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Original article

THE IMPACT OF AGE AS RISK FACTOR IN THE DEVELOPMENT OF SYMPTOMS OF MUSCULOSKELETAL DISORDERS RELATED TO WORK OF A DEFINED GROUP OF NURSES

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Abstract

Introduction: If musculoskeletal disorders are caused or aggravated by work and/or the effects of the immediate work environment, they are called work-related musculoskeletal disorders (MSD). The physical capabilities that enable people to cope with the physical demands of work are naturally subject to decline with age.

Aim: The aim of the paper was to assess the influence of age as a risk factor in the development of symptoms of musculoskeletal disorders related to work in a defined group of nurses.

Material and method: The study included 160 nurses divided into two groups. The first group consisted of nurses under 45 years of age, and the second group nurses over 45 years. The used instrument was the medical history questionnaire and checklist for work-related MSD symptoms from the Canadian Centre for Occupational Health and Safety

Results: Musculoskeletal pain was registered in a total of 136 (85%) nurses, of which 71 (100%) nurses were over 45 years of age, and 65 (73.0%) nurses under 45 years of age. 20.2% of nurses under 45 years of age and more than half (57.7%) of nurses over 45 years of age were absent from work due to musculoskeletal disease. 33.8% of nurses over 45 years of age were hospitalized due to musculoskeletal disorder.

Conclusion: The results of our study and literature data indicate a significant influence of age on the development of symptoms of work-related musculoskeletal disorders in nurses. Therefore, timely ergonomic intervention and regular health monitoring is necessary.

Keywords: aging, musculoskeletal disorders, nurses

Introduction

Musculoskeletal disorders (MSDs) cause inflammatory and degenerative changes that affect the muscles, tendons, nerves, joints, ligaments, and associated blood vessels[1]. If musculoskeletal disorders are caused or aggravated by work and/or the effects of the immediate work environment, they are called work-related musculoskeletal disorders[2]. According to the International Classification of Diseases ICD-11, more than 150 diagnoses are related to musculoskeletal disorders[3]. Studies by the World Health Organization (WHO) show that between 20% - 33% of people worldwide live with pain due to MSDs[4].

A large number of studies indicate significant risk factors in the workplace that arise from:

- the conditions and manner of work (improper posture, excessive force, repetitive movements, poor equipment, stress, etc.)
- the individual characteristics of the people working in that workplace (gender, age, body composition - BMI, presence of comorbidities, insufficient physical fitness, lack of work experience, etc.), which can influence the development of MSDs[5,6].

The physical capabilities (such as muscle mass and therefore muscle strength) that enable people to cope with the physical demands of work are naturally subject to decline with age[7].

From about age 30, the density of bones begins to diminish in both men and women. This loss of bone density accelerates in women after menopause. As a result, bones become more fragile and are more likely to break, especially in old age. As people age, their joints are affected by changes in cartilage and in connective tissue. Thus, in some people, the surfaces of the joint do not slide as well over each other as they used to. This process may lead to osteoarthritis[8].

The leading symptom of most musculoskeletal disorders is pain, and it is one of the most common causes of disability, absenteeism, and healthcare utilization by insured persons[9].

The risk of MSD is 3.5 times higher in healthcare workers[10]. It is estimated that almost one third of all cases of illness in healthcare workers are related to MSDs[11]. According to EU-OSHA, in 2015, the healthcare sector ranked 4th in Europe with a 47% prevalence of MSD[12,13]. Epidemiological studies show that MSD is a major occupational health problem among nurses[14]. More than half of absences are related to musculoskeletal disorders[15]. In nurses, the incidence of musculoskeletal disorders increases with age and increasing body mass index (BMI)[16].

To address contemporary issues of an aging healthcare workforce in Western countries and the expected increase in demand for healthcare, healthcare organizations face a serious challenge in maintaining the well-being of nurses throughout their working lives. As a result, workplace design and the adaptation of work tasks to the age of healthcare workers will be of particular interest in the coming years[17,18].

Aim of the study

The aim of the study was to assess the influence of age as a risk factor in the development of symptoms of musculoskeletal disorders related to work in a defined group of nurses.

Material and method

This was a descriptive-analytical cross-sectional study, which included 160 nurses divided into two groups. The first group consisted of nurses aged 20 to 45, and the second group of nurses over 45 years of age. The study was conducted in public and private healthcare institutions, in the period from September 2020 to June 2022.

The instrument used to obtain data in the current was a specially designed extended version of the medical history questionnaire and checklist for work-related MSD symptoms from the Canadian Centre for Occupational Health and Safety[9].

