ORIGINAL PAPER

Prevalence of Musculoskeletal Disorders among Dentists in Iran: A Systematic Review

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ABSTRACT

Introduction: Musculoskeletal disorders (MSD) have become significant problems for all health care workers especially dentists. This systematic review provides prevalence of MSD in dentists of Iran. **Material and Methods:** In this study all published literatures about MSD in Iranian dentists were selected without any time limits or other restrictions. However, it was found that the studies about MSD among Iranian dentist are very low. **Results:** The results of literatures investigations show that the prevalence was between 0.5% and 70%. The prevalence of pain in different regions includes; neck pain (0.7- 0.15), back pain (0.08 - 0.55), wrist pain (0.005-0.48), shoulder pain (0.08-0.5), knee pain (0.03- 0.25) and elbow pain (0.01- 0.2). The gender has no influence on the prevalence. Compare the results with other similar studies shows that the prevalence of MSD is an important issue in other area too. **Conclusion:** Results show that the prevalence of musculoskeletal problems is high in Iran. Therefore it is necessary conduct reliable and comprehensive epidemiological studies in this field to determine the causes of the problem more consciously; and propose appropriate solutions.

Keywords: prevalence, musculoskeletal, disorder, dentist, Iran.

1. INTRODUCTION

Occupation influences on health, social and economic development of a society is very critical. Musculoskeletal disorders (MSD) are work related diseases and many factors can cause it (1, 2). MSD are injuries of muscles, ligaments, tendons, nerves, blood vessels, bones and joints, that cause pain in the neck, shoulder, arm, wrist, hands, upper and lower back, hips, knees and feet (3). They affect the musculoskeletal system including the nerves, tendons, muscles, and supporting structures such as intervertebral discs (4). In recent decades musculoskeletal disorders have been grown globally (5, 6). Health care workers face a wide range of hazards on the job including musculoskeletal diseases and the prevalence of musculoskeletal diseases among them is significant (7). According to WHO there are over 59 million workers on healthcare facilities who are exposed to a wide range of occupational hazards in result the incidence of work-related injuries and diseases is high in this group (8). These diseases lead to physical, emotional, economical and social consequences on healthcare workers and their families (9). Studies show that wide variety of workplace hazards such as infections, eye injuries, vibration, percutaneous exposure incidents, exposure to radiation, dental materials, noise, psychological conditions and musculoskeletal disorders exists in dental practice (10). Dentistry is a high-risk profession in MSD (11-13) and it has large effect on their practices (14). According to research wrong position of the body and lack of body movement of dentists are the major ergonomic factors involved in the development of musculoskeletal disorders (15). Uncomfortable and static position with repetitive movements of arms and hands in combination with postural loads of upper back and head, during the dental work for long time and also psychological stress have important role in engaging dentists with these musculoskeletal symptom (6, 16-18). These occupational hazard causing absence from work and finally reduce the quality and productivity of their practices (19) .

Due to high incidence of MSD among dentists in different areas of Iran and also the high impact of musculoskeletal disorders on dentist's prac-

tices, this study investigated MSD among dentists in Iran.

2. MATERIALS AND METHODS

Data and analysis

In order to estimate the prevalence of musculoskeletal disorders including low back (LBP), shoulder and neck pain among Iranian dentists in the included studies, homogeneous items of data were analyzed. The core elements collected by the authors were information about sample size, gender, age, city and prevalence of LBP, shoulder and neck pain. Acceptable methodological quality was determined as the central tendency of the frequency distribution of methodological scores. The LBP, shoulder and neck pain prevalence data extracted from the methodologically acceptable studies were analyzed.

Search strategy

This study is a systematic review; meta-analysis of all published literatures has been done simultaneously and without any time limits or other restrictions. The papers were searched using the MEDLINE (PubMed) 1989 to 2014, Google scholar, Scopus, CINAHL (for English language) and the Iranian search engine included SID (Scientific Information Database, www.sid.ir) 2014, Irandoc (Iranian Research Institute for information Science and Irandoc.ac.ir) 2014, Iran-medex (www.iranmedex.com) 2014, Magiran (www.magiran.com) 2014 (for Persian [Farsi] language).

