G Ital Med Lav Erg 2020; 42:2, 82-86
ISSN 1592-7830

MEDICINA DEL LAVORO

Pasquale Scopa[1], Anita Pasqua di Bisceglie[1], Federica De Lotto[2], Angelica Alfano[3], Stefano Faiferri[2], Antonio Regazzo[2]

Musculoskeletal disorders and work-related musculoskeletal diseases among nursery school teachers: analysis in a sample in the city of Venice

[1] Medico del lavoro, Patronato INCA CGIL Veneto
[2] Medico legale, Patronato INCA CGIL Veneto
[3] Responsabile settore Danni da lavoro, Patronato INCA CGIL Veneto

ABSTRACT. **Objectives.** ***Musculoskeletal disorders (MSD) represent one of the most relevant occupational problems. School teachers and particularly nursery school teachers (NST) are reported to have a high prevalence of MSD. We aimed to estimate frequency of MSD in a sample of NST and to bring out cases of work-related musculoskeletal disorders (WRMSD) among these workers.***
Design. ***Cross-sectional prevalence study.***
Setting and participants. ***NST applying to the trade union patronage between December 2015 and December 2017 for problems of absence from work for health reasons have been proposed the compilation of the Italian version of the Nordic Questionnaire for musculoskeletal disorders. NST who reported MSD underwent medical examination performed by an occupational physician. In accordance with current legislation, certification of occupational disease was completed when a plausible occupational origin of the pathology could be identified.***
Main outcome measures. ***MSD and WRMSD prevalence.***
Results. ***Questionnaires were completed by 82 NST: 75 (91.5% of the sample) reported at least one MSD. 71 NST underwent medical examination. In 32 subjects (39% of the sample) a diagnosis of musculoskeletal pathology was formulated. Based on work history, 20 cases of probable occupational pathology were reported. Occupational etiology was ascertained for 12 subjects (14.6%): 11 cases of lumbar discopathy / lumbar disc herniation and 1 case of both lumbar disc herniation and tendinopathy of shoulder rotator cuff.***
Conclusion. ***Prevalence of musculoskeletal disorders was high and the most frequently affected body sites were similar to those reported in the literature, confirming NST as a group at risk for developing both MSD and WRMSD. Results indicate the importance of taking primary and secondary prevention actions to protect the health of NST.***

Key words: *musculoskeletal disorders, work-related musculoskeletal diseases, nursery school teachers.*

RIASSUNTO. Disturbi muscolo-scheletrici e malattie professionali negli educatori di asilo nido: analisi in un campione di educatrici della città di Venezia.
Obiettivi. **I disturbi muscolo-scheletrici rappresentano uno dei problemi più rilevanti in ambito occupazionale. Gli insegnanti scolastici e soprattutto gli educatori di asilo nido presentano un'elevata prevalenza di disturbi muscolo-scheletrici. Misurazione della frequenza di disturbi muscolo-scheletrici in un campione di educatrici di asilo nido ed emersione di casi di patologie muscolo-scheletriche correlate al lavoro.**
Disegno. **Studio trasversale di prevalenza.**
Setting e partecipanti. **Alle educatrici di asilo nido che fra dicembre 2015 e dicembre 2017 si rivolgevano al patronato**

Objectives

Musculoskeletal disorders (MSD) represent one of the most relevant occupational problems. MSD include several inflammatory and degenerative conditions involving muscles, bones, tendons, ligaments, joints and nerves. They can have a negative impact on quality of life and on working life in terms of absenteeism, work inability and compensation claims (1,2,3). School teachers and particularly nursery school teachers (NST) are reported to have a high prevalence of MSD (4,5). The work duties of school teachers can involve the prolonged maintenance of incongruous postures for different musculoskeletal districts. Moreover, NST carry out teaching and nurturing activities to children under the age of 6, requiring therefore also significant physical resources. Indeed NST are constantly required to lift, bend or carry children, sit on small seats or on the floor to take care of, play with and interact with children (6). Nevertheless, while some studies have examined the prevalence of MSD among school teachers (5,7), few studies have yet been performed to analyze MSD among NST (4,8,9).

The aims of our research were therefore: to estimate the frequency of MSD in a sample of nursery educators; to bring out cases of work-related musculoskeletal disorders (WRMSD) in this category of workers; to identify risk factors for the development of MSD and WRMSD in order to suggest indication for preventive strategies.