This questionnaire is adapted from the ergonomic program for MSD prevention from the Canadian Centre for Occupational Health and Safety[9]. The questionnaire consists of questions related to MSD and concerns the perception of work-related symptoms (pain during work/pain after completing work or pain after a week of absence from work, impact of pain in performing work tasks). Specially designed questions concern the use of medical devices, computers, training and education for their proper use, use of personal protective equipment, treatment, absences or hospitalization due to MSDs, regularity of health monitoring and assessment of work ability.

The obtained data were statistically analyzed with the SPSS 26.0 program. Continuous variables are expressed as mean values with standard deviation, and nominal variables as absolute numbers and percentages.

Results

Table 1. Display of results from responses to questions on the relationship of pain as a symptom of musculoskeletal disorders with work tasks during work, after work and after one week of absence from work

Is this pain present during work tasks?			***(p)***
Total n=160	**number**	**%**	
Lower	49	30.6	
Same	47	29.4	
Increased	40	25	
pain/age <=45y n=89	**number**	**%**	
Lower	35	53.8	**p<. 05 (Pearson Chi-square: 17.7443, df=2, p=.000140)**
Same	18	27.7	
Increased	12	18.5	
pain/age >45y n=71	**number**	**%**	
Lower	14	19.7	
Same	29	40.8	
Increased	28	39.4	
Is this pain after finishing work tasks			***(p)***
Total n=160	**number**	%	
Lower	5	3.1	
Same	62	38.7	
Increased	69	43.1	
pain/age <=45y n=89	**number**	%	NS
Lower	4	6.1	p<. 05 (Pearson Chi-square:
Same	25	38.5	3.99609,
Increased	36	55.4	df=2, p=.135600)
pain/age >45y n=71	**number**	**%**	
Lower	1	1.4	
Same	37	52.1	
Increased	33	46.5	
After a week's absence from work, is this pain			***(p)***
Total n=160	**number**	%	
Lower	85	53.1	
Same	50	31.2	
Increased	1	0.6	
pain/age <=45y n=89	**number**	%	***p<. 05 (Pearson Chi-square: 21.6457, df=2, p=.000020)***
Lower	53	81.5	
Same	11	16.9	
Increased	1	1.5	
pain/age >45y n=71	**number**	%	
Lower	32	45.1	
Same	39	54.9	
Increased	/	/	

Numerical data are expressed as the number and percentage of respondents, p<. 05 (Pearson Chi-square)

The study involved 160 nurses, of whom 94.4% were women, with an average age of 46.7±11.0 years, 89 (55.6%) were between 20 and 44 years old, and 71 (44.4%) were older than 45 years; 77.5% had secondary education, BMI was within the normal range (24.4); 33.7% were smokers. Among them, 50.0% were nurses in primary care, 25.0% worked in secondary care and dentistry. The average length of service at their current job was 12.8±6.46 years, and none of the respondents worked night shifts.

Table 1 shows the results of responses on the relationship of pain as a symptom of musculoskeletal disorders with work tasks during work, after completing work and after one week of absence from work.

In total, 136 (85%) nurses, of which 65 (73.0%) nurses under 45 years old and all 79 (100%) nurses over 45 years old, pain due to MSD was registered.

During the performance of work tasks, musculoskeletal pain increased in a total of 25%, of which 18.5% nurses under 45 years old and 39.4% nurses over 45 years old. During the performance of work tasks, pain was the same in 27.7% nurses under 45 years old and 40.8% nurses over 45 years old. A significant relationship was registered between age (<=45; >45) and the level of pain.

After completing the work process, musculoskeletal pain is the same in 38.7% of the total number of nurses, of which 38.5% of nurses are younger than 45 years old, and in more than half (52.1%) of nurses who are older than 45 years old. Pain is increased in a total of 43.1% of nurses, of which 55.4% of nurses are younger than 45 years old, and in 46.5% of nurses who are older than 45 years old. There is no significant relationship between age (<=45; >45) and the level of pain after completing the work process.

After a one-week absence from work, musculoskeletal pain is the same in 31.2% of the total number of nurses, of which 16.9% are nurses younger than 45 years old, and more than half (54.9%) are nurses older than 45 years old. Pain is less in 53.1% of the total number of nurses, of which 81.5% are nurses younger than 45 years old, and 45.1% are nurses older than 45 years old. A significant relationship is registered between age (<=45; >45) and the level of pain after a one-week absence from work.

