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The prevalence of musculoskeletal disorders and low back pain among Italian nurses: an observationalstudy

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Abstract. *Background and aim of the work:* Musculoskeletal disorders and low back pain have negative impact amongst Italian nurses who work in hospital. Nursing staff are known to be at risk of developing back disorders, where low back pain has a prevalence from 16% to 60% in the world. This study aims to determine the prevalence of musculoskeletal disorders and low back pain among nurses who working in a Roman hospital. *Methods:* Cross sectional study was carried out in an Italian hospital and the Nordic Musculoskeletal Questionnaire-IRSST was administered to 256 registered nurses. Logistic regression analyses were performed to understand risk factors associated with pain. *Results:* Nurses reported different locations of pain related to musculoskeletal disorders. The prevalence of low back pain was 90.2% during life, 80% during the last year and 44.5% during the last week. Female sex increases the risk of being affected by low back pain (OR = 2.07, 95% CI= 1.00-4.32). *Conclusions:* Musculoskeletal disorders and low back pain are reported by the majority of nurses interviewed, and a higher prevalence is observed in women. Pain does not depend on the amount of years of work, nor on age or body mass index. In order to assess the prevalence of low back pain carefully, it is recommended to study a greater number of Italian nurses in different hospitals. (www.actabiomedica.it)

Key words: prevalence, nurse, low back pain, musculoskeletal disorder, risk factors, Italy

Introduction

Musculoskeletal disorders (MSDs) are public health problems in several countries, particularly among nurses. Karahan et al. found the highest prevalence of MSDs (77.1%) in a sample health care workers in Turkey (1), while in Japan it is much lower at around 37% (2), in European countries it is around 25% (3). Nursing staff are known to be at risk of developing back disorders (4), where low back pain (LBP) has a prevalence from 40% to 60% in Asiatic countries (5,6) and around 46-47% in USA. In Europe one multicentre study showed a prevalence of 16% of LBP

and increased to 32% in the middle of the lumbar area (7). In Italy the prevalence was higher ranging from 36% to 86% (8). These disorders can interfere with work and daily life activities (9) causing significant changes in the quality of life until leaving the job (10). Furthermore, the LBP can be responsible of absence from work, reducing productivity and decreasing the capacity to carry out daily activities, with heavy economic and social repercussions, in terms of diagnosis and therapeutics(11). In parallels of the problem of absenteeism the phenomenon of presenteeism is significant: workers, despite the presence of pain, reach their workplace, with a reduction of the work productivity

(12) with estimated costs higher than those linked to sick leave and medical expenses (13). This situation exposes the worker to the risk of developing further clinical disorders like coronary heart disease (4).

The causes of LBP can be linked to the different mechanical strains to which the nursing staff is exposed during daily care, especially with non-autonomous or bedridden patients. One other cause could be that they work usually over a continuous period of time, ensuring their presence in service all day and night (18). The main risk factors are female sex (14,15), age (1,16), years of service (1,17,18,20), stress (17) manual mobilization of patients, lack of knowledge of ergonomic principles (1), sedentary lifestyle and overweight (14). Although there are a significant number of international studies describing the phenomenon from an epidemiological point of view, only few recent studies (8) focus on MSD and LBP among Italian nurses and their risk factors.

Aim

This study aims to determine the prevalence of MSD disorders among nurses in a Roman hospital with particular attention to LBP.

Methods

Design of the study

A cross-sectional study was carried out at AO San Camillo-Forlanini Hospital in Rome between January and March 2017. The research report was written according to STROBE recommendations (21).

Setting and participants

The population was composted by nurses working in three different clinical areas of the hospital: Acute, Sub-Intensive Care Unit and Intensive Care Unit. We extracted a convenience sample of this population. According to the literature we used a prevalence of LBP in Italy of 60% (33), with a 95% confidence level, and estimated the sample size of 246 units.

