

ORIGINAL ARTICLE

Changes in division of labour and tasks within public dentistry: relationship to employees work demands, health and work ability

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ABSTRACT

Objective: By 2023, fewer dentists are expected in Sweden, at the same time as the demand for dental care is expected to increase. Older people, in particular, are expected to require more dental health than previous generations. To meet this demand, the public sector dentistry in Sweden is moving towards changes in division of labour among dental professionals, including dentists, dental hygienists and dental nurses. However, the impact of this reallocation on the physical and psychosocial wellbeing of employees is unknown. The aim of this study was to compare workplaces with an equal or larger proportion of dental hygienists than dentists (HDH) with workplaces with a larger proportion of dentists than dental hygienists (HD) on the physical and psychosocial work load, musculoskeletal and psychosomatic disorders and sickness presence.

Material: A total of 298 persons employed in the Public Dental Service in a Swedish County Council participated in this study.

Conclusion: The medium large clinics HDH reported 85% of employee's with considerably more high psychosocial demands compared to employees in medium HD (53%) and large HD (57%). Employees in medium large clinics HDH also reported sleep problems due to work (25%) compared with employees in medium large clinics HD (6%), large clinics HD (11%) and small clinics HDH (3%). Clinic size does not seem to influence the outcome of the HD and HDH clinics to any great extent. Of all employees, about 94–100% reported high precision demands and 78–91% poor work postures.

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Introduction

It is expected that the total number of dentists in Sweden will be reduced by the year 2023,[1] while the demand for dental care is expected to increase.[2–4] The increase in demand is thought to be driven by a larger proportion of elderly people in the population who, unlike previous generations, retain their own teeth due to better oral hygiene practices, resulting in a greater need of dental care in old age. Moreover, there is also an increased need for oral health prevention and promotion among other groups in society, such as younger people and oral health risk groups. These changes may alter the demands on employees and require efforts to find the necessary effective, alternative collaboration strategies for the dental team.[1] Dentists and dental nurses have discrete roles, with the former professionals performing the examination and treatment and the latter assisting. Another oral health professional, dental hygienists, provide treatment of children, adolescents and adults. More efficient use of the personnel could be accomplished by dental nurses and hygienists performing some of the more common tasks performed by dentists, and also by using existing and

additional competencies while meeting the needs of the community. However, such a rearrangement of work tasks has been shown to create work intensification through changes in temporal exposure,[5–9] with the possibility of an increase in perceived stress.[10] Furthermore, such rearrangement of work tasks may involve altered physical and psychosocial job demands and alter the way in which leadership within the dental health environment is executed.[11] Swedish County Councils have implemented changes to the provision of dental health to ensure that they are able to meet the needs of the community. This approach involves changes to the proportions of professionals to an equal or larger number of dental hygienists in relation to the number of dentists at many clinics, through the delegation of tasks, such as the delivery of local anaesthesia and scaling, to dental nurses after mandatory supplementary training. The sharing responsibilities between dental hygienists and dentists may impose different and new physical and psychosocial work demands on the respective professions. It is possible that these changes in work demands may impact on the employees' work ability, with potential ill health and sickness absence,[4,6,9] which would be counterproductive due to the

cost of sickness absence to society and employers.[12] Reorganization is often carried out to rationalize operations, now focus on team building, flat organizations, training of multiple skills and improve the financial outcomes. When considering the reorganization of labour and tasks, it is necessary to also consider different aspects of the work environment as well as the tasks involved, to obtain a 'sustainable production system'. This is defined as a system that takes competition and production as well as the working environment into account with the intention to work more effectively without increasing work demands;[13] all important factors for employees, patients and employers.[14] It has been proposed that the redistribution of work tasks and the changes to the proportions of different dental employees may introduce new and/or additional stressors on the physical and psychosocial work environment in such a way as to affect the health and work capacity of employees and the dental services provided.[13]

This study aims to compare employees in workplaces with an equal or greater proportion of dental hygienists than dentists with workplaces with a greater proportion of dentists with regard to the proportional difference in poor physical and psychosocial workload, poor leadership, perceived exhaustion, proportion of employees with musculoskeletal disorders, psychosomatic disorders, work ability and reported sickness presence and absence in these workplaces.

As a hypothetical starting point, the theoretical model developed by Westgaard and Winkel was used to explain the relationship between organizational aspects as workplaces with an equal or greater proportion of dental hygienists than dentists (HDH) and workplaces with a greater proportion of dentists (HD), work environment, health and production, and

was used to guide the analyses in this study.[2] In a modified version of the model, it was assumed that workplaces of various professional compositions (HDH and HD) might have a direct effect on the physical and psychosocial exposure perceived by the staff, which may then have direct effects on health/illness with a subsequent impact on productivity. This model has been tested using structural equation modelling (SEM) in a previous study which showed that the hypothesis are partly confirmed with a good fit (RMSEA = 0.00, CFI = 0.92 and RMR = 0.09). It was the factors for psychosocial exposures which do not fit into the best model of SEM [15,16] (Figure 1).

