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Evaluation of the prevalence of musculoskeletal disorders in nurses: A systematic review

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Abstract

Nurses exposure many risk factors in the hospital setting. Musculoskeletal disorders (MSDs) is a common health problem between work related disabilities and injuries in nurses. The aim of this review was to examine the prevalence of MSDs in nurses and also summarize risk factors, outcomes, solutions. An electronic search was conducted in Pub Med in January 2017. Publications in the last ten years were researched using the key words: "Work Related Musculoskeletal Disorders" and "Nurses". The initial electronic search identified 111 papers. Some articles were excluded since they were not related to our study topic (7 articles were review, 15 of them were related to the roles of nurses in some musculoskeletal disorders, 14 articles were about nurses who working outside the hospital or new graduated/student, 28 articles addressed work related other health problems, 3 of them were related to hospital ergonomics and risk factors and 7 articles were interventions studies). Three papers were not reached to full text or abstract. The total number of remaining articles was 34 and all of them were included the study. It was considered that reported musculoskeletal disorders in nurses were limited to the past 12 months. It had been found that the prevalence of MSDs varied between 33.0% and 88.0%. The most commonly affected body regions were lower back, shoulder, neck, knees, wrists/hands. Lower back pain complaints were found to vary between 49.0% and 84.0%. The findings indicated that the work related musculoskeletal disorders associated with cumulative trauma and repetitive tasks included: lifting, transferring or repositioning, prolonged standing and also awkward postures (stooping, bending and reaching). These work-related health problems in nurses were significantly associated with age, gender, body mass index, ward, shift working and working in a hospital. Studies showed that musculoskeletal disorders were most seen among the operation room nurses and intensive care nurses. Also, MSDs were found to be the main causes of absenteeism, demanding a change of duty or job and visiting a physician. The MSDs was more prevalent occupational health problem among nurses. The prevalence of MSDs was associated with both demographic characteristics of nurses and hospitals' organizational factors. It was confirmed that making ergonomics interventions could improve the working environment in the hospital.

Keywords: Nurses, work related musculoskeletal disorders, ergonomics

Introduction

Musculoskeletal disorders (MSDs) are a group of disease that mainly affects nurses among healthcare providers [1-3]. These diseases are characterized by pain and complaint in hand, wrist, elbow, shoulder, neck, low back, foot and legs. MSDs are usually caused by vibration, force exertion, repetitive tasks and working in an awkward posture [4]. Epidemiological studies have demonstrated MSDs is a main occupational health problem in nurses [5,6]. MSDs can have a rigorous consequence on quality of life and may result in work constraints, absenteeism or even the want to change jobs [7]. Nurses are the main hospital workers in frequent close contacts with patients and they are interacting not only with patients but also with instruments and environment in hospital. Therefore, ergonomics discusses patient-machine-environment-healthcare providers to prevent MSDs [8].

The National Institute for Occupational Safety and Health (NIOSH) has published documents to prevent and reduce MSDs. The document describes some risk factors associated with patient handling, transferring, repositioning and lifting [9]. A systematic review reported that both physical and psychosocial work-related factors such as standing for long hours, working in shifts, daily workload, and dissatisfaction with work, inadequate income increase injuries in nurses [10]. Previous studies mentioned also some personal factors such as ageing, obesity and physical inactivity [11].

The prevalence of MSDs may vary between 33.0% and 88.0% among nurses all over the world [4,7,12]. The frequency of disorders was found 84.0% and 76.2% in studies performed on nurses in Estonia and Taiwan, respectively. The most frequent disorder in nurses is low back and then shoulder, neck, hands, legs [13, 14]. In studies conducted in Brazil and Italy, lower back, neck and knee were found the most frequent regions among MSDs [15]. In Turkey, the frequency of MSDs among nurses was found 79.5% [16].

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The aim of this review was to examine the prevalence of MSDs in nurses and also summarize risk factors, outcomes, solutions.