Instruments

We used the Italian version of the Nordic Muskuloskeletal Questionnaire-IRSST (NMQ) (22), a structured self-reported questionnaire mainly composed of multiple-choice questions. The tool consists of three parts and includes a total of 52 multiple choice questions. The first part (16 items) includes general information, the second part (27 items) investigates musculoskeletal disorders, and the third part (9 items) focuses on LBP. Other socio-demographic and clinical variables were also collected, such as: sex, age, body max index (BMI), type of employment contract, education (basic and post), specific training on manual handling of loads, and medical history such as: date of first episode of lumbo-sacral pain and duration of episodes, the intensity of pain (numeric rating scale-NRS), history of past injuries, load relief, analgesic therapy used and level of satisfaction.

Ethical aspects

The study was approved and all nurses recruited from the operative unities, have freely joined the study and have been fully informed about the purposes of the study and have signed the informed consent. The data were collected according the anonymity, according to the Italian legislation on the protection of personal data (Law 196/2003, European Regulation (EU) 2016/679).

Statistical analysis

The variables collected were coded and entered into an IBM SPSS Statistics (vs-22) database and processed for descriptive statistics, for frequencies, percentages, averages and standard deviation (SD). The relationship with some risk factors, such as the BMI, has been described using both point values (rounded to the unit) and the subdivision into categories according to the WHO classification (23): underweight: BMI < 18.5; normal weight: BMI 18.5-24.9, pre-obesity: BMI 25-29.9, obesity class I and II: BMI 30-39.9; obesity class III: BMI ≥ 40. The significant differences between qualitative variables as class of age, sex and BMI in relation to the prevalence of lumbar disorders

have been tested using the Chi Square test. With an alpha risk = 0.05. The correlation with the risk factors for LBP were analyzed using the odd ratio (OR) in univariate (non adjusted OR) and multivariate (adjusted OR) analysis.

Results

On a total of 340 questionnaires distributed to nurses who spontaneously 280 were returned, with a response rate of 82.3%. The questionnaires well filled up and included in the analysis were 265 (94.6%). The remaining (5.4%) were excluded as incomplete. The sex ratio F/M of the sample was 2.95 with 74.7% of females (Table 1).

The nurses worked in three different hospital areas, acute care area 66.8%, sub-intensive care unit 16.2% and intensive care unit 27.9%.

The main part of the sample (93.2%) had a full-time employment contract, 16.2% worked only in the morning shift, while 83% worked in the 24-hours shift (morning-afternoon-night); the average of working hours a week declared was 36.76 (SD = ± 4.9, range = 7- 40 hours), moreover 45.3% of the sample declared that they regularly work more than 10 hours a day. Only on third of the sample declared suffering of accidents or injuries in the past which led or may have

Table 1. Characteristics of the sample

Variables	Total n (%)	Female n (%)	Male n(%)	p-value
Total sample	265 (100%)	198(74.7)	67(25.3)	
Age mean (SD)	43.9 (+/-8,2)			
20-29		10(3.8)	4(1.5)	0.613
30-39		38(14.5)	11(4.2)	
40-49		103(39.5)	30(11.5)	
50-59		41(15.7)	19(5.0)	
60-69		3(1.1)	2(0.7)	
Education				
Bachelor Degree	76 (28.6)	28,3% (56)	29,9%(20)	
University Diploma	38 (13.6)	15,2% (30)	12,0% (8)	
Diploma	151 (57.8)	56,6% (112)	57,2% (39)	
Post-Education				
Master Degree (MsN)	81 (30.2)	29,7% (59)	31,4% (21)	
Ph.D	1 (0.4)	0	1,5% (1)	
Training on Manual handling				
Yes	216(81.5%)	79,3% (157)	88,1% (59)	0,11
BMI (mean (SD)	24.1 (+/-4,0)			
Underweight< 18.5	7 (2.7%)	7 (3.7%)	0 (0)	**_0.036_**
Normalweight18.5-24.9	168 (65.5%)	131 (69.0%)	37 (55,2%)	
Pre-obesity25.0-29.9	60 (23.4%)	39 (20,5%)	21(31,3%)	
Obesity Cass I and II 30.0-39.9	15 (5.7%)	10 (5,3%)	5(7,5%)	
ObesityCass III >40.0	7 (2.7%)(2.7)	3 (1.6%)	4 (6.0%)	
Weight (Kg) mean (SD)	67.2(+/-14)	62,7(+/-11,1)	80,3 (+/-13,3)	0,001
Height (cm) mean (SD)	166.8(+/-8,8)	163,3 (+/-6,5)	177,2 (+/-5,9)	0,001
DS*= standard deviation				

led to MSDs, 14.7% of which were due to accidents at work, 19.9% to road accidents and 7.1% to other types of unspecified cause.

