

ORIGINAL ARTICLE

General dental practitioners' knowledge and attitudes on children's pain and pain management—A questionnaire survey

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Abstract

The aim was to study general dental practitioners' knowledge and attitudes on pain and pain management in children and adolescents, using a multidimensional questionnaire. There is little information on dentists' views on pain in children. The research question was how attitudes and knowledge may correlate to the dentists' age, sex, years of professional experience, the proportion of working time devoted to treating children and adolescents, as well as being a parent. At the time of the study, 387 general dentists working for the Public Dental Service participated in a web-based, multidimensional validated questionnaire holding the categories (A) views on the care of children in pain, (B) physiology, (C) pain alleviation, (D) medication, (E) sociology/psychology, (F) Pain assessment instruments and methods, (G) non-medication methods of pain alleviation, and (H) documentation of pain management. The age categories were given as; below 25, 25-35, 36-45, 46-55 years, and older than 55 years of age. 71% of the responders were female. The dentists' age cohort, as well as the years of professional experience, tended to make a difference as to the pain interventions in children and adolescents ($P < 0.03$). The female dentists, in comparison to the male dentists, conveyed different pain treatment strategies ($P < 0.03$). The proportion of working time devoted to treating children and adolescents, as well as being a parent, did not show significant differences regarding pain strategies. Associations were observed between the age of the dentists studied, the number of years as professionals and the knowledge and attitudes that benefit children's pain treatment. Being a parent was not significant. In this studied group, female dentists displayed significantly more care regarding pain management, than did their male colleagues. Furthermore, the study highlighted the need for a short questionnaire, user-friendly yet with retained multidimensionality.

KEYWORDS

attitude, child, dentists, knowledge, pain

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1 | INTRODUCTION

Children and adolescents in Sweden, up until the age of 20, are offered free dental visits to maintain good oral health. This gives the general dental practitioner (GDP) the responsibility to stay updated on corresponding knowledge and cultivate ethical attitudes on children's pain and pain management. Up until now, only a few studies, using different approaches, have attempted to explore the field of GDPs' knowledge and attitudes on children's pain.¹⁻⁴ The available studies have reported on considerable differences within the dentists' group regarding knowledge and attitudes to prevent and manage children's pain. Murtomaa et al¹ reported that nearly 50% GDPs failed to routinely ask children about pain. A negative relationship was furthermore observed between children's perceptions and the pain management they received, as only dentists who rated the performed treatment as unpleasant were likely to ask the children about pain.¹ In 2005, Rasmussen et al² explored GDPs' knowledge, attitudes and management of procedural dental pain in children and found that one-fourth of the dentists doubted that children could report pain with any degree of certainty. Furthermore, most of the dentists considered 'Complete painlessness a Utopia'.² Another similarly performed study found 54% of the dentists to believe that preschool children had some or great difficulty in differentiating between pain and discomfort during dental treatment and that children have problems reporting pain with some degree of certainty.³ Approximately one-third of the GDPs were to some extent indifferent to young patients' experience of pain and psychological management.³ These dentists also estimated their own need for additional education about pain control in children to be low.³ In a report from 2018, GDPs were shown to underuse local anesthetics during dental invasive procedures in children and adolescents.⁴ Additionally, other GDPs have reported to believe that primary teeth could be restored without complete pain relief, using only nitrous oxide-oxygen sedation.⁵⁻⁷ In Denmark in 2015, GDPs reported perceived stress and uncertainty while treating children below school age.⁸ As many as 60% of these dentists never, rarely, or sometimes used local anesthesia in this age group.⁸ An inference from the above surveys may conclude that GDPs' knowledge and attitudes on children's pain need to be scrutinized from multidimensional perspectives.

Pediatric pain evaluation, in general, has been thoroughly studied, compared to pediatric dentistry.⁹⁻¹² In the dental literature, there is still a gap to be filled; dentists need to become aware of children's pain experiences and systematically gather information after the performed dental procedures.¹⁻⁴ A first step would be to raise awareness among GDPs through observational studies.

In the literature up until now, there are no studies offering multidimensional data on GDPs' knowledge and attitudes. Thus, the aim was to study general dental practitioners' knowledge and attitudes on pain and pain management in children and adolescents, using a multidimensional questionnaire. Another aim was to study how attitudes and knowledge may be related to dentists' sex, age, years of professional experience, the proportion of working time devoted to treating children and adolescents, as well as being a parent.