The search was done based on keyword in English for all motor engines and Persian phrase only for Persian electronic databases. The keywords included ''dentist'' combined with ''musculoskeletal disorders'' and ''Iran'' including all sub-headings. Because of high frequency of unrelated search results we concluded to search with the word of "dentist" and then extract papers related to MSD. The Persian key words were equivalent to their English words, and all probable combinations were considered. All keywords searched electronically by three Boolean operators with explained search strategy separately. After completed search, reviewed all search result in databases separately based on title or running title of studies and related articles were selected. Then we excluded duplicated articles in English or Persian language.

Inclusion criteria

All studies included in this study, if had criteria including LBP prevalence report in any gender, without any limitations for study design in Persian or English languages. Clinical intervention articles and studies with explanation of technical details were excluded.

Methodological appraisal

Articles were reviewed separately by two reviewers. After excluding those who didn't had inclusion criteria, data from the review entered in to the data collection forms. Then articles have been divided to 5 categories including infection problems, MSD, radiation problems, psychological problems and other problems. At all stages the disagreements between reviewers was addressed by group discussion. Cross sectional and analytical articles have been appraised with Modified STROBE questionnaire based on our purpose in this study.

Data extraction

Some data such as articles and author`s names, year of publication, region of the study, type of study, sample size, sampling methods, age and gender of participants, statistical method, confounders, inclusion criteria, prevalence of LBP, prevalence of shoulder and neck pain, assessment tool and variables were identified. All data that extracted into Office Excel sheets that created for this purpose.

Data analysis

All information was entered in the Excel 2012 and analyzed using STATA software (version 11), we examined homogeneity of data. The mean, frequency, distribution of SD (standard deviation) and inter-quartile range (IQR) with 95% confidence intervals were used for data analysis. Significant heterogeneity was determined for the pooled estimate. In order to compare the prevalence statistics reported in the included studies, the primary elements for homogeneity of data were analyzed. A standard test for heterogeneity examined the null hypothesis that the true prevalence is identical in every study. Articles heterogeneity was investigated in two stages by observing Forest plot and calculating I2.I2 defines the proportion of variation in prevalence estimates that is due to genuine variation in prevalence rather than sampling error. The essential quality reporting elements were established by the authors, which included information on gender, age and recall period (8). Acceptable methodological quality was determined as the central tendency of the frequency distribution of methodological scores. The LBP prevalence data extracted from the methodologically sound studies were analyzed.

Forest plots were showed the distribution of the data in rank order for prevalence estimate (lowest to highest ranks) and a vertical reference at the line of unity.

We estimated the potential influence of covariates on the prevalence estimates by a random effects regression model, using the Metaregression command in STATA. The Metaregression represented log odds ratios, which are presented as odds ratios with 95% confidence intervals.

A multivariate meta-regression model was constructed to investigate which covariates were associated with prevalence estimates if there was adjustment for other study covariates. The models were created by using a forward stepwise procedure and described in the results section.

Ethical considerations

In this study, published articles that examined dental health problems have been analyzed. To select articles has been made any restrictions on language, type of study, Journal and others; all searched papers have been checked. Researchers at all stages of the research were considered ethical instructions.

Limitations

Inclusion was limited to published reports as scientific papers in Iranian and international journals, and we did not look at the thesis and dissertation due to access restrictions. However, it is unlikely the details from those would have changed our overall conclusions.

3. RESULTS

In this review, 137 articles were included from database (SID, Iranmedex and Magiran, PubMed, CINAHL, Scopus and Web of science). 113 studies excluded after title and abstracts of articles reviewing (unrelated to this purpose and duplicated) then, 7 papers excluded after assessing for eligibility criteria. At the end, 17 articles were included (Figure 1). A total of 17 discrete studies were identified that investigated

