with TMD.

In the two counties, hard occlusal appliances are used considerably more frequently compared to soft ones which is in line with findings in other international studies [10,16].

The difference found in the two Swedish counties may be due to regional traditions. However, the common use of soft appliances could probably be explained by the fact that these are less expensive than hard appliances. This explanation is in line with Lindfors et al. [11], who reported that children and adolescences receiving free dental care in Sweden were treated more often with a soft appliance.

Need of OFP/TMD-specialist

Since 1993, there has been an OFP/TMD specialist qualification in Sweden [29]. The specialist plays an important role by guiding the general dentist to treat patients with severe and complex conditions, by participating in the development of the specialty, and by following the scientific development in the field of TMD. Moreover, the specialist transfers new knowledge to the general dentist and other dental care providers.

A specialist in OFP/TMD was greatly demanded by the participants in the present study. Referring patients was the most frequently given reason for a specialist. This might indicate that dentists are able to identify patients with a TMD-problem, but at the same time they experience an uncertainty regarding giving correct treatment. The complexity of OFP/TMD and the perception/belief that OFP/TMD-treatment is not profitable could also explain the high demand for an OFP/TMD-specialist [11].

The need for OFP/TMD-specialist has been shown earlier [8,11,24]. Tegelberg et al. [24] pointed out that the consulting activity should be a larger part of the specialist's work, and this need is confirmed in our study.

Most of the dental care providers in the present study were educated several years ago. On the other hand, more general dentists working in Blekinge got education in the field during the last 5 years which may explain the differences found. Our results suggest that there is a great need for education in the field of OFP/TMD regarding almost all aspects: both theoretical and practical. A recently published Swedish study [5] showed that the estimated treatment need of TMD differed considerable between four general dentists involved in that study, despite the fact that they were both experienced and calibrated. Taking together the two factors – lack of knowledge of OFP/TMD and inter-individual variability between the examiners/care takers – the authors' assessment is that there is a great risk of missing both identification and appropriate treatment of individuals with TMD-pain and dysfunction. Continuing postgraduate education in the field of OFP/TMD has been found to be of importance for increasing identification and improving care of OFP/TMD-patients [11].

Strengths and limitations

An advantage of collecting information with the help of a questionnaire is that this method is easy to manage and it gives a relatively good and broad overview of the participants' own assessment of the area being investigated. Furthermore, this questionnaire was tested for comprehensibility. A shortcoming is that we have not analysed the reliability and validity of the questions, which is a known problem [11,24].

Studies using questionnaires have contained statements on TMD aetiology, diagnostics, classification, treatment and prognosis [9,13,15], where 'OFP/TMD specialists' and sometimes psychologists provided their own responses and served as a 'norm' or 'golden standard' [9,12,13]. We did not choose this approach because our hypothesis was that there is a lack of knowledge within the whole field of OFP/TMD with regards to the absence of an OFP/TMD-specialist in the two counties. Consequently, our main concern was to map the dentists' and dental hygienists' own evaluation regarding OFP/TMD. The questionnaire included mainly yes/no questions or questions answered on a three-point-scale, which is considered to be a well-established method [8,24]. The authors of this study admit that qualitative research methods, such as interviews, could have been more appropriate as they would have given more informed information about the dental personnel's attitudes towards OFP/TMD than the questionnaire used.

Another shortcoming was that we did not use two different questionnaires – one for the dentists and one for the dental hygienists. This might have led to an increased response rate regarding the dental hygienists. For the general dentists, the participation rate (87%) was higher than that of the dental hygienists (around 70%). However, this result may be ranked as good with regard to a comprehensive review, which analysed the response rate of general practicing physicians to postal questionnaires in 361 surveys and which found a mean response rate of 61% [30], and to decreasing respond rates on questionnaires in general. Studies investigating similar questions presented response rates between 49% and 86% [17,11,31]. It has been shown that response rates can be enhanced by the use of prio incentives and planned follow-up [32]. That the participation rate in our study differed between the general dentists and the dental hygienist might show the different professional categories' attitudes of their roles regarding identification and caretaking of patients with TMD. It was also obvious that the response rate was higher in the county of Kronoberg compared to the county of Blekinge, which probably is due to the fact that one of the authors was lately employed in the former county. Another contributing factor to the high response rate was most likely the follow-up by a postal reminder. Since it was not possible to make an analysis of the drop-outs, this lack of information may have influenced the results and must be regarded as a limitation of the study.