Musculoskeletal disorders

Nurses reported different locations of pain related to MSDs (table 2).

More than half of the nurses complained pain in lumbar, neck, shoulders, dorsal areas. Lumbar pain in the last 12 months was the main disorders in the all sample (83.4%), after we found neck pain (71.3%), two third on shoulders (64.5%) and dorsal (59.6%). The distributions and differences of the relative locations of the pain according to the sex were summarized in table 3.

The distribution of pain according the sex presented some differences. Women mainly complained about pain than men: neck pain (77.3%) vs 53.7% for men (p<0.0001); other differences about pain in shoulders in the last 7 days: 36% for women vs 17.9 % (p<0,005), wrists (last 12 months) 45% vs 31.3% in men (p<0.018), lumbar in the 7 days 51% vs 34.3% (p<0.018), dorsal in the 12 months 64,7% vs 44.8% (p<0,004) and finally hips in the last 7 days 22.7% vs 10.5% (p<0.029).

Focus on low back pain

The prevalence of LBP in our sample was 90.2% during life, 80% during the last year and 44.5% during the last week. The prevalence of LBP no significant differences in the three different care settings (p=0.28): in acute area we founded 49.1%, 14,7% in sub-intensive care unit and 27.9% in intensive care unit. LBP in the last 7 days prevailed in women (p=0.018). In our study we didn't find significant associations between age/years of service and the prevalence of low back pain. The mean intensity of pain experienced by nurses due to LBP according to NRS was 5.62 (SD = ± 1.973), and the most painful episode was 7.47 (SD = ±2.203). There were no significant differences in the perception of the intensity according to the sex (p=0.609). Table 4 describes the prevalence and characteristics of LBP.

Table 5 summarized the univariate and the multivariate analysis of the distribution of LBP according to several risk factors.

The univariate analysis showed a lot of potential risk factors for LBP like sex (female), age (>35 years), BMI (overweight and obesity) and years of work (<19 years), but no factor presented any statistical significance. At the multivariate analysis, the logistical regression demonstrated the link between sex and LBP,

Table 2. Locationsaffected by MSD disorders

Location of pain	Disorders in the last 12 months	Disorders in the last 7 days	Impact of pain on normaldaily life activities
	Fq(%)	**Fq(%)**	**Fq(%)**
Lumbar	221 (83,4 %)	124 (46,8%)	143 (54%)
Neck	189 (71,3%)	99 (37,4%)	104 (39%)
Shoulders	171 (64,5%)	84 (31,7%)	90 (34%)
Dorsal	158 (59,6%)	86 (32,5%)	99 (37%)
Wrists	116 (43,8%)	58 (21,9%)	69 (26%)
Knees	111 (41,9%)	52 (19,6%)	58 (21,9%)
Hips/thighs	105 (39,6%)	52 (19,6%)	60 (22,6%)
Ankles	78 (29,4%)	40 (14,7%)	44 (16,6%)
Elbows	64 (24,2%)	24 (9,1%)	30 (11,3%)

Table 3. Dictributions and differences of locations of pain according the sex

Location of pain	Occurrence time	Male % (n)	Female % (n)	p-value
Neck	last 12 months	53,7% (36)	77,3% (153)	**< 0.0001**
	last 7 days	28,4% (19)	40,4% (80)	0.078
Shoulders	last 12 months	55,2% (37)	67,7% (134)	0.07
	last 7 days	17,9% (12)	36,4% (72)	**0.005**
Elbows	last 12 months	23,9% (16)	24,2% (48)	0.952
	last 7 days	4,5% (3)	10,6% (21)	0.131
Wrists	last 12 months	31,3% (21)	45,0% (95)	**0.018**
	last 7 days	14,9% (10)	24,2% (48)	0.111
Dorsal	last 12 months	44,8% (30)	64,7% (128)	**0.004**
	last 7 days	23,9% (16)	35,4% (70)	0.083
Lumbar	last 12 months	76,1% (51)	56,9% (170)	0.064
	last 7 days	34,3% (23)	51,0% (101)	**0.018**
Hips	last 12 months	31,3% (21)	42,4% (84)	0.109
	last 7 days	10,5% (7)	22,7% (45)	**0.029**
Knees	last 12 months	43,3% (29)	41,4% (82)	0.789
	last 7 days	25,4% (17)	17,7% (35)	0.170
Ankles	last 12 months	17,9% (12)	33,3% (66)	**0.015**
	last 7 days	10,5% (7)	16,7% (33)	0.432