2 | METHODS

2.1 | Cross-sectional survey with a multidimensional questionnaire

The design of this study was a cross-sectional survey using a web-based questionnaire. A multidimensional questionnaire had been derived from Finnish forms used on pediatric nurses, including the categories: (A) views on the care of children in pain, (B) physiology, (C) pain alleviation, (D) medication, (E) sociology/psychology, (F) pain assessment instruments and methods, (G) non-medication methods of pain alleviation, and H) documentation of pain management.

The forms were translated back and forth from Finnish to Swedish and then back again to Finnish, to keep the true meaning of each statement. The questionnaire was then applied to Swedish pediatric nurses. The face validity and construct validity of the questionnaire were thoroughly tested by Salanterä et al¹³⁻¹⁶ and Enskär et al¹⁷, through multinational comparative studies.

2.2 | Adapting the multidimensional questionnaire to the area of dentistry

In order to adapt the multidimensional questionnaire to the area of dentistry, three specialists in pediatric dentistry with over 20 years of working experience plus a senior researcher in behavioral sciences (experienced in psychometrics), discussed and adapted each item of the questionnaire's categories: A-H. The amount of the items was reduced from 113 to 56 (Table 1). This final set of items included the explicit dental-related statements: A3, A4, A5, A8, A14, and omitted the irrelevant 57, which was translated back and forth from Swedish to English since the original articles were published

TABLE 1 Number of items in the categories A-H, in the original questionnaire version for nurses^a and the new version for dentists

Category		Nurse version	Dentist version
		No. of items	No. of items
A	Views on the care of children in pain	18	14
B	Physiology of pain	9	5
C	Pain alleviation	8	4
D	Pain medication	23	8
E	Sociology and Psychology of pain	13	6
F	Pain assessment instruments and methods	9	2
G	Non-medication methods of pain alleviation	25	10
H	Documentation of pain management	8	7

^aSalanterä,⁹ Enskär.¹³

TABLE 2 Ranking based on item mean scores for each category A-E of DKA-CPP

Category item No.		Mean	SD	Agree %	Agree to some extent %	Don't know %	Disagree to some extent %	Disagree %
A1	Children usually tolerate pain better than adults (N = 381)	4.5	0.9	0.8	6.5	6.3	16.4	70.0
A2	A calm and quiet child that says it is in pain, is probably in pain (N = 381)	4.5	0.9	71.4	19.3	3.4	3.6	2.3
A6	Children <2 years experience less pain than children >2 years undergoing similar treatment (N = 383)	4.5	1.0	1.3	1.6	19.9	3.9	73.3
A8	It is important to get the parents involved in the pain treatment of their child when a tooth is being extracted (N = 380)	4.4	1.0	63.4	23.3	4.4	5.5	3.4
A5	Pain caused by a dental check-up is unnecessary and should be, if possible, avoided (N = 382)	4.3	1.2	66.2	17.0	3.6	7.5	5.7
A9	Parents better judge their child's level of pain than the child itself (N = 380)	4.1	1.0	0.3	11.7	9.7	38.1	40.2
A7	A child that has received local anesthesia but cries and states it is in pain, is probably in pain (N = 381)	4.0	1.1	40.1	40.1	5.2	13.3	1.3
A11	A child capable of verbalizing experiences is best suited to judge its own pain (N = 381)	3.9	1.2	41.6	29.2	15.4	7.8	6.0
A4	It is acceptable to treat a permanent tooth without any pain relief (N = 380)	3.7	1.3	3.9	27.4	0.8	30.3	37.6
A10	A child always tells when it is in pain (N = 372)	3.6	1.3	6.7	23.7	6.1	32.3	31.2
A3	It is acceptable to treat a primary tooth without any pain relief (N = 382)	3.5	1.3	3.9	34.3	0.8	34.8	26.2
A14	The dentist is better suited than the parent to judge if a child is in pain (N = 381)	3.3	1.2	6.5	25.8	15.6	32.8	19.3
A13	Parents tend to exaggerate their children's pain (N = 378)	3.1	1.1	3.7	30.4	27.8	25.0	13.1
A12	Children generally tolerate pain worse than adults (N = 375)	3.1	1.4	13.5	28.9	15.3	18.0	24.3
B3	Pain signals are transmitted via the nervous system to the brain (N = 380)	4.9	0.5	89.8	8.4	0.5	0.5	0.8
B2	Acute pain signals a threat to the body (N = 381)	4.7	0.6	71.9	22.9	3.6	1.3	0.3
B4	Damaged tissue is more sensitive to pain than sound tissue (N = 381)	4.4	0.9	61.5	25.8	8.3	3.6	0.8
B1	Untreated pain prolongs the time for healing/recovering till the onset of pain relief (N = 381)	4.3	0.9	48.4	32.6	15.4	2.6	1.0