Materials and Methods

An electronic search was conducted in Pub Med in January and February, 2017. Publications in the last ten years were researched using the key words: “Work Related Musculoskeletal Disorders” and “Nurses”.

Inclusion and Exclusion Criteria

The authors searched articles (covering the years from 2007 to 2017) publishing in English. The research had to address the prevalence MSDs in nurses. The review process followed PRISMA guidelines [17]. The initial electronic search identified 111 papers. Each title and abstracts of all articles was assessed by the authors to decide eligibility. Studies with the MSDs in nurses working at hospital were included. Articles related to the MSDs in nurses working at primary health care or home care were excluded (Figure).

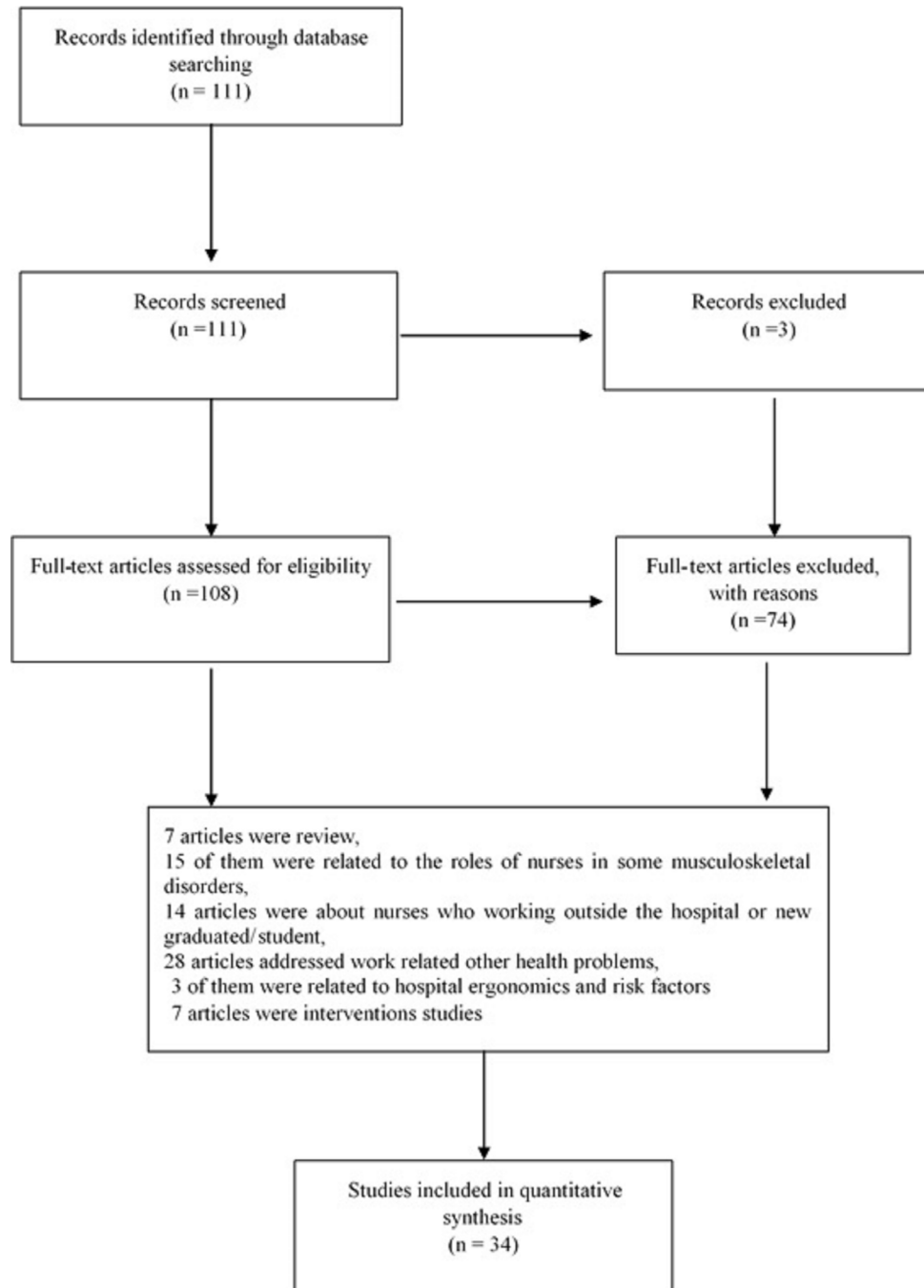


Figure. Flow diagram of the review process

In addition to these, some articles were excluded in detailed evaluation since they didn't inclusion criteria (7 articles were review, 15 of them were related to the roles of nurses in some musculoskeletal disorders, 14 articles were about nurses who

working outside the hospital or new graduated/student, 28 articles addressed work related other health problems, 3 of them were related to hospital ergonomics and risk factors and 7 articles were intervention studies). Three papers were not reached to full text or abstract. To end with, the total number of remaining articles was 34 and all of them were summarized in this study (Table 1).

Table 1. The summarize of studies about musculoskeletal disorders in nurses

References	Samples	Results	Conclusions and Solutions
1. Warming S. et al	148 nurses from a university hospital	64.0% of the nurses have Low Back Pain, 55.0% have Neck-Shoulder Pain and 20.0% have Knee Pain one of the three working days.	Musculoskeletal complaint and the pain level decreased at the day off.
2. Simonsen JG. et al	192 theatre nurses and assisting nurses	The prevalence of hand/elbow complaint was higher assistant nurses than theatre nurses. The prevalence of neck/shoulders in assistant nurses were 25.0%, 17.0% in theatre nurses.	Some coping strategies such as shorter shift may be protective
3. Ryu E. et al	531 nurses in a university hospital	The MSDs prevalence was 70.8%. The highest prevalence of symptom was shoulder (44.8%), waist (40.7%) and neck (33%).	Ergonomic intervention program and a anxiety reduction plan may prevent the MSDs
4. Abdollahzade F. et al	147 operating room nurses	A difference between working posture and age (P = 0.003), gender (P = 0.003), regular daily exercise (P = 0.048)	Ergonomic interventions and education-al programs may improve working pos-ture
5. Chung YC et al	3914 nurses 11,744 non-nurses	The frequency of MSDs for the nurses elevated from 28.3% in 2006 to 33.6% in 2010.	Major causes of MSDS are incorrect posture, the rolling shift system and psy-chological issues
6. Freimann T et al	221 nurses	The prevalence of MSDs 84.0%	Low back and neck pain was highly prevalent among Estonian nurses.