Table 2. The impact of pain on the performance of work tasks

How much does it affect your work?			***(p)***
Total n=160	**number**	**%**	
No impact	46	28.7	
Little impact	55	34.4	
absent from work because of the pain	35	21.9	
age<=45г n=89	**number**	**%**	p<. 05 (Pearson Chi-square: 29.3348, df=2, p=.000000).
No impact	33	50.8	
Little impact	28	43.1	
absent from work because of the pain	4	6.1	
age >45г n=71	**number**	**%**	
No impact	13	18.3	
Little impact	27	38.0	
absent from work because of the pain	31	43.7	

Numerical data are expressed as the number and percentage of respondents, p<.05 (Pearson Chi-square)

Table 2 illustrates the results of responses on the impact of pain on work performance. In a total of 28.7% of nurses, of which half (50.8%) of nurses under 45 years of age and 18.3% over 45 years of age, pain does not affect work. Due to pain, a total of 21.9% of nurses, of which 6.1% of nurses younger than 45 years of age, were absent from work, and among older nurses, this percentage is significantly higher (43.7%). A significant relationship was registered between age (<=45; >45) and the impact of pain during the work process.

Table 3. Display of results from the answers to the questions whether they use medical devices, computers, whether they have training and education for the safe use of the devices and whether they use protective equipment at work

Do you work with medical devices at your workplace?			***(p)***
Total n=160	**number**	**%**	
yes	135	84.4	
no	25	15.6	
age<=45г n=89	**number**	**%**	p<.05. (Difference test,
yes	82	92.1	p=.0026)
no	7	7.9	
age >45г n=71	**number**	**%**	
yes	53	74.7	
no	18	25.3	
Do you work with a computer at your workplace?			
Total n=160	**number**	**%**	
yes	160	100	
age<=45г n=89	**number**	**%**	
yes	89	100.0	
age >45г n=71	**number**	**%**	
yes	71	100.0	
Have you had any training or education on the safe use of the devices?			***(p)***
Total n=160	**number**	**%**	
yes	87	54.4	
no	73	45.6	
age<=45г n=89	**number**	**%**	p<.05. (Difference test,
yes	56	62.9	p=.0154)
no	33	37.1	
age >45г n=71	**number**	**%**	
yes	31	43.7	
no	40	56.3	
Do you use personal protective equipment at work?			
Total n=160	**number**	**%**	
yes	160	100	
age<=45г n=89	**number**	**%**	
yes	89	100.0	
age>45г n=71	**number**	**%**	
yes	71	100.0	

Numerical data are expressed as the number and percentage of respondents
p>0.05 (Difference test)

Table 3 presents the results of responses about the use of medical devices, working on a computer, training and education for the safe use of devices, and the use of protective equipment at work.

135(84.4%) of the total number of nurses of which 92.1% under 45 years of age and 74.7% over 45 years of age work with medical devices. The percentage differences registered between the two groups are significant.

All nurses at their workplace use computers and protective equipment at work. Half (54.4%) of the total number of nurses of which 62.9% under 45 years of age and 43.7% over 45 years of age, have had training or education for the safe use of devices. The percentage differences registered between the two groups are significant.

Table 4. Overview of responses to questions about whether they were absent from work, hospitalized, and had physical therapy due to a musculoskeletal disorder

Have you ever missed work due to pain or discomfort related to a musculoskeletal disorder?			***(p)***
Total n=160	**number**	**%**	
yes	59	36.9	
no	101	63.1	
age<=45г n=89	**number**	**%**	p>. 05 (Pearson Chi-square:23 .8870, df=1, p=.000001).
yes	18	20.2	
no	71	79.8	
age>45г n=71	**number**	**%**	
yes	41	57.7	
no	30	42.3	
Have you been hospitalized for this pain or discomfort?			***(p)***
Total n=160	**number**	**%**	
yes	27	16.9	
no	133	83.1	
age<=45г n=89	**number**	**%**	p<. 05 (Pearson Chi-square: 26.1264, df=1, p=.0000002).
yes	3	3.4	
no	86	96.6	
age >45г n=71	**number**	**%**	
yes	24	33.8	
no	47	66.2	
Have you had physical therapy?			***(p)***
Total n=160	**number**	**%**	
yes	83	51.9	
no	77	48.1	
age<=45г n=89	**number**	**%**	p<. 05 (Pearson Chi-square: 29.8965, df=1, p=.000000)
yes	29	32.6	
no	60	67.4	
age >45г n=71	**number**	**%**	
yes	54	76.1	
no	17	23.9	

Numerical data are expressed as the number and percentage of respondents
p<. 05 (Pearson Chi-square

Table 4 shows the results of responses regarding absence from work, hospitalization, and whether nurses had physical therapy due to musculoskeletal disorders.