1st author	Publication year	Site	Method	Sample size	Sampling method	Measurement tool	Mean age	Male sample size	Female sample size	Prevalence of MSD	Inclusion Criteria
Aarabi A.M(20).	2009	Shiraz	C-S (letter to editor)	196	Random	Question	Not reported	139	57	Neck pain=0.61, Back pain=0.54	Not reported
AbdolSamadi HR(21).	2005	Hamedan	analytical C-S	Dentist= 100 , physician= 100	Census in dentists, screen? In doctors	question and P/E (phalen, Tinnel, reversephalen), Hx, after positive P/E MG- NCV	Not reported	Not reported	Not reported	CTS (Carpal tunnel syndrome) symptomatic indentist =0.03, 0=doctors; LBP in dentist=0.3, neck pain =0.5	higher than 1 y experience, Not underlying disease, not matching excluded, high hand activity was excluded
Abrishamkar S(22).	2005	Tehran , Chaharmahal and Bakhtiari , Esfahan	C-S	Dentist= 251, physician= 110, general population= 96	doctors and general population random	self-designed questionnaire, ULBQ	Not reported	155	96	dentist: neck pain=0.67, non dentist=0.26	Not reported
Ahmadi F(23)	2012	Hamedan	C-S	71	Census	Nordic Q(12m)	38	60	11	12m :neck pain=0.5, shoulder pain=0.3, upper back pain=0.24, wrist pain=0.48, LBP= 0.17, knee pain=0.14, elbow pain= 0.01, whole site=0.65, 7 d: neck pain=0.07, shoulder pain=0.1, upper back pain=0.04, wrist pain=0.1, LBP= 0.085, knee pain= 0.06, elbow pain= 0.01, tight=0, whole=0.28	Not reported
Aminian O(24).	2013	Iran	C-S	dentist=300, pharmacologist=250	Random	Nordic Q(7d, 12m)	43.19, 45.03	261,193	0	dentist(LBP7d= 0.19.9, LBP 12m= 0.55), pharmacologist (LBP7d= 0.16, LBP 12m= 0.36)	Not reported
Barakat S(25).	2013	Esfahan	C-S	dentist student= 70	Random	NordicQ, REBA	23.97	34	34	neck pain=0.31, shoulder pain=0.41, upper back pain=0.275, wrist pain=0.31, LBP= 0.32, knee pain= 0.22, elbow pain= 0.2, foot pain=0.14	Not reported
Choobineh A.R(26).	2012	Shiraz	C-S	160	Random	Nordic Q, RULA	39.01	97	63	neck pain=0.656, shoulder pain=0.5, Back pain=0.475, wrist pain=0.394, LBP= 0.344	higher than 1 y experience, not hx of trauma, any disease affected MSD
Dehghan F(27).	2003	Tehran	C-S	99	Non random	Nordic Q	38.5	66	33	neck pain=0.59, shoulder pain=0.41, Back pain=0.545, wrist pain=0.38, fingers pain=0.02, headache=0.28; at time: neck pain=0.32, shoulder pain=0.20, Back pain=0.29, wrist pain=0.23, fingers pain=0, headache=0.13	corporative, complete questionnaire
Eivazi M(28).	2012	Tabriz	C-S	100	Random	Nordic Q, risk factors questionnaire	42.12	80	20	neck pain=0.48, LBP=0.38, wrist and hand pain=0.25, shoulder pain=0.13, 0.25, knee pain=0.17, thoracic spine pain==0.19, elbow pain= 0.09, foot pain= 0.13, leg pain=0.12, femoral pain=0.12	not pregnant, not hx of trauma, romatologic disorders, congenital anomaly
EzoddiniArdakani F(29).	2004	Yazd	C-S	70	Census	Question, severity of pain(numerical scale, visual scale, verbal scale)	36.6	52	18	neck pain=0.47, LBP=0.32, wrist pain=0.35, hand pain=0.37, shoulder pain=0.11, knee pain=0.04, other=0.03	Not reported
Kardani M(30).	2014	Ahvaz	C-S	100 (general=78, specialist=22)	Non random	Mac kaferi, numerical scale, ergonomic factors	40	61	39	neck pain=0.7(neck pain=0.58, OA= 0.12	min 2 y experience, not congenital disease and chronic neck pain
NaslSeraji J(31).	2005	Birjand	C-S	48 (general=35, empirical=4, nurse=9)	Non random	Nordic Q (12m), REBA	36.7	39	9	neck pain= 0.15, shoulder pain=0.08, LBP=0.35,	Not reported
Pargali N(1).	2010	Shiraz	C-S	82	Random	Nordic Q	37.5	40	42	neck pain=0.33, LBP=0.28	Not reported
Pour Abbas R(32).	2004	Tabriz	C-S	97	Random	Question	Not reported	76	21	Not reported	Corporative
Sahebjamee M(33).	1989	Tehran	C-S	dentist=200, doctor=98	Random	Question	42.5	dentist = 160, doctors = 87	dentist=40, doctors=12	OA neck=0.19, Low back=0.08, knee=0.2, wrist=0.005	Not reported
Varmazyar S(34).	2012	Tehran	C-S	63		Nordic Q, REBA	28.38	29	30	neck pain=0.51, LBP= 0.43,elbow pain =0.05	
Ebrahimian H(35).	2013	Northern Khorasan	C-S	60	Random	REBA, Question	41.17	44	16	12m: neck pain=0.27, shoulder pain=0.4, LB pain=0.47, elbow pain= 0.2, hand pain= 0.25,upper back=0.3, tight pain=0.23, knee pain=0.25, foot pain=0.12; 7d:neck pain=0.13, shoulder pain=0.13, LB pain=0.15, elbow pain= 0.03, hand pain=0.08, upper back=0.07, tight pain=0.03, knee pain=0.03, foot pain=0.02	Not reported