7. Rogers B	42 registered nurses	Poorly designed physical work environment contributed the injuries	The improvement activities may helpful to minimize hazards and risks and pre-vent occupational injuries
8. Arsalani N et al	520 nursing personnel	88.0% of nurses had MSDs The most prevalent pain was low back 65.3%	The use of biomechanical equipment for lifting and transferring patients might be beneficial a reduction of musculoskeletal pain among nurses
9. Murray E. et al	941 female, direct care nurses	Presence of back problems was related absenteeism	Implementing interventional program may prevent work related pain and reduce work absence.
10. Lee SJ et al	304 intensive care unit nurses	Job demands showed the strongest association with MSDs Effort reward imbalance had stronger relations with MSDs	Effort reward imbalance can be efficient measure job stress in MSDs
11. Attar SM et al	200 registered nurses	85.0% of the participants reported MSDs Lower back symptom was most prevalent (65.7%)	Prolonged shifts and being underweight contributed to development of MSDs
12. Bhimani R et al	58 rehabilitation nurses	The most common MSDs was low back (39.0%)	No systematic shift mechanism existed on the unit. Remodeling the unit to make it more ergonomically.
13. Florentino S et al	2140 nurses	Lower back symptom prevalence was 60.6%, the upper back 44.5% and the neck 48.6%	Nurses should minimize the risk of back injury with the use of mechanical aids.
14. Wang SY et al	5187 registered professional nurse and registered nurse	Registered nurses suffered from more types of MSDs compared with registered professional nurses	Ergonomics solutions may be essential
15. Yan P et al	2851 nurses	The prevalence of MSDs was 78.5%. The prevalence of MSDs in the neck, shoulder, back, and waist is high,	The prevalence of MSDs in nurses with different ages, working years, departments, sexes, physical conditions, and weekly working hours have varying degrees of risk of WMSDs.
16. Serranheira F et al	1396 nurses	Most of the nurses reported more than one symptom 88.0%	Repetitive tasks were related with low back pain
17. Tinubu BMS et al	76 nurses	The prevalence of work related MSDs was 84.0%.	Coping strategies and education programs are recommended for nurses
18. Reed et al	304 nurses	Foot/ankle MSDs are the most prevalent in pediatric hospital nurses	Self-management and treatment strate-gies are recommended
19. Heiden et al	273 nurses	High levels of physical job demand increased the risk of MSD considerably	Age adapted preventive measures are recommended
20. Sheikhzadeh A et al	50 peri-operating nurses	The most prevalent complaint was lower back pain 84.0%	The engineering interventions may include redesigning operating room
21. Freimann T et al	404 nurses	The prevalence of musculoskeletal pain was 70.0%	Psychosocial risk factors in working environment have a significant impact on the incidence of musculoskeletal pain