36.9% of the total number of nurses, of which 20.2% under 45 years and 57.7% over 45 years, were absent from work due to a musculoskeletal disorder. A significant association was registered between age (<=45; >45) and absence from work.

16.9% of the total number of nurses, of which only 3.4% of the group under 45 years, and 33.8% of the group over 45 years, were hospitalized due to musculoskeletal disorder. A significant association was registered between age (<=45; >45) and hospitalization.

Half (51.9%) of the total number of nurses, of which 32.6% of the group under 45 years and 76.1% of nurses over 45 years had physical therapy. A significant association was registered between age (<=45; >45) and physical therapy.

Table 5. Display of the answers to the questions whether they were treated and whether treatment is still ongoing for musculoskeletal disorders

Have you been treated for a musculoskeletal disorder?			***(p)***
Total n=160	**number**	**%**	
Yes	103	64.4	
no	57	35.6	
age<=45г n=89	**number**	**%**	**p<. 05 (Pearson Chi-square: 50.0615, df=1, p=.000000)**
Yes	36	40.4	
no	53	59.6	
age >45г n=71	**number**	**%**	
yes	67	94.4	
no	4	5.6	
Is treatment for a musculoskeletal disorder ongoing?			***(p)***
Total n=160	**number**	%	
Yes	75	46.9	
no	85	53.1	
age<=45г n=89	**number**	**%**	**p<.05. (Difference test, p=.0000)**
yes	16	18.0	
no	73	82.0	
age >45г n=71	**number**	**%**	
yes	59	83.1	
no	12	16.9	

Numerical data are expressed as the number and percentage of respondents
p>0.05 (Difference test), p<. 05 (Pearson Chi-square)

Table 5 presents the responses to questions whether nurses had been treated and whether treatment for musculoskeletal disorders was still ongoing.

64.4% of the total number of nurses, of which 40.4% were under 45 years of age and 94.4% over 45 years of age, were treated for a musculoskeletal disorder. A significant association was registered between age (<=45; >45) and treatment for musculoskeletal disorders.

46.9% of the total number of nurses, of which 18.0% were under 45 years of age and 83.1% over 45 years of age, were undergoing treatment for a musculoskeletal disorder. The percentage differences registered between the two groups are significant.

Table 6 displays the results of responses regarding the regularity of preventive examinations by an occupational medicine specialist.

One third (38.1%) of nurses do not regularly undergo preventive examinations with an occupational medicine specialist. Only one nurse from the group over 45 years of age was sent to an occupational medicine specialist for a targeted examination for musculoskeletal disorders.

Table 6. Overview of the answers to the questions about the regularity of preventive examinations by an occupational medicine specialist

Do you regularly go for preventive check-ups with an occupational health specialist?		
Total n=160	**number**	%
yes	99	61.9
no	61	38.1
age<=45г n=89	**number**	**%**
yes	55	61.8
no	34	38.2
age >45г n=71	**number**	**%**
yes	44	62.0
no	27	38.0
Have you been referred to an occupational medicine specialist for a targeted examination for musculoskeletal disorders?		
Total n=160	**number**	%
yes	1	0.6
no	159	99.4
age<=45г n=89	**number**	**%**
no	89	100.0
age>45г n=71	**number**	**%**
yes	1	1.4
no	70	98.6

Numerical data are expressed as the number and percentage of respondents

Table 7 shows the results of the assessment of the working ability of nurses as a total number and individually for both age groups.

90.6% of the total number of nurses are capable of working. All nurses under 45 years of age are capable to do their job. In the group of nurses over 45 years of age, 21.1% are capable to work but with limitations. No nurse from the group under 45 years of age was referred to the disability pension committee for assessment of work ability for musculoskeletal disorders, and from the group of nurses over 45 years of age, 6 (8.5%) were referred. In 4 (66.7%) the decision was able to work with limitations and two (33.3%) were able to work part-time.

Table 7. Display of work ability assessment

What was the rating for work ability		
Total n=160	**number**	%
Capable of working	145	90.6
Capable of working with restrictions	15	9.4
age<=45г n=89	**number**	**%**
Capable of working	89	100.0
age>45г n=71	**number**	**%**
Capable of working	56	78.9
Capable of working with restrictions	15	21.1
Have you been referred to a disability pension committee for assessment of work ability for musculoskeletal disorders?		
Total n=160	**number**	%
yes	6	3.7
no	95	59.4
age<=45г n=89	**number**	**%**
no	89	100.0
age>45г n=71	**number**	**%**
yes	6	8.5
no	65	91.5
What was the decision of the disability pension commission?		
Total n=160	**number**	%
No decision	154	96.2
Capable of working with restrictions	4	2.5
Capable to work part-time	2	1.3
age<=45г n=89	**number**	**%**
No decision	89	100.0
age >45г n=71	**number**	**%**
No decision	65	91.5
Capable of working with restrictions	4	5.6
Capable to work part-time	2	2.9