Table 1. Methodological description of dentists MSD studies

2067 dentists for MSD. Characteristics of reviewed studies are presented in Table 1 and Figures 1.

All papers studied the prevalence of MSD disorders in both sexes except one (472 men vs. 204 women). And 13 studies have been stated the mean age. The studies have been done according to Nordic or self-designed questionnaire.

Seventeen accepted studies in this review were between 1989 and 2013; and 9 studies reported musculoskeletal disorders with Nordic questionnaire. Among all musculoskel-etal disorders every paper have been studied a part of MSD including neck pain in 15 studies, back pain in 14 studies, wrist pain in 7 studies, shoulder pain in 8 studies, knee and elbow pain in 6 studies, hand pain in 3 studies, foot pain in 2 studies, Carpal tunnel syndrome, thoracic spine, leg, femoral and finger pain in 1 study. The prevalence of pain in different regions including; neck pain (0.7- 0.15), back pain (0.08 -0.55), wrist pain (0.005-0.48), shoulder pain (0.08-0.5), knee pain (0.03-0.25) and elbow pain (0.01-0.2)(showed in Table 1).
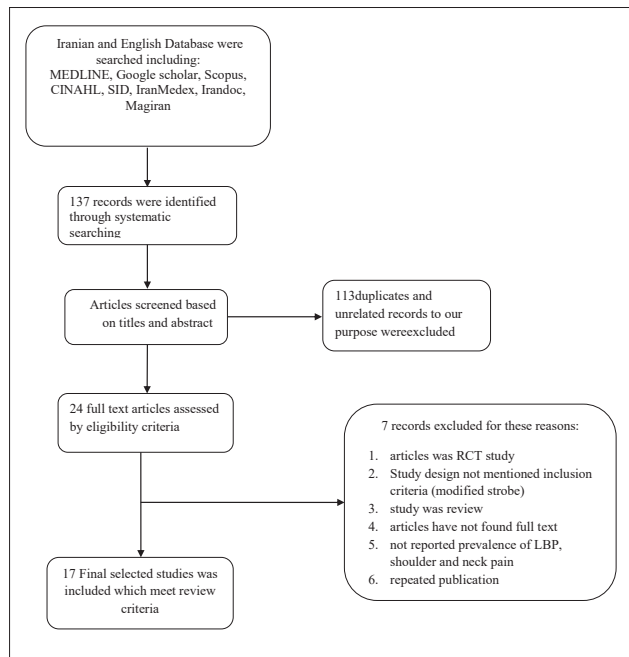
Figure 1. Search result flowchart

Due to significant heterogeneity in the prevalence of musculoskeletal disorders, analyzes were conducted using Random Effect Model. Nine articles used Nordic questionnaire for assessment of MSD in dentists (Table 1).