References	Samples	Results	Conclusions and Solutions
22. Nilsson et al	196 registered nurses	The lower back and shoulders were the most effected body region	Both individual factors and work-related factors influenced the nurses' health
23. Mynarski et al	93 nurses	Over 70.0% of the nurses have mostly lower back pain.	On a regular daily exercise may prevent musculoskeletal complaints,
24. Choobineh et al	375 nurses	Perceived physical demands were extensively related with musculo-skeletal symptoms	Hospital administrator should implement any interventional program such as reducing physical and psychological demands, as well as manual material handling activities demands
25. Shieh S et al	788 nurses	567 nurses (72.0%) had low back pain.	Longer daily working hours and a large number of cared patients per shift should be discouraged.
26. Lee SJ et al	361 nurses	There was an interaction between lift availability and work-related low-back and shoulder pain.	Using lifts devices have the greatest effect for reducing work-related pain
27. Sezgin D et al	323 nurses	The most prevalent pain was in the legs, lower back and back.	Type of shift work, type of hospital, and incidence of changes in work schedule are related with MSDs
28. Attarchi M et al	454 nurses	The incidence of MSDs was higher in shift nurses than day nurses	Coping strategies should take for shift nurses to reduce lower back pain
29. Lamy S et al	1896 nurses	Nurses exposed higher levels of biomechanical constraints in actions and postures in comparison with a lower level of perceived job safety and steadiness.	The work-unit-level organizational characteristics may impact workers' musculo-skeletal disorders
30. Amin NA et al	468 public hospital nurses	The neck was the most prevalent body region (48.9%)	Psychosocial risk factors were considerably related with MSDs
31. Darby B et al	428 endoscopy nurses	Nurses with a body mass index (BMI) of 25 or more had extensively more upper back disorders	Adjustments need to be made for nurses with a BMI of 25 or more and/or who are 68 inches or taller.
32. Letvak SA et al	1171 nurses	The prevalence of musculoskeletal pain was 71.0%	More interest must be paid to the health of the nursing workforce.
33. Cameron SJ et al	303 registered nurses	57.0% of the nurses reported job-related pain or discomfort in their lower back	Hospital wellness programs could all help to decrease the effects of the musculo-skeletal problems in the future.
34. Bos E et al	3169 nurses	The low back problems 76.0% were higher than neck-shoulder 60.0%.	The perceived exposure to risk factors is evaluated differently for nurses according to their units.