Methods

This study is a part of a larger longitudinal survey, the Dental Organization in Transition in Sweden (the DOiT - survey), evaluating the physical and psychosocial health of dental staff.

Study design and sample

The study reports on cross-sectional data obtained from employees in the Public Dental Service in a Swedish County Council. All 486 dental staff members were invited to participate. The dental staffs from each dental clinic were first informed about the study by their supervisors and also that participation was voluntary. The questionnaire was developed as a web survey using the EsMaker NX3 software, with the link emailed to the recipients. The DOiT project was approved by the Regional Ethical Review Board in Linköping (ref. no: 2012/186-31).

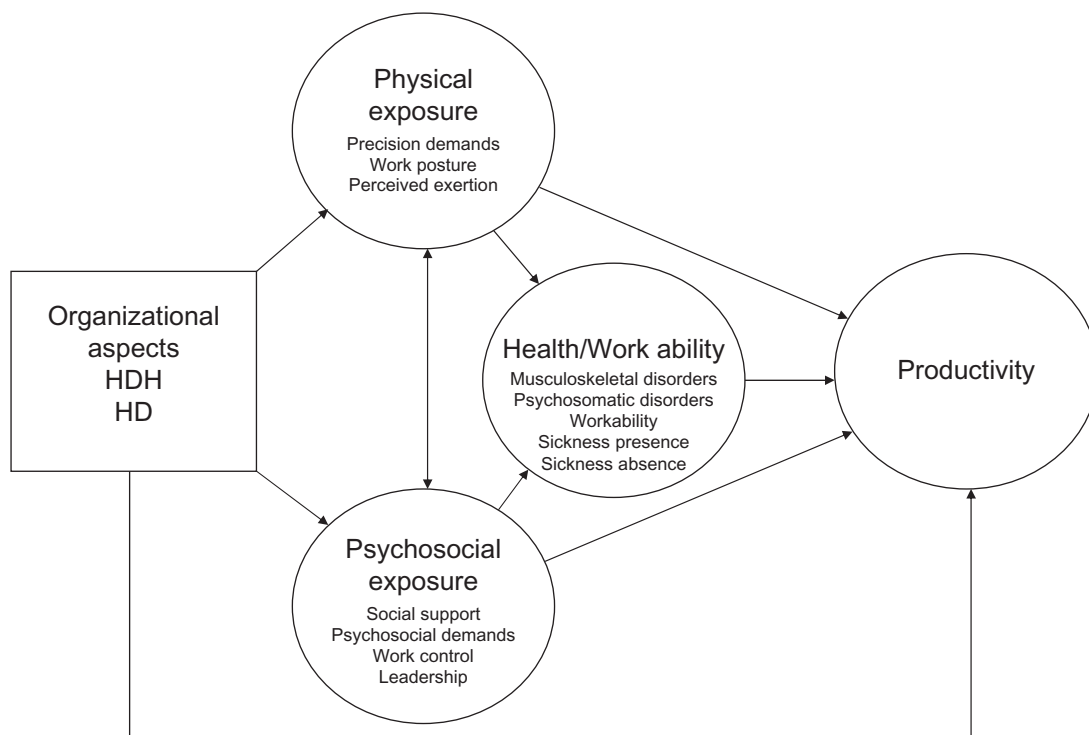


Figure 1. Theoretical model on which the present investigation is based, with the factors and items in this study that correspond to the model's headlines. (Modified version of Winkel and Westgaard [2]).

Web survey

Employees answered the web-based questionnaire during the period of November 2012 to January 2013. If needed, two reminders were sent, the first reminder after three weeks and the second reminder after nine weeks, then were participants classified as non-responders. The questionnaire comprised questions concerning Demographics, Workplace Physical and Psychosocial conditions, Leadership, Psychosomatic conditions, Pain and disorders of the musculoskeletal system, Work ability, Sickness absence and Sickness presence.

Demographics

The demographic items included age, gender, educational level, years in dental service, hours worked per week, working hours per day, name and size of workplace, profession, and whether they held a management position. Due to the number of potential explanatory items, the physical and psychosocial work conditions and leadership evaluated in this study were pooled using a structure factor from a previous study.[15,17]

Factors workplace physical conditions

Physical work conditions were evaluated with six items [18] scored in 10 boxes (1 = Not at all to 10 = To a high degree), and were pooled by the median into two factors: Precision demands (three items, Cronbach's Alpha = 0.79), and Work posture (three items, Cronbach's Alpha = 0.74). A higher score reflects poorer physical conditions. An example of a question is: 'Does your work usually mean awkward postures for you?'