(Continues)

TABLE 2 (Continued)

Category item No.	Mean	SD	Agree %	Agree to some extent %	Don't know %	Disagree to some extent %	Disagree %
B5 Acute pain has no impact on the breathing frequency (N = 380)	3.8	1.00	1.3	7.3	30.3	30.3	30.8
C1 Treating pain in children requests other methods complementing the medicaments (N = 382)	3.9	0.9	28.1	49.0	13.8	7.8	1.3
C3 A good method to relieve pain is to make use of the child's fantasy (N = 381)	3.9	1.1	33.6	40.9	12.8	8.6	4.1
C2 A good way to achieve pain relief is to distract the child's attention from the pain experience (N = 380)	3.9	1.1	28.5	48.6	6.2	12.8	3.9
C4 Usually, the child's pain experiences diminish when the parents are present (N = 382)	3.5	1.1	16.6	43.6	17.7	17.4	4.7
D6 Paracetamol is the first choice of medicament when treating pain in children (N = 381)	4.7	0.7	76.0	15.9	4.9	2.9	0.3
D5 Paracetamol is suitable for use on children with asthma (N = 381)	4.1	1.3	61.2	10.4	15.1	5.5	7.8
D7 Anti-inflammatory medicaments can advantageously be given together with Paracetamol to children experiencing moderate pain (N = 380)	3.6	2.2	26.9	32.6	20.6	14.4	5.5
D1 When treating pain in children, only one sort of pain relief medicament should be used a time (N = 380)	3.2	1.3	10.7	23.5	17.2	29.0	19.6
D2 Pain relief medicaments are as equally effective used preventively as when the child already is in pain (N = 382)	3.1	1.4	13.5	27.5	12.5	27.5	19.0
D3 A good way to eliminate pain when treating a child is to use sedation (N = 381)	3.0	1.5	15.9	36.2	2.8	23.2	21.9
D4 Paracetamol has an impact on the central nervous system (N = 372)	2.8	1.6	24.0	13.3	17.3	8.3	37.1
D8 Anti-inflammatory medicaments irritate children's stomach and intestines when used long term (N = 380)	2.1	1.2	62.7	19.3	15.9	0.5	1.6
E5 When a child is uninformed about a treatment it is more prone to experience pain compared to a child that is informed (N = 380)	4.3	1.0	53.0	32.9	5.0	6.0	3.1
E1 A child's environment has a big impact on the pain experience (N = 383)	4.2	0.8	39.9	47.7	6.7	5.2	0.5
E3 Children's pain experiences are influenced by their own personalities (N = 382)	4.2	0.9	38.8	47.9	5.2	6.3	1.8

(Continues)

TABLE 2 (Continued)

Category item No.	Mean	SD	Agree %	Agree to some extent %	Don't know %	Disagree to some extent %	Disagree %
E2 Children's pain experiences are influenced by culture (N = 382)	3.9	0.9	30.4	47.5	12.7	6.5	2.9
E4 It is difficult to recognize whether a child experiences pain or fear (N = 381)	3.9	0.9	24.2	61.2	2.1	11.2	1.3
E6 Children can sleep even when experiencing difficult pain (N = 383)	2.1	1.2	2.1	15.8	15.3	26.4	40.4

Note: The mean score and standard deviation (SD) based on Likert-type scale (1 = low knowledge, 5 = high knowledge). The number of respondents is given within brackets. Data also shown for proportion of dentists' answers regarding level of agreement for each item. Dentists' Knowledge and Attitudes toward Child Pain Perception (DKA-CPP).

in English. In this way, enabling future studies to have access to the same data (Table 1).