Table 4. Focus on LBP

LumbarDisorders	Fq	(%)	
At least once in a lifetime	239	(90,2)	
At least once in the last week	118	(44,5)	
At least once in the last 12 months	221	(83,4)	
Number of daysduring the last 12 months with disorder			
1-7 days	111	(50.2)	
8-30 days	49	(22.2)	
More thanonemonth	38	(17.2)	
All the days	18	(8.1)	
missing	5	(2.3)	
total	221	(100)	
Duration of episodes of lumbar pain			
1-7 days	188	(78.7)	
8-30 days	40	(16.7)	
1-3 months	2	(0.8)	
More than 3 months	9	(3.8)	
total	239	(100)	
Days on whichlumbardisordershaveimpairednormalactivities from beingcarried out in the last 12 months			
Never	63	(28.5)	
1-7 days	90	(40.7)	
8-30 days	42	(19.0)	
More thanonemonth	21	(9.5)	
missing	5	(2.3)	
Total	221	(100)	
Anamnesticfeatures			
discopathy/radiculopathy	95*	(46.1)	
medical, physiotherapist or otherspecialisedvisitsbecause of lower back disorders	111	(53.9)	
* 22 (%) exempted from manualhandling of loads			

Table 5. Univariate and mulivariateanalysis of Lumbar pain distributionaccording to potentialriskfactors

Variables	% (p value)	Non-adjusted OR (IC95%)	Adjusted OR
Sex			
Male	76,1%	1	1
Female	85,9% NS*	1,9 (0,96-3,8)	2,07 (1-4,32)
Classes of age			
< or =35 years	79,0%	1	0,72 (0,26-2,01))
>35 years	84,3% NS	1,43 (0,61-3,38)	1
BMI			
Under and normalweight	82,3%	1	1
Overweight and obesity	86,6% NS	1,39 (0,66-2,92)	1,48 (0,68-3,19)
Years of work			
< or = 19 years	85,0%	1	1,57 (0,75-3,32)
> 19 years	80,7% NS	0,74 (0,37-1,47)	1

* Non significant

female is the only statistical significant risk factor (OR = 2, 07; CI 95% 1-4,32).

Pharmacological and non-pharmacological treatments

Paracetamol and NSAIDs were used as pharmacological treatments for LBP by 74.3% of the nurses, the 4.9% used minor opioids and 1.1% major opioids. In addition, unconventional strategies were used, such as bed rest in 22.6% of cases, physiotherapy in 20.7% used, while 13.2% used no medication. The treatments received didn't work enough in 14.0 % of the cases vs 86% satisfied, with no significant differences between the two sexes (p=0,378). Among the nurses who had LBP in the last 12 months it emerges that 29.2% declared that their lumbar disorders didn't impact on normal activities at work or at home, 41.7% declared the pain impact on normal activities at work or at home for 1-7 days, 19.5% declared that LBP impacted on activities at work or at home for 8-30 days and 9.7% for more than 30 days.

Discussion

The aim of this survey was to determine the prevalence of DMS and LBP among a sample of 265 registered nurses in one Roman hospital, and to investigate the risk factors through the NMQ. The sample is mainly composed by female nurses, as for the entire nursing population in Italy (24).

Musculoskeletal disorders

This study has shown that musculoskeletal disorders are particularly common in nurses who are in direct contact with patients, in over half of the sample. Nurses reported that the most common sites where they had pain related to MSDs were mainly lumbar, neck, back and shoulders (table 2).