Factors workplace psychosocial conditions

Psychosocial conditions were evaluated with 15 items [18] and pooled on the median into three factors containing conceptually related items: 'Psychosocial demands (six items, Cronbach's Alpha = 0.84), Work control (four items, Cronbach's Alpha = 0.79), and Social support (five items, Cronbach's Alpha = 0.79)'. Each item was scored on a 10-box scale (1 = Not at all to 10 = To a high degree). A higher score reflects poorer psychosocial conditions. Example of a question is: 'Is the strain in your job so great that you hardly talk or think about anything except work?'

Factor leadership

Leadership was evaluated with three item scored on a ten-box scale and pooled on the median to the factor Leadership (Cronbach's Alpha = 0.63). The factors were anchored with verbal descriptors of 'Not at all' (value of = 1) and 'To a high degree' (value of = 10), with a lower value indicative of better leadership.[18] Example of a question is: 'How is the contact and cooperation with your immediate superior?'

Items psychosomatic conditions

Four items were used to evaluate the presence of psychosomatic conditions: Sleep problems, Stomach disturbances, Difficulty disconnecting from work during leisure time, and Headaches.[18] Each item was scored on a ten-box scale (1 = Not at all to 10 = To a high degree). Higher scores reflect poorer psychosomatic conditions. Example of a question is: 'Often has sleep problems due to work?'

The five factors (Precision demands, Work posture, Psychosocial demands, Work posture, Social support, Leadership) and items (Sleep problems, Stomach disturbances, Difficulty disconnecting from work during leisure time, Headaches) are then dichotomized. The proportions above the fifth box are presented in percent.

Factor perceived exertion

Perceived exertion was evaluated at 14 different body locations: Eyes, Neck, Shoulders, Upper back, Lower back and left and right of Upper arm, Elbows, Wrists, Hands/fingers.[19] Example of a question is 'How strenuous for the neck/cervical spine do you perceive your work to be at the end of a normal working day in the past month?' The end locations were scored from 0 to 14 and score 1 = Very, very little, to 13 = Very, very strenuous. The factor, Perceived exertion (Cronbach's Alpha = 0.94), was grouped and the proportion of scores higher than 7 of 14 boxes is presented in percent. A higher score reflects greater perceived exertion.

Items for pain and symptoms of the musculoskeletal system

Nine items [20] were used to identify the presence of pain and symptoms of the Neck, Shoulders, Elbows, Wrists/hands, Upper back, Lower back, One hip or both, One knee or both and one ankle or both. The options were Yes/No. Only those who reported problems in any of these nine regions are presented as percentages.

Items work ability

Three items [21] were used to evaluate Work ability. The two items 'Your work ability in relation to physical demands', and 'Your work ability in relation to psychosocial demands', originally measured with five options, were collapsed to a dichotomous variable of 'good' and 'poor' work ability in relation to the physical and psychosocial demands. The response options of 'Very good', 'Fairly good' and 'Reasonably good' were grouped as 'Good', and the options of 'Less good' and 'Poor' were grouped as 'Poor'. For the third item, 'Due to my health, I hardly think that I can do my current job in two years' time', which was originally measured with three options, the option Hardly (Poor) remains as one option, while the options Maybe and Yes formed the second option. The fourth item, 'Considering your work and work environment, how satisfied are you?', was measured on an 11-box scale (0–10), where a higher score reflects poorer psychosomatic conditions. The

proportion of higher than the fifth box is presented as a percentage.

Items sickness absence

Two items evaluated sickness absence because of physical or psychosocial problems, each with five possible response options: 'No', 'Yes, less than a week', 'Yes, one to four weeks', 'Yes, four weeks to two months', and 'Yes, more than two months'. Responses were regrouped to form a dichotomous variable of 'No' and 'Yes' for Sickness absence caused by physical and psychosocial load. 'Yes' options are then presented as a percentage (%).

Items sickness presence

Two items evaluated sickness presence due to physical or psychosocial problems with four possible response options: 'Not at all', 'Sometimes', 'Often' and 'Always'. [18] Responses were combined to form a dichotomous variable, 'Not at all', renamed 'No sickness presence', and the options 'Sometimes', 'Often' and 'Always' were combined to form the category 'Sickness presence'. In this study, responses to the option 'Sickness presence' are presented as a percentage.

Dental clinics

Workplaces with an equal or larger proportion of dental hygienists than dentists are defined in the study as High Dental Hygienists (HDH). Workplaces with a greater proportion of dentists than dental hygienists are defined in this study as High Dentists (HD). The grouping of clinic size was based on the number of employees. Small clinics were defined as ten or fewer employees. Medium clinics were defined as 11–20 employees, and large clinics were defined as more than 20 employees. Data on clinic size and the number of employees were provided by the county council.