Results

Nurses, in particular, are at higher risk than other health professionals to experience work related musculoskeletal disorders. The work related musculoskeletal disorders have adverse effects not only on quality of life for nurses, but also the quality of care at healthcare facilities.

The following titles might be summarized factors associated with nursing work-related musculoskeletal disorders, the most seen work-related MSDs, outcomes of these disorders, solutions and recommendations according to studies in literature.

Factors Associated with Nursing Work-related Musculoskeletal Disorders

Physical Factors

Many physical factors have affected health of nurses during them performing their tasks in the hospital environment. Perceived physical demands common in nurses i.e., moving objects pulling/pushing machines, lifting patients, recurring motions and extreme flexion, bending, twisting and sudden movements [18,19]. These physical demands increased the risk of complaints in different

body regions [13,20-22].

Many studies have also reported that cumulative and repetitive manual activities including moving/lifting/lowering surgical sets and patients, pulling/pushing heavy loads such as a wheelchairs etc. were shown to be increasing the musculoskeletal symptoms [23-25].

The most common activities were recurred twisting and straightening of the elbow (71.0%) followed by recurred action of the wrist and fingers (68.0%) and heavy lifting (38.0%) [13].

Other factors related to MSDs were standing positions for a prolonged time and awkward postures (during transferring patients from and to bed) [12,26].

One of the major challenges in carrying or transportation patient has not been used special equipment and devices. The using of lift devices were at significantly less risk of injury for MSDs [27].

Psychological Factors

The relationship work-related psychosocial factors (PSFs) and musculoskeletal disorders have been greatly documented in many studies [25, 28, 29]. Studies demonstrated that relations of PSFs

and physical exhaustion have likely increased the risk of MSDs in nurses. High perceived workload, role conflicts, low job satisfaction, poor social support, time pressure, low justice and respect in the workplace were among those factors constantly effected these disorders in several studies [7,21,30-33].

Freimann et al. examined the psychosocial factors related to musculoskeletal pain in nurses. Based on the results of this study there was a significant association were observed between somatic stress symptoms (stomach ache; headache; palpitations; tension in various muscles) and MSP [28].

A study that conducted by Amin et al. proved that job control in daily responsibilities correlate with the incidence of pain or distress in the lower limbs (OR: 1.52) [29].

Demographic factors

Gender, BMI and year of employment of nurses have implications for the incidence of musculoskeletal symptoms [34,35]. The incidence of having at least one musculoskeletal symptoms elevated with age. Age-related changes, beginning at age 40, include less muscle mass, muscle capability, and intervertebral disc potency, leading to less power and mobility [32].

Heiden B et al. reported that physical capabilities may differ from the young to the old age in nurses and therefore the occurrence of MSD at different body sites, showing a important increase. They addressed the relationship age with MSDs and they categorized age in to three groups: <35, 35-44 and ≥45 years. Findings showed that no considerable increase of MSDs from the young (<35 years) to the middle (35-44 years) age-group, but there was increase of risk MSDs from the young to the old age-group (≥45 years), (p=0.000), and also from the middle to the old age-group (p=0.004) [36].

Chung et al. showed astonishingly a finding the frequency of MSDs was higher in the 20–24-year-olds than ≥60-year-old group. The age-specific occurrence of MSDs aligned from 56.0% to 85.6% among the nurses [22]. It is reasonable that because higher administrative nurses are older and have longer histories of employment as nurses [27].