These sites are considered globally a cause of physical disability (25), specifically, exposure to high demands, low control, effort-reward imbalance, as been found associated with the lower back, around the neck, shoulder and pain in different anatomical site (4,26). There are significant differences between sexes

and sites of the pain. It is plausible that the differences are also correlated by the significant differences of the higher BMI of the females compared to the males but also to the substantial differences between the sexes that are described in a recent epidemiological survey on the Italian population (27). This survey showed that the LBP characterizes the female sex, age over 35 years and overweight, as described. The nature of the schedule of work (shift work), work experience (>7 years), sex (female) and BMI were significantly associated with prevalence of LBP among nurses (28,29). It is known that physical exercise is a protective factor against low back pain and overweight (30). The LBP represents the most widespread location among nurses who voluntarily adhered to participate in this survey, in the last 12 months (> 80%), in the last 7 days (> 40%), and seems to have a considerable impact on daily life activities (table 2) on about half of nurses, whereas the average intensity of pain is described as moderate (VAS = 4-6), with peaks up to severe pain (VAS> 7). However, other studies have documented various rates of prevalence work related LBP in nurses from various populations for a 12-month time period: in Brazil over 70% (31), in Korea 19.8% (32) , in France 41.1% (33), in Nigeria 44.1% (34) and in Italy (8,16). The prevalence of LBP in nurses is traditionally attributed to high physical demands (35), because where the nurses are subjected to flexion and torsion during care (4,36), or to the low compliance to the use of necessary aids for the safe handling of bed ridden patients. Probably they have not retrained, about best practice, due to lack of time, culture or limited availability in the care departments of specific equipment, which can facilitate handling, such as the high sliding crossbar, the trapeze, the mechanical lift, which can be reduce damage to the spine and to the osteo-muscular system. Prevention of LBP involves first and foremost the application of ergonomic principles, an appropriate work organization, and specific information from the employer on potential risks. Furthermore, Directive 2003/88/EC of the European Parliament and of the Council of the 4 November, 2003 establishes the minimum health and safety requirements concerning the organization of working time, specifying daily rest periods, breaks, the maximum weekly work duration, annual time off and aspects relating to night work,

shift work and the time rest by work. Although the European directive dates back to around 15 years ago, Italy has only implemented it in the last three years, so many nurses have worked continuously even for a time not exceeding 17 hours, with a weekly number of hours exceeding 36 hours, up to a maximum of 43 hours. it is singular how a period of professional experience over 20 years seems to be a protective factor. It is plausible that such nursing staff is often trained or generally work on two shifts (no night) or they in Day-Hospital, Day-Surgery or outpatient services, compared to the Units where nurses work around 24 hours and assist non self-sufficient patients. However, LBP remains the most common musculoskeletal disorder among nurses, characterized by long-term painful episodes, from 1 to 7 days for more than the majority of our sample, with peaks ranging from 8 to 30 days on more than 15% of nursesour sample. This can represent the main cause of absence due to illness in this professional group (37), in particular for a nurse population not very young, over 40 years old, with work experience at least 20 years in clinical wards and not always numerically adequate. In 2017, Italy had 5.4 nurses per 1,000 inhabitants, below the OECD average of 9.0 nurses per 1,000 inhabitants (38). The nature of the schedule of work (shift work), work experience (>7 years), sex (female) and BMI were significantly associated with prevalence of LBP among nurses (39).

Conclusions

MSD and LBP disorders characterize the Italian nursing population as in other countries, and affect the well-being of the professional's private and occupational health. This can compromise the quality of the work performed in the clinical setting, as well as its presence to guarantee the continuous presence in the workplace, as well as the potential risk of presenteeism. The quality assessment of data was based on validated scales as NMQ, but self-reporting of nurses' perception could be a source of recall bias. Furthermore, a small sample of convenience of a single hospital was used, therefore its generalizability must be taken with caution. Future studies will have to investigate whether the correct observation of the principles

of ergonomics in the workplace, execution of physical exercises, monitoring of the psycho-physical well-being of the nurses are able to highlight cases of MSD or LBP early, also through an optimal management of the human resources, and guarantee numerical standards proportional to workloads. Continuing education pathways are necessary to change the risk behaviors of the nurses and the employment of a young nursing population for care activities on partially or totally dependent patients. We would be useful to monitor MSD cases through a clear monitoring system to apply prevention strategies as a mission of manager of health departments and improving the well-being of healthcare workers and significantly influencing the quality of the care process (40).

Conflict of interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article

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