Statistics

The descriptive statistics are presented as frequencies (n), percentages (%), 95% confidence interval (CI95%) and cumulative percent. Bootstrapping was used to calculate the 95% confidence intervals. Bootstrapping is that inference about a population from sample data can be modelled by resampling the sample data and performing inference. This process is repeated a large number of times (typically 1000 or 10,000 times) and provides an estimate from which we can answer questions about the dispersion. Maximum Likelihood χ^2 test was used and Fisher's exact test was used when more than 20% of the cells had an expected value less than five on items for medium large clinics. In the analysis of clinic size, correspondence analysis was used to obtain the main differences. All tests are two-sided. The Spearman correlation for χ^2 (ordinal by ordinal) was used to analyse relationships between HDH/HD and Clinic size. Cronbach's Alpha was used to analyse the internal consistency reliability on the items which then were grouped using the median to factors.

A multinomial logistic regression analyse (method = Enter, model = main effects) were performed with the dependent item HDH/HD and clinic size together (Small clinic HDH, Medium large clinic HD and Large clinic HD with medium large clinics HDH as a reference) and as independents those factors and items that became significant in the Tables 2–4. The statistical limit for significance was set at $\alpha = 0.01$. Data processing was performed using the SPSS version 22 (IBM Corp, Armonk, NY).

Results

Out of 486 employees, 321 (66% response rate) answered the questionnaire. Twenty employees were excluded because of missing data on their background variables and three people were excluded because they worked at workplaces without a dentist. Sixteen employees who did not perform clinical work (clinical coordinators) were also excluded. The study group therefore consisted of 282 employees.

Table 1 presents the demographic and organizational data. There was no difference between groups in the distribution of gender, age category or years in dental work. However, the number of small, medium and large clinics differed significantly between HDH and HD ($p < 0.001$), with more small HDH clinics. There was a strong correlation between clinic size and HDH/HD ($r_s = 0.73$, $p < 0.001$). Due to the strong correlation, all analyses were broken down by HDH and HD and clinic size.

Physical and psychosocial factors between HDH and HD distributed on clinic size

Table 2 shows that a significantly larger proportion employees (85%) in medium large HDH clinics reported poorer psychosocial demands than employees in medium large HD clinics (53%, $p < 0.001$), and for large clinics HD (57%, $p < 0.001$). In small HDH clinics perceive 28% of employees significantly ($p < 0.01$) poorer leadership compared with 9% in medium large clinics HD. For all clinics reports employees poor work postures (78–91%) and high precision demands (94–100%). Between 0 and 3% of employees reported poor social support in all clinics.

Musculoskeletal disorders, work ability factors, sickness presence and sick leave caused by high physical load between HDH and HD distributed on clinic size

Table 3 shows that 51% in large clinics HD reported significantly ($p < 0.01$) more pain and disorders from wrists and hands compared with 27% in medium large clinics HD. All clinics report the highest share of pain and disorders from the neck (60–67%), shoulders (56–70%) and lower back (44–61%).

Sick leave and sickness presence caused by high psychosocial load, psychosomatic problems and work ability between HDH and HD distributed on clinic size

Table 4 shows that there were significantly more employees who reported often having sleep problems due to work in medium large HDH clinics (25%) than in medium large

Table 1. Demographic data in frequencies (*n*), valid percentage (%) and 95% confidence interval (CI95%) for all 282 employees divided between HDH and HD.

Variables	HDH			HD		
	<i>n</i>	%	CI95%	<i>n</i>	%	CI95%
Total sample	97	100		185	100	
Gender						
Female	87	89.7	83.7–94.6	166	89.7	85.1–94.1
Male	10	10.3	5.1–16.3	19	10.3	5.9–14.9
Age (2012)						
Less than 40 years	19	19.6	11.2–27.4	48	26.0	20.1–32.6
40–49 years	19	19.6	12.2–27.6	38	20.5	14.7–27.0
50–60 years	41	42.3	32.7–52.0	73	39.5	32.8–47.3
More than 60 years	18	18.6	11.0–27.1	25	13.5	8.5–18.7
Missing (1) <i>n</i> = 281	–	–		(1)	(0.5)	
Professions						
Dental nurse	55	56.7	45.8–66.3	107	57.8	51.1–64.7
Dentist	27	27.8	18.9–36.4	52	28.1	21.4–34.6
Dental hygienist	15	15.5	8.6–22.9	26	14.1	9.2–19.4
Years in dental service						
Less than 10 years	26	26.8	17.9–36.1	58	31.4	24.1–38.1
10–19 years	22	22.7	15.3–32.3	27	14.6	9.8–19.9
20–29 years	13	13.4	7.2–20.6	41	22.2	16.3–28.5
30–39 years	28	28.9	20.2–38.6	48	25.9	19.7–32.4
More than 40 years	7	7.2	2.2–12.2	11	5.9	2.7–9.2
Missing (1) <i>n</i> = 281	(1)	(1.0)		–	–	
Working hours per week						
Less than 36 hours/week	41	42.3	32.0–52.1	73	39.5	32.4–47.3
36–40 hours/week	55	56.7	46.9–67.0	109	58.9	51.1–65.9
More than 40 hours/week	1	1.0	0.0–3.2	3	1.6	0.0–3.8
Clinic size						
Small clinic (less than 10 employees)	36***	37.1	27.2–46.3	0***	0.0	–
Medium-large clinic (between 11 and 20 employees)	61***	62.9	53.7–72.2	55***	29.7	23.0–36.0
Large clinic (more than 20 employees)	0***	0.0	–	128***	70.3	64.0–77.0