Setting and participants

NST who applied to the trade union patronage between December 2015 and December 2017 for problems related to absence from work for health reasons have been proposed, on a voluntary basis and after signing of informed consent, compilation of the Italian version of the Nordic Questionnaire for musculoskeletal disorders (10). NST who reported MSD underwent a medical examination and thorough pathological and occupational history performed by an occupational physician. If applicable, additional diagnostic tests have been prescribed and therapeutic indications provided. Individual and non-occupational factors were also considered to evaluate the occupational etiology

per problemi di salute comportanti assenza dal lavoro è stata proposta la compilazione del questionario Nordic per i disturbi muscolo-scheletrici. Le educatrici che segnalavano tali disturbi sono state sottoposte a valutazione da parte di un medico del lavoro. In base alla normativa vigente, nei casi di plausibile origine occupazionale delle patologie riscontrate, è stato compilato il primo certificato di malattia professionale.
Risultati. **Il questionario è stato compilato da 82 educatrici: 75 (91.5% del campione) segnalavano almeno un disturbo muscolo-scheletrico. 71 sono state sottoposte a valutazione medica. Per 32 soggetti (39% del campione) è stata diagnosticata una patologia. In base all'anamnesi lavorativa sono stati segnalati 20 casi di patologia professionale. L'etiologia occupazionale è stata accertata per 12 educatrici (14.6%): 11 casi di discopatia/ernia discale del tratto lombare ed un caso di ernia discale del tratto lombare e concomitante tendinopatia della cuffia dei rotatori di spalla.**
Conclusioni. **La prevalenza di disturbi muscolo-scheletrici riscontrata era elevata e le sedi corporee più frequentemente interessate erano simili a quelle riportate in letteratura, confermando le educatrici di asilo nido come gruppo di lavoratori a rischio per lo sviluppo sia di disturbi muscolo-scheletrici che di malattie professionali. I risultati indicano l'importanza di misure di prevenzione primaria e secondaria per tutelare la salute di questi lavoratori.**

Parole chiave: disturbi muscolo-scheletrici, malattie professionali muscolo-scheletriche, educatrici di asilo nido.

of diseases. In accordance with current legislation, certification of occupational disease was completed for cases in which a plausible occupational origin of the pathology could be identified consistently with the relevant guidelines of Italian Society of Occupational Medicine (SIML) and with Operational addresses for emergence and prevention provided by National Italian Insurance Institute for Occupational Injuries (INAIL), Veneto Region and Venice Hospital's Department of Prevention (11,12).

Results

Between December 2015 and December 2017, 82 NST working in municipal nurseries of the city of Venice referring to the trade union patronage for problems related to job absences due to health problems have consented to complete the Italian version of the Nordic questionnaire. They were all women, mean age 53.5 ± 9 years, and with a mean seniority in the NST task of 29.1 ± 9.5 years (Table II). Seven questionnaires were negative for MSD. Among the 75 positive questionnaires for MSD, 63 were positive for disorders of a single body district and 12 for 2 or more body districts. 50 questionnaires were positive for low back pain, 15 for neck pain, 5 for shoulder pain, 3 for knee pain and 2 for ankle pain. Four of the 75 NST with positive questionnaire did not want to undergo medical examination. Therefore 71 NST were examined by an occupational health specialist, who carried out thorough occupational and pathological anamnesis. Fourteen workers were found to have changed both job qualification and job task due to health problems, in 10 cases of musculoskeletal nature. These 10 workers were included in data analysis. At the time of medical evaluation, therefore, these workers were no longer NST but were assigned to administrative tasks by an average period of 7.5 ± 8 years.

For the 57 effective NST, an in-depth medical history was then conducted to identify the possible occupational origin of the complained MSD. In 21 among these cases the diagnostic tests already carried out by the workers or prescribed by the occupational physician did not show signs indicating a disease diagnosis. Four workers did not complete the diagnostic tests or the evaluation process.

The NST sample examined (n = 82) showed 75 questionnaires positive for musculoskeletal disorders, corresponding to 91.5% self-reported MSD prevalence (Table I).

Nordic Questionnaire includes three sections providing information on: general features of the subject; a summary picture of disorders (discomfort, soreness, pain) and / or disabilities (intended as an impediment to perform normal work and / or non-occupational activities) in nine body regions; nine specific cards investigating the presence of disorders and / or disabilities at specific body regions.

Mean age of NST with self-reported MSD was 50.7 ± 6.6 years and their seniority as NST was 26.4 ± 9.6 years (Table II). Considering symptomatic NST who underwent medical examination (n = 71), a musculoskeletal disease was ascertained in 32 individuals, and therefore musculoskeletal diseases prevalence was 39%. The mean age of NST with musculoskeletal symptoms and an established MSD (n = 32) was 51.9 ± 9.2 years and their seniority as NST was 27.1 ± 10.0 years (Table II).