The Likert-type response alternatives to the items in categories A-E were: Agree; Agree to some extent; Don't know; Disagree to some extent and Disagree.

As to the categories F-H, the GDPs were asked about pain assessment methods and the documentation they used. The pre-set response options were: *Applied to all or almost all children in pain; Applied to many children in pain; Don't know; Applied to some children in pain and Applied to few or no children at all in pain*. Accordingly, the categories F-H did not represent a Likert-type scale.

The coding of the data was transformed according to Salanterä's key so that a score of 5 was interpreted as the highest level of knowledge. Likewise, a score of 1 was interpreted as the lowest level of knowledge about pain and pain management.¹³⁻¹⁷

2.3 | Pilot study of the adapted questionnaire

A pilot study of the adapted multidimensional questionnaire was performed on ten GDPs to determine the understandability and logic of all items. The outcome confirmed that no additional adjustments were needed.

To test the comprehension of the items and the construction of the questionnaire on a broader scale, an additional pilot study was performed on 50 general dentists, resulting in the conclusion that no further adjustments were necessary. On average, the respondents spent 20 minutes completing the questionnaire. The test-retest was performed on ten dentists. The ICC analysis showed high values for all items (0.97-0.99). The Spearman correlation coefficient varied for all items between 0.78-0.96.

2.4 | Location of the study

Region Västra Götaland (RVG) is the largest region in Sweden with a population of 1.6 million people. Its largest city, Gothenburg, had at the time for this study approximately 526,000 inhabitants. The Region Västra Götaland was responsible for the dental care of 363,512 children and adolescents (51% females), 19 years of age or younger.

Region Västra Götaland employed 50% of all dentists working in the region, including 567 GDPs, working at 128 clinics.

Only actively working GDPs up to the age of 68 years at the time of the survey were eligible for the study. In all, 567 GDPs (69.8% females).

The data was collected over a seven-week period between October and December 2012.

2.5 | Questionnaire applied on GDPs

The questionnaire tested in the pilot study was termed *Dentists' knowledge and attitudes regarding the child's pain perception* (Tables 2

TABLE 3 Proportion of dentists' answers regarding level of agreement for each item, category F-H

Item No.		Applied on all or almost all children in pain %	Applied on many children in pain %	Don't know %	Applied on some children in pain %	Applied on few or no children in pain %
F1	By observing changes in the child's behavior (speech, voice, facial expression, body movements, etc) (N = 375)	83.7	12.3	1.6	2.1	0.3
F2	By observing changes in the child's physiological parameters (such as heart frequency, breathing, sweating) (N = 372)	42.5	21.3	7.5	17.7	11.0
G1	Singing to the child (N = 379)	1.8	5.0	5.5	15.7	72.0
G2	Distracting the child's attention from the experienced pain (N = 381)	32.8	37.8	2.4	19.7	7.3
G3	Distracting the child's attention from the check-up/treatment (N = 381)	25.2	37.6	6.0	21.0	10.2
G4	Talking to the child (N = 385)	90.4	6.2	1.3	1.6	0.5
G5	Smiling to the child (N = 384)	72.7	12.2	7.0	5.0	3.1
G6	Joking with the child (N = 385)	42.3	27.8	6.8	13.8	9.3
G7	Holding the child (N = 379)	31.9	18.7	8.2	18.2	23.0
G8	Playing music to the child (N = 381)	7.3	14.7	6.3	23.9	47.8
G9	Helping the child to relax and breath properly (N = 384)	51.6	27.1	2.3	13.5	5.5
G10	Using the child's fantasy (N = 384)	39.0	32.6	4.9	15.9	7.6
H1	I make a short general comment in the child's journal, such as: experienced pain (N = 382)	64.1	19.9	3.4	6.8	5.8
H2	I document the location of the pain (N = 383)	76.5	13.6	1.8	4.2	3.9
H3	I document the duration of the pain (N = 385)	54.0	26.8	2.9	8.6	7.7
H4	I document the quality of the pain (N = 380)	39.0	27.6	9.7	14.5	9.2
H5	I document the pain relief medicament used (N = 385)	81.3	14.3	1.0	2.6	0.8
H6	I document the non-pharmacological pain relief methods, such as relaxation and distraction (N = 382)	13.1	18.1	10.2	25.1	33.5
H7	I document the assessment of the applied pain relief (N = 385)	22.6	24.7	9.9	22.3	20.5

Note: The number of respondents is given within brackets. Dentists' Knowledge and Attitudes toward Child Pain Perception (DKA-CPP).

and 3). Demographic data was documented on the dentist's sex, age, years of professional experience, and whether the dentist was a parent.