Some factors that may influence the results were not included in the questionnaire, such as gender, university of undergraduate dental education, clinic size (number of dentists and/or dental hygienists) and localization (town, countryside or coastal area) of the actual clinic, as well as if the responder was mainly taking care of children/adolescents or adults. Regarding the reliability of the dentists answers, one may consider a study published in 2015 [33] showing that Swedish dentists ability to assess their level of knowledge in

the field of TMD is better compared to dentists in Saudi Arabia.

The study was performed in two small counties in Sweden, similar to each other in many respects. Sweden has a unique system and organization of specialist dentists/dental care. Consequently, it can be assumed that there might be some differences between Swedish general dentists and dental hygienists working in countries where no such specialist system is established. The results of this investigation may contribute to improving the undergraduate education in the field of TMD as well as to create postgraduate customized education for dentists and dental hygienists.

The next step is to perform theoretical education and practical training in TMD for dental care providers in one of the two counties and to evaluate the effect of this postgraduate education in comparison to the other county without a structured education as a control group.

Conclusions

The majority of the dental care providers in both counties had a positive attitude – irrespective of professional category – to patients with TMD. However, knowledge and competence in the field are sparse and require further postgraduate education. There is a great need of an OFP/TMD specialist in these two counties for more complicated patients, and to implement updated knowledge and competence in the PDS.

Acknowledgements

The authors extend their thanks to all the dentists and dental hygienists who, without any economic or other benefits, participated in this study, and to Annika Kahlmeter, Head/Director of the Public Dental Service Kronoberg, for supporting this study. Furthermore, thanks go to Helene Ekström, formerly employed at the Department of Research and Development, Region Kronoberg, for help regarding the development of the questionnaire and Per-Erik Isberg, Department of Statistics, Malmö University, for advice on statistic methods and co-evaluation of statistical analyses. The study was approved by the Research Ethics Advisory Committee Kronoberg County Council, Sweden (Ref. No. 13/2013).

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This study was supported by grants from the Department of Research and Development, Region Kronoberg, Sweden [grant no. 15RK535-7].

References

[1] Adern B, Stenvinkel C, Sahlqvist L, et al. Prevalence of temporomandibular dysfunction and pain in adult general practice patients. Acta Odontol Scand. 2014;72:585–590.

[2] National Institute of Dental and Craniofacial Research [Internet]. Prevalence of TMJD and its signs and symptoms [updated: 2014 Mar 07; cited 2016 Oct 07]. Available from: http://www.nidcr.nih.gov/datastatistics/finddatabytopic/facialpain/

[3] Carlsson GE. Epidemiology and treatment need for temporomandibular disorders. J Orofac Pain. 1999;13:232–237.

[4] Al-Jundi MA, John MT, Setz JM, et al. Meta-analysis of treatment need for temporomandibular disorders in adult nonpatients. J Orofac Pain. 2008;22:97–107.

[5] Yekkalam N, Wanman A. Factors associated with clinical decision-making in relation to treatment need for temporomandibular disorders. Acta Odontol Scand. 2016;74:134–141.

[6] The Swedish Council on Technology Assessment in Health Care. Methoder för behandling av långvarig smärta. En systematisk litteraturöversikt [Methods for the treatment of chronic pain. A systematic review of the literature]. Stockholm: Statens beredning för medicinsk utvärdering (SBU); 2006.

[7] Wassell RW, Adams N, Kelly PJ. The treatment of temporomandibular disorders with stabilizing splints in general dental practice: one-year follow-up. J Am Dent Assoc. 2006;137:1089–1098. quiz 168–169.

[8] Tegelberg A. Case of patients with occlusal disharmony in a Swedish district. Attitudes and needs. Tandlakartidningen. 1990;82:1044–1050.

[9] Le Resche L, Truelove EL, Dworkin SF. Temporomandibular disorders: a survey of dentists' knowledge and beliefs. J Am Dent Assoc. 1993;124:90–94, 97–106.

[10] Aldrigue RHS, Sánchez-Ayala A, Urban VM, et al. A survey of the management of patients with temporomandibular disorders by general dental practitioners in southern Brazil. J Prosthodont. 2016;25:33–38.

[11] Lindfors E, Tegelberg A, Magnusson T, et al. Treatment of temporomandibular disorders – knowledge, attitudes and clinical experience among general practising dentists in Sweden. Acta Odontol Scand. 2016;74:460–465.

[12] Glaros AG, Glass EG, McLaughlin L. Knowledge and beliefs of dentists regarding temporomandibular disorders and chronic pain. J Orofac Pain. 1994;8:216–222.