Among these 32 symptomatic NST with ascertained musculoskeletal disease, 20 (62.5%) had low back pain, 5 (15.6%) shoulder pain, 3 (9.3%) knee pain, 2 (6.2%) ankle pain and 2 (6.2%) cervical pain as the only symptom. 20 (62.5 %) NST had pain in more than one body district and 9 (28.1%) in more than 3 body districts.

Our research also aimed to bring out cases of work-related muscoloskeletal disorders (WRMSD). Therefore in occupational anamnesis we researched and evaluated elements suggested by the pertinent literature to identify potential causal links between the pathologies and the working activity. Individual and non-occupational factors were also considered to evaluate the occupational etiology of diseases. Occupational anamnesis was suggestive for WRMSD in 20 of the 32 NST with a diagnosed disease: 16 with herniated disc or discal protrusion of the lumbar spine, 3 with tendinopathy of the shoulder rotator cuff and 2 with knee meniscopathy. Three subjects presented more than one pathology. These subjects (n = 20) had an average age of 54.9 ± 6.9 years and average seniority as NST of 27.8 ± 10.3 years (Table II). For these 20 workers, the

Table I. ***Demographic characteristics of study participants***

	Prevalence (%)
Self-reported MSD	95.1
Ascertained MSD	39.0
Ascertained WRMSD	14.6

first certificate of occupational disease was completed and the report was sent to the recipients required by current legislation. The reported occupational diseases have been recognized for 12 NST (mean age 53.4 ± 7.5 years; average seniority as NST 26 ± 10.8 years): 11 cases of lumbar disc herniation and one case of both herniated lumbar disc and tendinopathy of shoulder rotator cuff. Therefore, in our sample, prevalence of WRMSD was 14.6% (Table II).

Discussion and conclusion

Overall prevalence of self-reported MSD detected in our study sample was 91.5%, higher than values found among previously studied school teachers populations (5,9,13). This is probably explainable by the fact that in many studies disorders prevalence only for a specific body site has been sought. In most of the relevant published surveys, to assess MSD Authors used self-developed questionnaires or standardized questionnaires as in the case of the Nordic Questionnaire that we have adopted in our research. Further Authors used different questionnaires such as the Nortwick Neck Pain Questionnaire, the Job Content questionnaires and the Subjective Health Complaints Questionnaire (14-27). In agreement with Erick and Smith we considered essential to combine data collection on MSD through a standardized questionnaire with anamnestic and clinical evaluation in order to obtain more accurate results (4,28).

We found low back pain to be the most frequently reported MSD among school teachers, according to the results of other studies. The prevalence of neck and/or shoulder pain we found (22.8%) was lower than in other studies. This is probably because several of those studies concerned music teachers, among whom a greater prevalence of pain in these body sites was highlighted. The prevalence of lower limb pain we found (15.5%) is included in the range of values found in studies that have considered this body district (4).

Few studies have considered the prevalence of MSD among NST, with heterogeneous results: 40% in a Swedish study; 61% in a U.S.A. study; 34.7% and 63.3% for upper limbs and spine symptoms in Italy (4,29,30).

Back pain is the most commonly reported MSD both among school teachers as a whole and among NST (4,9,16,17,26,27,30). This is due to the peculiar working methods of the NST, which must frequently lift, bend or carry children, play with and interact with children.

In addition to data obtained through questionnaires, clinical and anamnestic evaluation allowed us to obtain more accurate details regarding both the nature of the musculoskeletal pathology and the actual methods of carrying out the work activity.

We diagnosed documented pathology in 32 of the 75 NST who reported musculoskeletal disorders in the questionnaire.

Occupational anamnesis allowed us to highlight the cases in which the operations carried out in the performance of the duties were habitual and systematic, being a source of biomechanical occupational overload for the body site affected by the diagnosed pathology.

All the workers we examined worked full-time for 36 hours a week with NST jobs in various nurseries in the Municipality of Venice.