****p* < 0.001.

Table 2. Factors for physical and psychosocial work demands, perceived exertion after work, and leadership in valid percentage (%) and 95% confidence interval (CI95%).

	Small clinics		Medium large clinics				Large clinics	
	HDH		HDH		HD		HD	
	%	CI95%	%	CI95%	%	CI95%	%	CI95%
Poor work posture	78	64–92	84	75–92	91	84–98	87	81–93
High precision demands	94	86–100	100	–	98	95–100	99	98–100
Perceived exertion	33	19–47	31	20–44	20	9–31	31	23–40
High psychosocial demands	64	47–78	85 ^{1,2}	75–93	53 ¹	40–67	57 ²	49–66
Poor work control	28	14–44	48	36–61	29	16–42	38	30–46
Poor social support	3	0–8	0	–	2	0–6	2	0–4
Poor leadership	28 ³	14–44	16	8–26	9 ³	2–18	17	11–24

Higher percentage represents deterioration. Medium large clinics HDH, 1, 2, against 1 = medium large clinics HD and 2 = large clinics HD, = *p* < 0.001. 3 = *p* < 0.01.

Table 3. Variables for sick leave, sickness presence, less good or poor work ability for employees and musculoskeletal disorders.

	Small clinics		Medium large clinics				Large clinics	
	HDH		HDH		HD		HD	
	%	CI95%	%	CI95%	%	CI95%	%	CI95%
Sickness leave caused by high physical load	11	3–22	12	3–20	7	2–16	9	5–15
Sickness presence caused by high physical load	39	22–56	36	23–48	27	16–40	29	21–37
Less good or poor work ability in relation to the physical demands at work	61	44–75	57	44–69	55	42–67	56	47–63
Pain, disorders during the past 12 months from:								
Neck	64	50–78	67	56–79	60	47–71	65	57–73
Shoulders	56	39–72	62	51–75	62	49–75	70	63–78
Elbows	17	6–31	18	8–28	22	11–33	22	14–29
Wrists, hands	42	25–58	36	25–49	27 ¹	16–40	51 ¹	43–59
Upper back	39	22–56	30	18–41	29	18–42	40	32–48
Lower back	47	31–64	61	48–72	44	31–56	58	48–66
One hip or both	36	22–50	28	18–38	24	13–36	24	16–32
One knee or both	28	14–42	26	15–38	20	11–31	23	16–31
One ankle, foot or both	14	3–28	20	10–31	13	6–22	26	18–37

Those who responded 'yes' are presented as a percentage (%) for each variable. Higher percentage represents deterioration. 1 = *p* < 0.01.

HD clinics (6%, $p < 0.01$), and small clinics HDH (3%, $p < 0.01$), and large clinics HD (11%, $p < 0.01$). For all clinics between 47 and 62% reported less good or poor work ability in relation to the psychosocial demands at work.

Compilation of significant differences split into HDH/HD, clinic size and profession

There were significant ($p < 0.01$) differences between Dental nurses in medium large clinics HDH, where 77% perceive

high psychosocial demands compared with dental nurses in large clinics in which 51% and in medium large clinics HD which 38% perceive high psychosocial demands. There was also a significant ($p < 0.01$) difference between dentists in medium large HDH clinics where 41% often have sleep problems compared with dentists in medium large HD clinics, where none perceived high psychosocial demands. There were no significant differences between professions on HDH and HD clinics and clinic size (Figure 2). Differences for 'all professions' are reported in Tables 2-4.

Table 4. Variables for sick leave, sickness presence, psychosomatic disorders, musculoskeletal disorders and less good or poor work ability, failure to work for the following two years and everything regarding satisfaction as valid percentage (%) and 95% confidence interval (CI 95%) for each factor.