According to the Bureau of Labor Statistics, in 2009, the mean number of absent days because of injury or illness was 6 for personnel age 25 to 34 years, 9 for personnel age 35 to 44 years, 11 for personnel age 45 to 54 years, and 13.7 for personnel age 55 to 64 years [37]. These data refers to older age health were important risk factors for the incidence of musculoskeletal pain [13]. Nurses with low back pain were older and had a longer work history, with a prevalence rate of 78.8% in those with a work history of 8 years or longer. With regards to the number of years of working as nurses, those with 2-5 years in service possess a 2.11 times higher risk of low back pain than those with <2 years in service [27]. In consistent with these studies Darby B et al. found a relationship between the factors with age, BMI and year of employment with the complaint in the body regions [19].

One of other demographic factors was body mass index (BMI) of nurses. A research has confirmed a strong relationship between being overweight and work related MSDs; however, this study showed that being underweight has a important connection with work related MSDs. Being underweight was also a major risk factor (OR 2.66, P = 0.004) [24].

Nurses with higher BMI were considerably more likely to report

discomfort in upper limbs, compared to nurses with lower BMI (OR: 1.05) [29].

Organizational Factors

The prevalence of MSDs among hospital nurses is high. Extended shift schedules, type of department and reduced staffing has increased job demands of nurses. Nurses usually have high work tasks because of personnel lack. Nurses are mainly disappointed with hard work schedule and shift work [23,38].

A research conducted by Arsalani in Iran found that neck pain was addressed by the nurses who worked over 44 h/week. Most Iranian nurses exposed the unpredictability of overtime work, but also experienced a high number of weekly working hours due to a lack of personnel [32].

Concerning with department, operation room nurses had the highest (74.3%) of discomfort incidence. Studies report that the operating room nurses are faced to a high level of physical ergo-nomic risk factors in their unit setting. Nurses in operating room organize for surgery by arranging instruments, aid the patient on operating table, assisting surgeon with instrumentation, and move the other machines. Theatre nurses practiced prolonged static postures (68.0% vs 52.0%), while assistant nurses announced high physical load (61.0% vs 44.0%) [20, 39]. Similarly Attar et al showed that the biggest risk was in nurses working in the operation room (OR 2.2) [24].

Musculoskeletal symptoms prevalence

Nurses reported about musculoskeletal disorders in the lower back, neck, shoulders, hands, and feet during the past 12 months according to Nordic Questionnaire in many studies. The participants suffer a relatively high prevalence of disorders low back, knee and neck as the three most common body regions during the preceding 12 months [26,32,40].

The rate of MSDs in different parts of world has been varied like that: Nigeria (85.0%), higher than those showed in Mexico (76.0%), Japan (70.0%), Canada (66.0%), and the United States (60.0%). In contrast, the rate was lower than that in Brazil (93.0%) and Turkey (90.0%) [24].

The evidences showed that nearly three out of four nursing personnel (73.2%), suffered from pain or discomfort in at least one of any of body region during the past 12 months [29].

The three body regions where discomfort was common (during two-time periods: the past 12 months and the past week, respectively) were: low back (65.3%, 39.8%), knee (56.2%, 35.2%) and neck (49.8%, 27.0%) [32].

Lower back disorders were the most common problem in many studies [14,33,41,42]. Lower back and neck are body areas most frequently affected by pain [28]. Nurses practiced some tasks more than 10 times a day, such as invasive actions (OR = 2.142); care of hygiene and patient comfort in bed (OR = 2.484); patient mobilization in bed (OR = 2.022); and patient feeding (OR = 2.186) influenced dorsal and lumbar symptoms (p<0.05) [43].

Neck pain was related with transferring patients, heavy lifting and standing an uncomfortable posture, poor job satisfaction and job control. Low-back pain was related with heavy lifting and transferring patients, extended standing position, twisting a scratchy posture, high work demand, poor job satisfaction. Knee

pain was related with extended standing position and poor job satisfaction [44].