The age categories were given as; below 25, 25-35, 36-45, 46-55 years, and older than 55 years of age. In this way, the GDPs' identities were made anonymous to the authors.

In Sweden, dentists are working until the age of 68 years.

2.6 | Procedures

A web-based version of the questionnaire with a 24-hour availability was constructed and the eligible group of dentists was invited to participate via e-mail (the addresses were connected to their employment in the Public Dental Service (PDS). The questionnaire took approximately 20 minutes to fill out.

Reminders were sent out three times. The data was collected over a seven-week period. The questionnaire was responded to anonymously and it was not possible to link a questionnaire to a specific person.

2.7 | Variables

The five chosen explanatory variables were: GDP's age, sex, years of professional experience, the proportion of working time devoted to treating children and adolescents, as well as being a parent. Of all the respondents, 50.1% were 46 years or younger which was decisive for the dichotomization. This proportion was similar to that of all dentists in the RVG. The median number of years of professional experience was 17 (mean and SD 18.3 ± 13.4), which was decisive for the dichotomization.

2.8 | Ethical aspects

At the time of the study, the Regional Ethics Review Board of Gothenburg did not require a study protocol since dentist participation was voluntary and the survey could be anonymously performed. The GDPs filled out an age category instead of their exact age.

All clinical department heads were contacted and informed about the survey's objective and method, stressing the importance of the study's voluntariness and anonymity. The department heads in turn informed the employed dentists. The participants agreed to participate by responding to the web questionnaire.

2.9 | Statistics

The statistical analyses were performed using the IBM SPSS software, version 21. Descriptive statistics were used to present the main data for the 37 items, divided into categories A-E. Regarding

these categories, the Chi-square test analyzed the relationships in the distribution of sex, age, and years of professional experience, the proportion of working time devoted to treating children and adolescents, as well as being a parent.

One-way analysis of variance (ANOVA) was applied to the variables of sex, age, years of professional experience, proportion of working time devoted to treating children and adolescents, as well as being a parent (regarding A-E). The significant level chosen was $P < 0.05$. To adjust for multiple comparisons, a correction of the significant level was made according to the Bonferroni-Holm technique.^{18,19} ANOVA was chosen to reinforce the Chi-square results. The scales' internal consistency was measured by Cronbach's alpha. Due to missing responses on different items, the numbers of analyzed individuals vary in the tables.

3 | RESULTS

The questionnaire was responded to by 387 GDPs (68.3%), the majority of whom were females. Half of the respondents were 46 years or younger, which also constituted a natural group split for comparisons (Table 4). The proportion was comparable to that of all dentists in the Region Västra Götaland.

Information on the year of graduation was available for 382 out of 387 GDPs and the median number of years of professional experience was 17 (mean and SD 18.3 ± 13.4 years).

The proportion of working time devoted to treating children or adolescents was reported to be 26-50% by 184 out of 382 GDPs,

TABLE 4 Responding dentists by age, professional experience (years), and proportion of working full time devoted to treating children (%) based on the respondent's sex

	Female ^a n	Male ^a n	Total n
Age (years) ^b			
<46	143	48	191
>46	125	67	192
Total	268	115	383
Professional experience ^c (years)			
<17	137	50	187
>17	129	64	193
Total	266	114	380
Proportion of working time child/adolescent % ^d			
0-25	89	60	149
26-50	139	45	184
51-75	39	10	49
>76	0	0	0
Total	267	115	382

^a3 missing data for sex.

^b1 missing data for age.

^c4 missing data for professional experience.

^d2 missing data for allotted time.