	Small clinics		Medium large clinics				Large clinics	
	HDH		HDH		HD		HD	
	%	95% CI95%	%	CI95%	%	CI95%	%	CI95%
Sickness leave caused by high psychosocial load	0	-	5	0-12	4	0-9	2	0-4
Sickness presence caused by high psychosocial load	8	0-19	18	8-28	13	6-22	13	7-18
Often has sleep problems due to work	3 ²	0-8	25 ^{1,2,3}	15-36	6 ¹	0-11	11 ³	6-16
Often has an upset stomach due to work	8	0-17	13	5-23	15	6-24	9	4-14
Has difficulty disconnecting from work during leisure time	8	0-19	21	12-31	15	6-24	14	9-20
Has frequent headaches due to work	14	3-25	15	7-25	18	9-29	10	6-16
Less good or poor work ability in relation to the psychosocial demands at work	56	39-72	62	49-74	47	35-60	48	40-58
Due to my health, I hardly think that I can do my current job in two years' time	3	0-8	0	-	2	0-6	3	0-6
Less pleased with everything regarding job satisfaction and work environment	19	8-33	41	30-54	22	11-33	23	16-31

Higher percentage represents deterioration. Medium large clinics HDH, 1, 2, 3 against 1 = medium large clinics HD and 2 = small clinics HDH and 3 = large clinics HD, = $p < 0.01$.

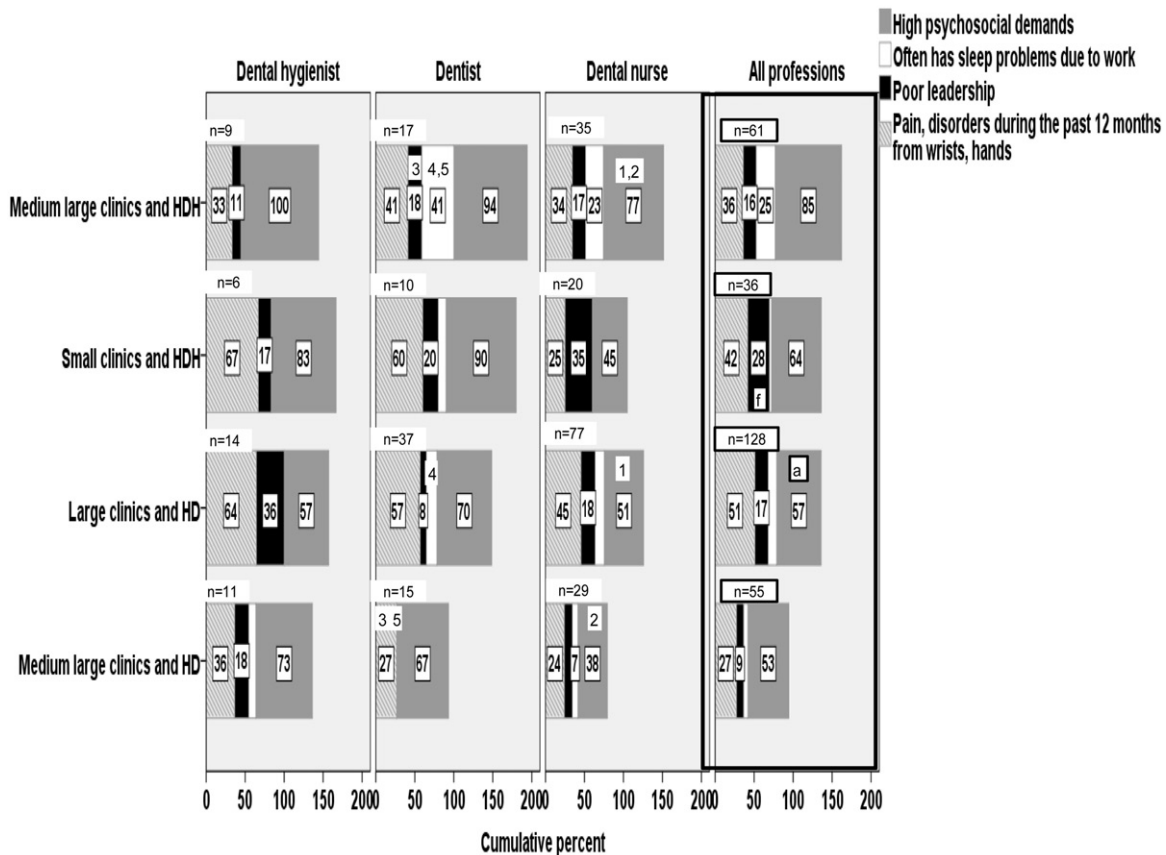


Figure 2. Overview of items with significant differences in HDH and HD and clinic size distributed on clinic size and professions and all professions in cumulative percent and number of employees (n) and significant differences ($p < 0.01$) with figures for professions: 1,2 = dental nurses in medium large clinics HDH against 1 = dental nurses in large clinics HD and 2 = dental nurses in medium large clinics HD.3 = dentists in medium large clinics HDH against dentists in medium large clinics HD. 4,5 = dentist in Medium large clinics HDH 'Often has sleep problems due to work' against 4 = dentists in Large clinics HD and 5 = dentists medium large clinics HD.