Outcomes

Musculoskeletal disorders might have a severe impact on quality of life and may result in work constraint, absenteeism or even the want to change jobs [41,45]. Letvak et al aimed to determine the extent to which health problem in nurses affects their work productivity; they found the incidence of musculoskeletal pain was 71.0% of nurses had affected their productivity [46]. Murray et al surveyed a study related to work absence duration due to MSDs, and they assessed the mean cumulative work absence was 19.2 days in the past 12 months [45].

Teaching of self-care and preventative measures for these health risks is still inadequate. This could affect the willingness for nurses to contribute professionally and stay in their jobs [27].

Recommendations

Use of mechanical devices to lift patient can decrease the risk of musculoskeletal complaint from patient handling. Some intervention researches have reported important reductions in biomechanical anxiety, musculoskeletal pain, and injury rates when nurses used biomechanical equipment. Taking away manual handling activities and supporting the use of lifting device have become a key factor of safe patient handling policies internationally [14,18,31,42,47]. For the level of lift use, important interactions were found for work-related shoulder pain and any neck pain. Using medium-level lift decreased the risk of shoulder pain three times than nurses without lifts, and using low-level lift increased the risk of neck pain three times. There was no association with low back pain and lift use at any level, but findings showed a reduction in low back pain rate by the level of lift use [31].

There were some strategies to tackle with MSDs: change of working technique, use of lifting devices and avoiding tough tasks at work. Educational programs may helpful reducing the MSDs prevalence [22].

Hospital administrations should implement coping strategies, such as shorter shifts in the most at-risk departments [24].

Raising self-awareness and encouraging proper physical activity and stretching exercises, and instructing how to act in response to MSDs [27]. Compatible with these results exercising at least moderate level decreases the risk of musculoskeletal disorders [42].

Hospital wellness programs considered to support good ergonomic practices to get better anxiety and disorders will be of benefit for nurses [35].

Discussion

This review examined the prevalence of work related MSDs (low back, neck, shoulder, and upper back) from 34 published studies of nurses working in hospitals. The literature reviewed in this study showed that risk of work related MSDs can increase with associated many factors such as physical, psychological, demographic and organizational factors. The researchers found substantial variation in prevalence rates of the musculoskeletal disorders. The work related MSD have been reported to range between 33.0% and 88.0% for nurses in the reviewed studies. The highest prevalence of disorders was low back pain. Lower back pain complaints were

found to vary between 49.0% and 84.0%.

The musculoskeletal disorders were most seen among the operation room nurses than other units according to studies included in this review. Also, MSDs were found to be the most important causes of absenteeism, demanding a change of duty or job and visiting a physician.

Some study samples included small proportions of nurses such as 42, 58, 76 nurses [18,30,40], some included large samples 5187, 3914 and 2851 nurses [14,22,47]. Many studies examined the all risk factors for MSDs, a few studies addressed only psychosocial factors for MSDs. Prevalence and incidence of symptom or pain were identified by self-report in all included studies. Self-report refers to both over- and under-estimation of prevalence of health outcomes. The terminology used to in many studies for musculoskeletal disorders was injury, pain, complaint, discomfort. The frequency of musculoskeletal disorders in the past years was assessed with Nordic Musculoskeletal Questionnaire in one third of studies.

Hospital administrators should take some precautions to prevent musculoskeletal disorders such as using devices and lifting equipment, setting an ergonomics hospital environment, giving education about coping strategies and reducing psychosocial factors. In addition to this, nurses should pay attention body posture during working tasks and physical activity.

Conclusion

Work related MSD was a common occupational health problem among nurses who provide direct patient care. This review research summarized the latest literature on work-related musculoskeletal disorders in nurses. Work related MSD are associated with both demographic characteristics of nurses and hospitals' organizational factors. As a result, it may be helpful for hospital administrators to implement some measures such as ergonomics solutions, stress reduction plan, educational program in the most risk department. It has been confirmed that using devices for transferring and lifting patients might decrease risk of MSD in nurses.

Future research should focus on minimize hazards and risks through work design. The findings from this study can provide comprehensive information for researchers.

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