[13] Tegelberg A, Wenneberg B, List T. General practice dentists' knowledge of temporomandibular disorders in children and adolescents. Eur J Dent Educ. 2007;11:216–221.

[14] Baharvand M, Sedaghat Monfared M, Hamian M, et al. Temporomandibular disorders: knowledge, attitude and practice among dentists in Tehran, Iran. J Dent Res Dent Clin Dent Prospects. 2010;4:90–94.

[15] Lee WY, Choi JW, Lee JW. A study of dentist's knowledge and beliefs regarding temporomandibular disorders in Korea. J Craniomandib Pract. 2000;18:142–146.

[16] Ommerborn MA, Kollmann C, Handschel J, et al. A survey on German dentists regarding the management of craniomandibular disorders. Clin Oral Investig. 2010;14:137–144.

[17] Reissmann DR, Behn A, Schierz O, et al. Impact of dentists' years since graduation on management of temporomandibular disorders. Clin Oral Investig. 2015;19:2327–2336.

[18] Steenks MH. The gap between dental education and clinical treatment in temporomandibular disorders and orofacial pain. J Oral Rehabil. 2007;34:475–477.

[19] Carlsson GE. Some dogmas related to prosthodontics, temporomandibular disorders and occlusion. Acta Odontol Scand. 2010;68:313–322.

[20] Statistiska centralbyrån [Internet]. Folkmängd i riket, län och kommuner 31 december 2013 och befolkningsförändringar 2013 [updated: 2014 Mar 13; cited 2016 Oct 07]. Available from: http://www.scb.se/sv_/Hitta-statistik/Statistik-efter-amne/Befolkning/Befolkningens-sammansattning/Befolkningsstatistik/25788/25795/Helarsstatistik—Kommun-lan-och-riket/370301/

[21] Socialstyrelsen [The National Board of Health and Welfare] [Internet]. Kompetensbeskrivning för legitimerad tandhygienist. Artikelnr. 2005-105-1, October 2004 [cited 2016 Oct 07]. Available from: http://www.tandhygienistforening.se/media/150904/kompetensbeskrivning_ for_tandhygienist.pdf

[22] Socialstyrelsen [The National Board of Health and Welfare]. Socialstyrelsens författningssamling: Delegering inom tandvården SOSFS 2002:12 (M) Föreskrifter. 2002 [cited 2016 Oct 07]. Available from: http://www.socialstyrelsen.se/Lists/Artikelkatalog/Attachments/10884/2002-10-12_2002_12.pdf

[23] Klefbom C, Wenestam C-G, Wikström M. Vad får tandhygienister göra? Tandlakartidningen. 2005;97:66–73.
[24] Tegelberg A, List T, Wahlund K, et al. Temporomandibular disorders in children and adolescents: a survey of dentists' attitudes, routine and experience. Swed Dent J. 2001;25: 119–127.
[25] Gnauck M, Helkimo M, Magnusson T. Routines for interocclusal appliance therapy among general dental practitioners in a Swedish county. Swed Dent J 2012;36:125–132.
[26] Carlsson GE, Magnusson T, Management of temporomandibular disorders in the general dental practice. Chicago (IL): Quintessence Pub. Co.; 1999.
[27] Agerberg G. On mandibular dysfunction and mobility [dissertation]. Umeå: Umeå University; 1974.
[28] Glass EG, McGlynn FD, Glaros AG. A survey of treatments for myofascial pain dysfunction. Cranio. 1991;9:165–168.
[29] Helkimo M. Specialist qualification in stomatognathic physiology/ TMD in Sweden. J Craniomandib Pract. 2002;20:147–149.
[30] Creavin ST, Creavin AL, Mallen CD. Do GPs respond to postal questionnaire surveys? A comprehensive review of primary care literature. Fam Pract. 2011;28:461–467.
[31] Al-Khotani A, Naimi-Akbar A, Bjornsson O, et al. Professional knowledge among Swedish and Saudi healthcare practitioners regarding oro-facial pain in children and adolescents. J Oral Rehabil. 2016;43:1–9.
[32] Huggins KH, LeResche L, Whitney C, et al. Survey of temporomandibular disorders: comparison of dentist respondents and non-respondents. J Dent Res (Special Issue) 1991;70:543.
[33] Al-Khotani A, Björnsson O, Naimi-Akbar A, et al. Study on self-assessment regarding knowledge of temporomandibular disorders in children/adolescents by Swedish and Saudi Arabian dentists. Acta Odontol Scand. 2015;73:522–529.