TABLE 5 DKA-CPP items in categories A-E. Chi-Square test ($P < 0.05$) regarding dentist's sex, age, years of professional experience. Number of dentists (n) and frequency (%) who do not agree (including values 3 to 5), respectively

Category item No.	Male	Female	P-value	Age < 46	Age ≥ 46	P-value	Professional experience	Professional experience	P-value
A3	64 (56)	172 (64)	NS	104 (54)	133 (70)	0.04	104 (55)	131 (69)	NS
A4	71 (62)	190 (72)	NS	118 (61)	144 (77)	0.04	112 (59)	148 (78)	0.002
A13	57 (50)	193 (77)	0.001	109 (58)	141 (74)	0.04	104 (56)	144 (76)	0.002
A14	61 (54)	191 (72)	0.001	124 (64)	128 (68)	NS	120 (64)	130 (68)	NS
D3	70 (61)	139 (52)	NS	89 (46)	120 (63)	0.04	87 (46)	120 (63)	0.04

Note: Dentists' Knowledge and Attitudes toward Child Pain Perception (DKA-CPP). Abbreviation: NS, not significant.

and 51-75% by 49 GDPs (Table 4). 280 of the respondents were parents, while 103 reported having no children.

The responding frequency to items in the questionnaire varied between 372 and 383. Full data for all items in the questionnaire are shown in Table 3. In Table 3, items in categories A-E are presented based on rankings of mean scores together with the dentists' responses regarding the level of agreement for each item. In Table 3, items are presented without ranking but show the dentists' responses on how they apply different strategies related to the items.

The Chi-square test showed a significant ($P = 0.001-0.04$) relationship for sex, age, and years of professional experience for five of the items (Table 5).

For example, a relationship was observed between the dentists' sex and attitudes to the parents' role when treating children. Some of the items were related to the age of the dentist; younger dentists tending to overlook pain compared to older dentists.

One-way ANOVA reinforced the results of the Chi-square test, with significant values for sex, age, and number of years since registration (Tables 6 and 7). The studied female dentists showed another view about the management of children in pain, compared to the male dentists.

In this analysis, there were no differences in attitudes or knowledge between dentists who were parents or not, or between dentists with different working relationships within children's dentistry.

Cronbach's alpha for *Views on the care of children in pain* (14 items) was 0.50, *Physiology of pain* (5 items) 0.68, and 0.28 for *Pain medication* (8 items).

4 | DISCUSSION

This cross-sectional survey showed the GDP's knowledge and attitudes on pain in children and adolescents, as evaluated by a multidimensional form. The applied items revealed the GDP's views on aspects of pain, and the complexity of the needed everyday expertise in relation to their age, sex, years of professional experience, the proportion of working time devoted to treating children and adolescents, as well as being a parent. No forms have so far addressed GDPs knowledge as structured by different categories. Additionally, this survey highlighted a need for a shorter, more user-friendly questionnaire yet with retained multidimensionality.

The main result was that the amount of years of professional experience, and accordingly the age, influenced how children's pain was understood and managed. Some significant differences in the GDPs' responses emerged; those with more than 17 years of professional experience tended to be more responsive to the child's situational needs. It could be reasoned that over time, general dentists gathered experience that they synchronized with skilled colleagues and assimilated into their own praxis. Other medical professions have reported similar trends following the amount of working years.²⁰⁻²² On the other hand, Rasmussen *et al*² found no differences between younger and older GDP groups, with a cut-off point at 50 years of age, as for example responded to: *Learning to cope with slight pain is a part of life.*

TABLE 6 Dentists' Knowledge and Attitudes toward Child Pain Perception (DKA-CPP)