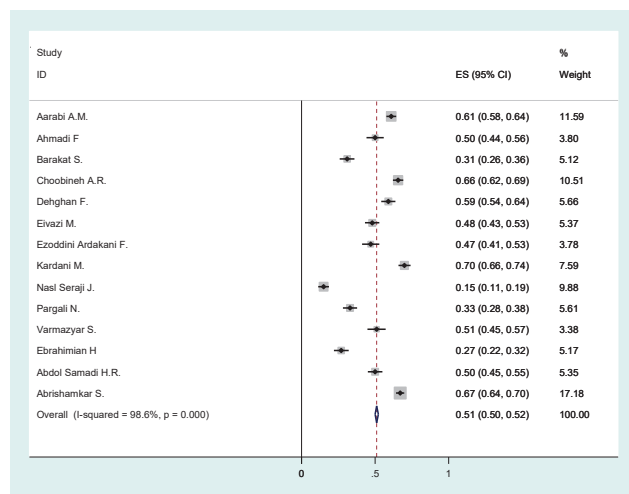Overall prevalence of neck pain in workers calculated 51% (I-squared= 98.6%, P=0.000) (Figure 2).

Figure2. Forest plot of prevalence estimates and 95% confidence intervals from studies of prevalence of neck pain in workers

Gender was associated to prevalence of neck pain (P =-0.04, SE=-0.003) while mean age was not associated to prevalence of neck pain among dentists (p= 0.01, SE=0.01) (Table 2).

SE	T	P value	Neck pain
0.01	0.72	0.01	Mean age
-0.003	-0.45	-0.04	Male to female ratio
0.23	0.52	0.09	Constant

Table 2. Association between prevalence of neck pain and gender of participants and Mean age

Overall prevalence of low back pain in dentists calculated 42% (I-squared= 96.1%, P=0.000) (Figure 3).
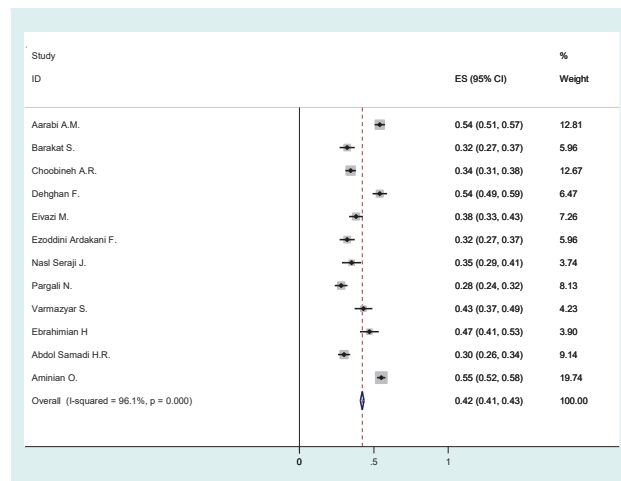

Figure 3. Forest plot of prevalence estimates and 95% confidence intervals from studies of prevalence of low back pain in workers

Gender was associated to prevalence of low back pain (P =-0.003, SE=0.017) while mean age was not associated to prevalence of low back pain among dentists (p= -0.05, SE= -0.001) (Table 3).

SE	T	P value	Low back pain
-0.001	0.05	-0.05	Mean age
0.017	0.51	-0.003	Male to female ratio
0.47	1.72	0.73	Constant

Table 2. Association between prevalence of low back pain and gender of participants and Mean age

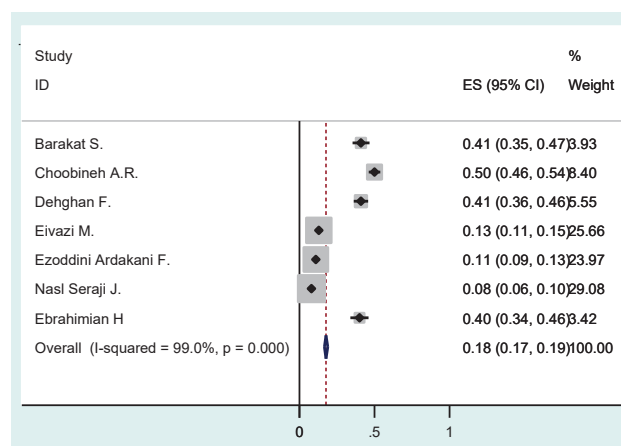Overall prevalence of shoulder pain in workers calculated 18% (I-squared= 99.0%, P=0.000) (Figure 4).