Numerical data are expressed as the number and percentage of respondents

Discussion

The aim of this study was to assess the impact of age as a risk factor in the development of symptoms of musculoskeletal disorders related to work in a defined group of nurses. From the results obtained, musculoskeletal pain was registered in a total of 136 (85%) nurses, of which 71 (100%) nurses were over 45 years of age, and 65 (73.0%) under 45 years of age. Pain affected work performance in 43.78% of nurses over 45 years of age. 20.2% of nurses under 45 years of age and more than half (57.7%) of nurses over 45 years of age were absent from work due to musculoskeletal disease. 33.8% of nurses over 45 years of age were hospitalized due to musculoskeletal disorder. More than a third of nurses did not regularly go for preventive examinations with an occupational medicine specialist. Nurses younger than 45 years of age were all able to work. In the group of nurses older than 45 years, 21.1% were able to work with limitations. Of the group of nurses younger than 45, none was referred to the Disability Pension Commission for assessment of work ability, and of the group of nurses older than 45 years, 6 (8.5%) were referred. Four (66.7%) received a decision that were able to work with limitations, and two (33.3%) were able to work part-time.

Numerous studies indicate the influence of age on the occurrence of pain as the main symptom of musculoskeletal disorders at work in nurses.

Age is a major risk factor for prevalent regional pain. Thus, in a random sample of the Dutch population[19], pain affecting the elbow, hip, or foot, was about 1.5 times more common in people aged 45-64 years than in those aged 25-44. In the Quebec Health Survey[20], odds of upper extremity pain causing frequent disturbance in work activity were raised by 1.7-3.4-fold in those aged ≥50 *vs*. 18-24 years. In a survey of over 4,000 adults from 16 British general practices[21], pain lasting for ≥3 months and 'highly disabling or severely limiting' affected 10% of 55-64-year-olds but was rare in young adults; and in a sample drawn from 40 British general practices, sciatica was 5-8 times more common in people aged 55-65 than in those aged 16-24[22].

In 2000, Shultz *et al*. conducted a study involving 83 nurses engaged in hospital work. The results showed that 75.9% of nurses had pain as the most common symptom of musculoskeletal disorders, 57.8% had current MSD, 30.1% had been examined and used medication, and 21.7% had been absent from work due to musculoskeletal disorders. The greatest influence on the occurrence of musculoskeletal disorders was age and length of service longer than 10 years[23]. Similar results were obtained in our study, especially in the group of nurses over 45 years of age.

In the study by Ou *et al.* (2021), which included 117 nurses, the medical checklist for MSDs and the Work Ability Index were used as instruments, and it was determined that medium and heavy physical work, long work on the computer and insufficient education and training significantly affected the occurrence of MSDs and reduced work ability [24]. These results correlate with the results in our study where all nurses worked on the computer, and almost half of them did not have education and training in the correct handling of medical devices.

The study by Ribeiro *et al.* (2017) was conducted on 409 nurses in Portugal and showed that 89% had symptoms (pain) and 51.4% of nurses were absent from work due to work-related MSDs [25]. We also obtained similar results, especially in the group of nurses older than 45 years.

The study by Arsalani *et al.* (2014), involving 520 nurses, found that the incidence of at least one musculoskeletal symptom increased with age. Age-related changes began at the age of 40 and included a decrease in muscle mass and muscle strength, resulting in reduced work capacity and mobility [26].

In a study by Stanchev *et al*. (2022) conducted on 1412 nurses from 19 hospitals in Sofia, musculoskeletal symptoms occurred in 97.5% of nurses with a significant representation in the group over 45 years of age. 62.6% had some medical treatment, and 21.5% were hospitalized[27]. In our study, 85% of nurses had pain due to MSD, 51.9% had physical therapy, and 16.9% of nurses were hospitalized for a work-related musculoskeletal disorder.

Literature data and our findings indicate a significant influence of age on the development of symptoms of work-related musculoskeletal disorders in nurses. Pain is the most common symptom that seriously affects the performance of work tasks. As a result, we have a significantly increased number of absenteeism from work, hospitalization, and reduced work ability, especially in nurses older than 45 years. Therefore, the need for timely ergonomic intervention and regular health monitoring as a prevention of the occurrence of work-related MSDs is indispensable.

Conflict of interest statement. None declared.

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