Item A1. Children usually tolerate pain better than adults						
Age	n	Mean	SD	95%CI	P-o	P-a
<46 years	192	4.3	1.0	4.2; 4.5	0.0001	0.002
≥46 years	190	4.6	0.8	4.5; 4.8		
Total	382	4.5	0.9	4.4; 4.6		
Experience	n	Mean	SD	95%CI	P-o	P-a
<17 years	188	4.3	1.0	4.2; 4.5		
≥17 years	191	4.7	0.8	4.6; 4.8	0.0001	0.004
Total	379	4.5	0.9	4.4; 4.6		
Item A4. It is acceptable to treat a permanent tooth without any pain alleviation						
Experience	n	Mean	SD	95%CI	P-o	P-a
<17 years	189	3.4	1.4	3.2; 3.6	0.00001	0.0004
≥17 years	189	4.0	1.2	3.8; 4.2		
Total	378	3.7	1.3	3.6; 3.8		
Item A13. Parents tend to exaggerate their children's pain						
Experience	n	Mean	SD	95%CI	P-o	P-a
<17 years	186	2.9	1.1	2.8; 3.1	0.0003	0.01
≥17 years	190	3.3	1.1	3.2; 3.5		
Total	376	3.1	1.1	3.0; 3.3		
Item B1. Untreated pain prolongs the time for healing/recovering till the onset of pain relief						
Age	n	Mean	SD	95%CI	P-o	P-a
<46 years	192	4.1	0.9	3.9; 4.2	0.0001	0.002
≥46 years	190	4.4	0.8	4.3; 4.6		
Total	382	4.3	0.9	4.2; 4.3		
Experience	n	Mean	SD	95%CI	P-o	P-a
<17 years	188	4.1	0.9	4.0; 4.2		
≥17 years	191	4.4	0.8	4.3; 4.5	0.001	0.03
Total	379	4.3	0.9	4.2; 4.3		
Item D3. A good way to eliminate pain when treating a child is to use sedation						
Age	n	Mean	SD	95%CI	P-o	P-a
<46 years	193	2.7	1.4	2.5; 2.9	0.00002	0.001
≥46 years	189	3.2	1.4	3.1; 3.5		
Total	382	3.0	1.5	2.9; 3.2		
Experience	n	Mean	SD	95%CI	P-o	P-a
<17 years	188	2.7	1.4	2.5; 2.9		
≥17 years	191	3.3	1.4	3.1; 3.5	0.0002	0.01
Total	379	3.0	1.5	2.9; 3.2		

Notes: Items with statistically significant differences $P < 0.05$, based on the dentist's age <46/≥46 (years) and professional experience <17/≥17 (years in practice). Mean, SD, 95% confidence interval (CI). ANOVA, original P -values (P -o) and P -values after Bonferroni-Holm adjustment (P -a). Score 1 = low level of knowledge, score 5 = high level of knowledge

Another main finding among the studied GDPs' was their significant attitudes spread and the differently managed pain, as to the items: *Parents tend to exaggerate their children's pain; The dentist is*

better suited than the parent to judge when the child is in pain, and The child's pain is usually diminished when a parent is present. The GDPs' range of responses to children in pain are supported by Rasmussen

TABLE 7 Dentists' Knowledge and Attitudes toward Child Pain Perception (DKA-CPP)

Sex	n	Mean	SD	95%CI	P-o	P-a
Item A4. It is acceptable to treat a permanent tooth without any pain alleviation						
F	265	3.8	1.3	3.6; 3.9	0.001	0.03
M	115	3.5	1.4	3.3; 3.8		
Total	380	3.7	1.3	3.6; 3.8		
Item A8. It is important to get the parents involved in the pain treatment of their child when a tooth is being extracted						
F	268	4.5	0.9	4.4; 4.6	0.001	0.03
M	112	4.2	1.2	4.0; 4.4		
Total	380	4.4	1.0	4.3; 4.5		
Item A13. Parents tend to exaggerate their children's pain						
F	265	3.3	1.1	3.2; 3.4	0.000002	0.0001
M	113	2.7	1.0	2.6; 2.9		
Total	378	3.1	1.1	3.0; 3.3		
Item A14. The dentist is better suited than the parent to judge if a child is in pain						
F	267	3.5	1.2	3.4; 3.6	0.0001	0.002
M	114	3.0	1.3	2.7; 3.2		
Total	381	3.3	1.2	3.2; 3.5		
Item C4. Usually, the child's pain experience diminishes when a parent is present						
F	268	3.7	1.1	3.5; 3.8	0.00001	0.0004
M	114	3.1	1.1	2.9; 3.3		
Total	382	3.5	1.1	3.4; 3.6		

Note: Items with statistically significant differences $P < 0.05$, based on the dentist's sex, F = female, M = Male. Mean, SD, 95% confidence interval (CI). ANOVA, original P -values (P -o) and P -values after Bonferroni-Holm adjustment (P -a). Score 1 = low level of knowledge, score 5 = high level of knowledge.

et al², Wondimu and Dahllöf³, and Berlin et al⁴, who established that dentists not always used topical analgesia prior to the oral injection and did not always offer anesthetics during invasive procedures in the primary and permanent dentition.