For 'All professions' see Tables 2-4.

Table 5. Multinomial logistic regression analysis for the four significant items in medium large clinics as independent in significance ($p=$), odds ratio (Exp(B)) and 95% confidence interval (CI95% Exp(B)).

Method = Enter (Medium large clinics HDH as reference)	B	S.E	Wald	$p=$	Exp (B)	CI 95% Exp (B)
Small clinics and HDH						
High psychosocial demands	-1.01	0.36	7.74	0.005	0.36	0.18-0.74
Poor leadership	0.70	0.37	3.54	0.06	2.01	0.97-4.18
Often has sleep problems due to work	-2.31	0.76	9.25	0.002	0.10	0.02-0.44
Pain, disorders during the past 12 months from wrists/hands	0.47	0.32	2.18	0.14	1.61	0.86-3.01
Medium large clinics and HD						
High psychosocial demands	-1.41	0.33	18.40	>0.001	0.25	0.13-0.47
Poor leadership	-0.56	0.42	1.77	0.18	0.57	0.25-1.31
Often has sleep problems due to work	-1.28	0.49	6.89	0.009	0.28	0.11-0.72
Pain, disorders during the past 12 months from wrists/hands	-0.11	0.31	0.12	0.73	0.90	0.50-1.62
Large clinics and HD						
High psychosocial demands	-1.42	0.30	23.09	>0.001	0.24	0.14-0.43
Poor leadership	0.10	0.31	0.07	0.80	1.02	0.59-1.98
Often has sleep problems due to work	-0.78	0.31	5.89	0.02	0.47	0.26-0.87
Pain, disorders during the past 12 months from wrists/hands	0.85	0.24	12.15	>0.001	2.33	1.45-3.76

Multinomial logistic regression showed that for small clinics HDH, there was a 36% risk ($p=0.005$) of high psychosocial demands and a 10% risk ($p=0.005$) to often have sleep problems due to work. For medium large clinics HD there is a 25% of a risk ($p<0.001$) to perceive high psychosocial demands and 28% risk ($p<0.009$) to often have sleep problems due to work compared with medium large clinics HDH. For large clinics HD there are a 24% risk ($p<0.001$) to perceive high psychosocial demands but compared with medium large clinics HDH the risk is 2.33 times higher ($p<0.001$) in large clinics to perceive pain and disorders from hands/wrists (Table 5).

Discussion

The present study shows that employees in medium large workplaces HDH reports significantly higher psychosocial demands and more sleep problems due to work compared with medium large clinics HD and large clinics HD and for sleep problems also small clinics HDH. These two factors seem to be the two most important factors which also are confirmed by the multinomial regression analysis where small clinics HDH, medium large clinics HD and large clinics HD report lower risk to perceive high psychological demands, or more sleep problems caused by the work compared with medium large clinics HDH. A majority of the employees report also a poor physical work environment and sleep problems with rather narrow confidence intervals reflecting the accuracy of this measure. The finding that employees on medium large clinics HDH reports both severe psychosocial demand's and sleep problems suggests a pattern of poor working environment.

On the professional level, there is a difference for dental nurses on medium large HDH clinics with perceived higher social demands in comparison to medium and large clinics HD. Even for dentists there are more who perceive sleep problems caused of work than in the medium, large clinics over medium large clinics HD and large clinics. A poor work environment may increase the risk of poor recovery and consequently increases perceived stress.[22] The modified theoretical model of Westgaard and Winkel [2] suggests that organizational changes have a direct impact on both the

physical and psychosocial exposure at work and then on health and work ability and finally production. The question is why only medium large clinics HDH report this and not small clinics HDH. If the reported poor environment is caused by an organizational change that has occurred recently, then small clinics should also report higher psychosocial demands and more sleep problems. Moreover, the significant differences are so strong and the overall pattern of other variables so consistent that there are indications that there is a real difference. A part of the problem may be that in this cross-sectional study we do not have information about when the organizational changes were made for each HDH clinics as these changes takes place step by step in an ongoing process. Depending on the duration of the changes this may have an influence on the result. Further possible explanation is that in HDH clinics run greater risks of being closed down or merged with another clinic. This is suggested by the finding that these workplaces are often smaller (Table 1) and located in rural areas. The absence of good social support increases the risk of stress and ill health by impairing the employees' ability to manage psychosocial demands and low-decision latitude.[23] Moreover, it is important to have a feeling of usefulness and control over one's work.[24] For dentists, one explanation could be that if they should become ill, or are absent, replacement is difficult, which may impact on the dynamics in the workplace negatively.