They were responsible for care of infants and children aged between 6 months and 3 years, in a number ranging between 15 and 20 per day, depending on organizational needs. The organization of the work of the educators provides that in the time slot between 10:30 and 13:30 there is the coexistence of two workers and only one in the remaining parts of working time. In this way, the worker took care of no less than 10 children during the time bands of coexistence of two NST and 12-15 in the other, and temporally prevailing, circumstances. Job tasks encompassed infants and children reception, taking them from the stroller or from the arms of the parents, their arrangement in beds or cribs, their lifting and positioning on the changing table for hygiene and changing diapers (operations carried out not less than 15 times in the morning, and in any case according to individual needs) with subsequent repositioning in beds or cribs, the withdrawal and positioning on a high chair for the snack and for the meal with subsequent relocation at rest, their picking up and positioning on / from pots placed on the ground to perform the physiological functions, their picking up and positioning towards / from mats placed on the floor for children of intermediate age and relocation in bed / cradle, the

Table II. *Prevalence of self-reported MSD, ascertained MSD and ascertained WRMSD*

	n	Female gender (%)	Age (years; mean ± SD)	Seniority as NST (years; mean ± SD)
Overall NST sample	82	100	53.5 ± 9	29.1 ± 9.5
NST with self-reported MSD	75	100	50.7 ± 6.6	26.4 ± 9.6
Symptomatic NST with ascertained musculoskeletal disease	32	100	51.9 ± 6.9	27.1 ± 10.0
NST with probable WRMSD	20	100	54.9 ± 6.9	27.8 ± 10.3
NST with ascertained WRMSD	12	100	53.4 ± 7.5	26.0 ± 10.8

conferment to parents at the end of the working day. It was also necessary to withdraw the infants whenever they cried and therefore to comfort them. Frequency of manual handling of children resulted to be inversely proportional to their age. The cradles and cots had a low support surface and side rails of considerable height, entailing the need for the NST to bend the trunk in association with a significant front dislocation during withdrawal and support phases of the baby / infant on the cot / crib. Also withdrawal / support operations from / to the high chair for meals feeding and from / to the carpets on the floor for gaming / education sessions involved incongruous movements of the spine.

The above-mentioned working phases had been identified as biomechanical risk factors for NST already in an Italian research published in 1988 (31). Based on clinical and anamnestic elements indicated by literature we identified 20 cases of probable WRMSD. In 12 of these cases the occupational origin of the disease was ascertained, for the most part pathologies of lumbar spine.

MSD are a relevant problem because they involve suffering to the individual with a consequent need for absence from work. In our study we highlighted a high prevalence of MSD among NST, especially in the spine, and also a significant number of ascertained occupational diseases.

The high prevalence of MSD we found is consistent with results published in literature, both with regard to school teachers in general and the specific subgroup of NST. Our study is in agreement with others published about the most frequently reported site of disorders – spine – followed by neck / shoulders and lower limbs.

The high frequency of musculoskeletal disorders and the occupational origin of the diseases found in this study clearly indicate the need for primary and secondary prevention interventions of musculoskeletal disorders to be addressed to nursery school educators. With this in mind, an effort is required to design the environments and work furnishings that consider ergonomic aspects.

Proper information and training on health risks should be addressed to these workers. An accurate health surveillance activity should also be directed to these workers to detect early musculoskeletal disorders and to indicate the appropriate early treatments. This could avoid the chronicity of the disorders, limiting the onset of work-related pathologies, the absence from work and in some cases the removal from work. In our sample we found that 10 of the 14 job qualification and job task changes were due to musculoskeletal disorders. This reinforces the need for greater cooperation of the actors involved in the process of assessment and management of biomechanical overload risk for nursery school educators.

The present study has some limitations. The most relevant is its cross-sectional design. Further longitudinal studies are needed to understand the associations between disorders and diseases with other occupational risk factors. NST assignment to the classes included one year of activity with the infants alternating with one year with older children. This did not allow us to perform correlation analysis between the prevalence of the diseases found and the duration of exposure. The inclusion of subjects in the study sample on a voluntary basis did not allow us to obtain the sample size required for inferences on the prevalence of disorders and diseases observed on larger working populations or on other kinds of teachers. However, our study is the first in Italy to investigate the phenomenon of MSD and WRMSD among NST. An element of strength is the use of self-reported information collected with a standardized and validated questionnaire, supplemented by a clinical and anamnestic evaluation to increase the reliability of the results.

In conclusion, this paper aimed to highlight the size and relevance of MSD and WRMSD among nursery school educators by analyzing a sample of workers by integrating both self-reported information and a medical assessment. The prevalence of musculoskeletal disorders was high and the most frequently affected body sites were similar to those reported in the literature, confirming NST as a group at risk for developing both MSD and WRMSD. Results indicate the importance of taking primary and secondary prevention actions to protect the health of nursery school educators.

No financial support has been provided for this research.

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Correspondence: *Pasquale Scopa, Via Aquileia 6, 35139 Padova (PD), Italy, Phone: 00393406012969, pasqualescopa@yahoo.it*