The studied GDP's attitudes and knowledge on single items are not directly comparable to other studies' outcomes. However, a similar magnitude of supportive responses from the GDPs' (83%) and pediatric nurses from a previous study (91%) to the item, *Pain caused by a dental check-up is unnecessary and should be avoided if possible*, point to the groups' positive attitude on this item. Likewise, existing data from the pediatric nurses regarding the categories: *Views on the care of children in pain*; *Pain relief*, and *Sociology and psychology of pain*, show the medical personnel's high score.¹⁷

For some items in the questionnaire, *When treating pain in children, only one sort of pain relief medication should be used*, or *Parents tend to exaggerate their children's pain*, the responses varied considerably.

A further observation was that the items, *Children tolerate pain better than adults*, and *Children generally tolerate pain worse than adults*, resulted in inconsistent responses. The inconsistency may be explained as the responders' insecurity, the wish to come across as having good attitudes, or additional undetected bias. The result is comparable with the finding of Daher et al (2015), who reported that pediatric dentists did not feel equipped to assess preschool children's dental pain.¹⁹ A way to prepare GDPs and pediatric dentists to meet preschool children professionally is to promote clinical and observational studies in the field. Given that children's pain assessment in medical care generally has gained ground, it is necessary to develop dental professionals' awareness.⁹⁻¹²

The manner in which the GDPs responded to some of the statements has shown an association to their sex. Wondimu and Dahllöf³ and Rasmussen et al² have similar results from questionnaires holding clinical scenarios. Berlin et al⁴ reported no sex differences among GDPs regarding pain management in children. The cause of this inconsistency may be due to several interacting factors such as the GDP's educational and cultural background.

It should be acknowledged that very small fluctuations in the studied items (in relation to dentists' sex, age, years of professional experience) have made significant differences. At the same time, the ANOVA-based results were supported by the Chi-square test.

The external validity of the results was valued as satisfactorily and applicable for other domestic GDP populations. One explanation is that all 567 working GDPs were reached and that the response rate was nearly 70%. Another was that the responders represented the largest county in Sweden.

The findings address GDPs everyday work-related questions on a multidimensional level, therefore providing insight on pain management in children and adolescents. Future research could be to apply the questionnaire to other large GDP cohorts. Also, to gain comparable data, as well as to revise, shorten and refine the questionnaire. The internal consistency analysis showed very low to moderate reliability using Cronbach's alpha, which may be problematic for a test concerning the similarity of the items.²³ This would especially be true for the scale on *Pain medication*. However, the number of items in a scale and how broad of a construct the scale covers, certainly have a great impact on the value of Cronbach's alpha. Nevertheless, specifically the scales on *Pain medication* and *Views on the care of children in pain* need more evaluation in the dental setting, to be acceptable for further use in clinical research.

A major limitation of the study was that the local ethics committee, at the time of data collection, did not require an ethical review of GDPs' participation, if it was voluntary and anonymous. Especially, in small clinics, GDPs may have felt obliged to respond to the survey in order to meet the expectations of colleagues and managers. A consequential limitation was that no information was available about the non-responders. However, the sex distribution of the respondents corresponded well to the sex and age of all employed general dentists in the studied region, resulting in good representability of the study group. The region consists of a

medium-sized city, towns, as well as rural areas. This represents a distribution of dental caries in children and adolescents in line with the national caries data. It is, therefore, reasonable to conclude that the children's treatment by the dentists was well-reflected in this population.

5 | CONCLUSIONS

GDPs sex, age, and years of professional experience correlated positively to their knowledge and attitudes on pain and pain management in children.

The proportion of working time devoted to treating children and adolescents, as well as being a parent, had no influence regarding the GDPs' knowledge and attitudes.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

AUTHOR CONTRIBUTIONS

L. Krekmanova, A. Robertson, and G. Klingberg designed the study in collaboration, critically reviewed and revised the manuscript, and approved the final manuscript as submitted. M. Hakeberg assisted in the statistical and critical discussion of the results and approved the final manuscript as submitted. S. Nilsson assisted in designing the study and critically reviewed and revised the manuscript.

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