Generally, for all employees, regardless of size or clinic or if you work at a HDH clinic or HD clinic is that their work is perceived very precision demanding precision with poor postures. This could increase the risk of problems with musculoskeletal disorders, for example, of the lumbar spine.[25] A consequence of a poorer psychosocial and poorer physical work environment is an increased risk of ill health, which, in the long run, may affect the dental services negatively. This highlights the importance of mandatory ergonomic education in dentistry and in other health care professionals.

The results of this study are consistent with previous studies, which found that stressful work, poor postures and, thus, a risk of disorders of the neck and lower back, are inherent to dentistry.[13,26-28] Both a poor psychosocial and a poor physical work environment increase the risk of ill health, which is supported by the modified theoretical model of Westgaard and Winkel [2] and Bongers et al.[29]

The presence of health problems is a strong determinant of sickness presence, especially for professionals who can only be replaced with difficulty in the workplace, and professions for which few alternative work tasks are available, despite a high educational level.[30,31] For dentists, this may mean that they are isolated, and have limited opportunities for professional interaction or support.

Certain other factors also impact on the risk of sickness presence, such as difficulties of staff replacement, time pressure, insufficient resources, and a poor personal financial situation.[32] High psychosocial demands, with little opportunity for the employees to influence their own work and poor support in the workplace, could lead to perceived stress and a high work pace, and could also increase the risk of neck and shoulder pain [32] and further exacerbate ill health.[33,34] Employees who perceive being exploited or received compensation is disproportional to the work performed may be at increased risk of illness.[35]

While the psychosocial work environment was demanding in HDH, it was not the same as in HD clinics. A poor psychosocial work environment may be due to employees perceiving the demands from the management as being too high in relation to the compensation/reward received. A large discrepancy between management expectations and what the employee believes should be reasonable compensation for the work performed increases the risk of health problems among employees. Moreover, if the employee has a poor ability to cope with this kind of stress, the risk of ill health increases.[36,37]

A redistribution of the number of dentists in relation to dental hygienists may not be the only solution to meet the future demands within the oral health service sector. For this reason, it is important to take into account and plan for strategies that involve the work content in terms both of the employee's competencies and his/her participation, but also to manage the needs of the dental care service based on the population's oral health.

In future studies, it is important to analyse the actual production, patient visits and type of treatment per category: dentists, dental nurses and dental hygienists. Most likely, the reported differences may also be influenced by these production variables.

Methodological considerations

The responses obtained are considered to be representative of employees in general dentistry as the overall response rate was 66% (321 of 486 employees responded), which strengthens the findings of this study. This sample size also provides satisfactory power (80% or more).[38] However, in the subgroup analyses, the power was reduced to 50–70%. In addition, due to the number of analyses conducted (42 analyses in Table 2, 72 analyses in Table 3 and 54 analyses in Table 4), there is an increased risk of erroneous significant relationships (Type 1 error). With $p = 0.05$, the calculated risk is much more than 100% for Type 1 errors according to Bonferroni and Hochberg. Consequently, the overall alpha level should be lowered to compensate for this risk. But corrections made in

accordance to Bonferroni and Hochberg will often be too conservative, in this case between $p = 0.001$ to $p = 0.0006$ and will increase the statistical Type II error i.e., retaining the null hypothesis when it should have been rejected.[39–41] Therefore, the significance level chosen was $\alpha = 0.01$.

Conclusions

A large proportion of dental health professionals in medium large clinics HDH professions perceive high psychosocial work demand's compared with all the other clinics.

High psychosocial demands is the factor that has the greatest impact among employees.

More employees in medium large clinics HDH reported sleep problems due to work compared with employees in medium large clinics HD, large clinics HD and small clinics.

There is some evidence that suggests that dental nurses in medium large clinics perceive higher psychosocial demand's compared with dental nurses in Medium large clinics HD and Large clinics HD.

There is also some evidence that dentists in medium large clinics more often have sleep problems due to work compared with dentists in medium large and large clinics HD.

Clinic size does not seem to influence the outcome of the HD and HD clinics to any great extent.

In all clinics, employees reported a high amount of high precision demands and poor work postures.

On the whole it seems that dentists and dental nurses have a poorer working environment in medium large clinics HDH and dental hygienists in small clinics HDH compared with other clinics and HDH/HD.

It is possible that a redistribution of the number of dentists and dental hygienists may not be the only solution to meet the future demands within the oral health service sector, especially if this is done at the expense of the health of the dental professional.

Disclosure statement

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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