Figure 4. Forest plot of prevalence estimates and 95% confidence intervals from studies of prevalence of shoulder pain in workers

SE	T	P value	shoulder
-0.002	-0.78	-0.01	Mean age
0.09	2.29	0.15	Male to female ratio
0.48	1.66	0.75	Constant

Table 3. Association between prevalence of shoulder pain and gender of participants and Mean age

Gender was associated to prevalence of shoulder pain (p= 0.15, SE= 0.09) while mean age was not associated to prevalence of shoulder pain among dentists (p= -0.01, SE= -0.002) (Table 3).

The prevalence of neck pain, shoulder pain and back pain

among dentists is obtained 51%, 18%, 42% respectively. That is not related to gender and age.

4. DISCUSSION AND CONCLUSION

Musculoskeletal problems, especially work-related ones are growing increasingly; one of the occupations that are encountering with these problems are medical workers such as dentists (35, 36). Although many studies have been done in this field globally but there are not comprehensive studies in Iran. Also most published studies are in Persian; therefore, a systematic review of these literatures was conducted.

According to the results of Meta-analysis the range of MSD problems in dentists were 0.5% to 70%. In similar studies such as Hay et al this range was reported 64%- 78% in dentists and 78% - 93% in dental staff and dental hygienist (3). The differences in the prevalence of musculoskeletal problems reported in various studies can be stem from individual and social varieties.

The highest reported problem in MSD was neck pain with the prevalence of 51% that is similar to studies in Queensland, Saudi Arabia and Netherlands (36). But this prevalence shows different results in other studies including Lalumandier et al in USA with 28%, Akesson in Sweden with 73%, Rucker in Canada with 61% Alexopoulos in Greek with 26%.

The variations in reported prevalence may be due to issues such as various measurement tools, cultural differences and the individual's tasks. In some of these studies, in addition to dentists the sample includes dental staff and hygienists, but this study only include General dentists and specialists. High level of incidence in this group may be related to ergonomic problems such as unsuitable repetitive movements (37, 38), using vibrating instruments, bending forward at an angle of 15 degrees or sometimes up to 30 degrees for a long time (in 86% of the working time) with keeping up shoulder that caused a lot of pressure on the neck and shoulder (39). Psychosocial factors are another effective items, but detection the rate of impacts of every one of these factors is very difficult (37, 38).

Back pain with the prevalence of 42% (in different studies is reported 28%-55%) is the second, and shoulder pain with the prevalence of 18% (In different studies is reported 8%-50%) is the third high prevalence MSD among dentists. Hey et all in their systematic review study are reported back pain and neck pain as the most MDS complaints among dentists with the prevalence rates of 36.3%-60.1% and 19.8%-70% respectively. The results of Gupta et al study shows the neck pain with the most prevalence rate (57.5%) and back pain with moderate prevalence rate (53.7%). Results of our study are similar to the range reported in other studies.

In this study, neck pain and back pain is seen more in women than men, which is similar to other studies (3, 39, 40). But in this study the effect of gender on the prevalence of neck pain has not been considered, which can be caused by sample size women than men in this study (407 men vs. 204 women). In only 13 of the mentioned studies in this study, the mean age was mentioned. However, our study found a correlation between aging and neck pain, that shows with increasing more dental neck pain have been reported. But with increasing age, lower back pain and shoulder pain, less has been reported. Also in study of Hays the negative relationship between musculoskeletal problems and aging

has been seen (3). The differences can be seen in the reports comes from a variety of issues, including individual, cultural and social differences. In addition, items such as measurement tools, methods of asking question about the problems, economical issues and tools used by the dentists could be effective on the MSD problems (41). With the attention to the high prevalence of musculoskeletal problems reported in our country, and based on the results of this study, it seems there is a need to do more epidemiological studies in this area, and look more closely at the causes of the problem.

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