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Original Research Article

Work related musculoskeletal symptoms; exposures and perception towards physiotherapeutic interventions at work setting in teachers and caregivers of special schools in Pune: a questionnaire based study

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ABSTRACT

Background: Teachers and caregivers at special schools are at a risk of developing work related musculoskeletal disorders (WRMSDs) as they tend to work in awkward postures. It is important to identify musculoskeletal complaints and exposure levels to incorporate work site modifications to reduce risk of developing WRMSDs. Also understanding their perception towards physiotherapy might help in better implementation of worksite wellness programs.
Methods: Participants were administered nordic musculoskeletal questionnaire (NMQ), quick exposure check (QEC) questionnaire and a self-designed questionnaire with five domains.
Results: Out of the 66 participants, 36 were teachers and 30 were caregivers. Results of NMQ stated that, 20 participants reported to have pain. 50 participants had discomfort in the form of stiffness, fatigue. Assessment via QEC revealed, 39 participants were exposed at a lower level, followed by 22 and 5 who were exposed at moderate and higher level of the risk factors causing WRMSDs respectively. 26 participants were not engaged in regular physical activity. 26 participants had never been explained about safe and ideal ways to handle children with special needs in order to prevent WRMSDs.
Conclusions: Musculoskeletal pain was predominantly in the lower back, shoulder/arms, and neck region. Almost 60% of participants were exposed at a lower level to the risk factors leading to WRMSDs. All of the participants stated that they would like to attend a training program by a physiotherapist regarding the same.

Keywords: WRMSDs, Exposure level, Perception towards physiotherapy

INTRODUCTION

Work related musculoskeletal disorders (WRMSDs), as defined by Forde et al in 2002, "are a subset of musculoskeletal disorders (MSDs) that arise out of occupational exposures and may lead to work restrictions, work-time loss, or consequently cause work leave."[1] WRMSDs are disorders arising at occupational settings or workstations and can contribute towards significant proportion of occupational morbidity. These disorders after setting in, can affect their capacity to work professionally as well as can hamper their activities of daily living to varied extent. The commonly affected body regions in WRMSDs have been found to be the low back, shoulder, neck, hand, and forearm. Persons with WRMSDs show a vast variety of symptoms such as pain, stiffness, paresthesia, tingling, numbness, and weakness.[2] All these symptoms affect physical as well as mental health, ultimately affecting the worker's productivity. WRMSDs occur as a result of an activity of a high level traumatic impact or in the form of cumulative trauma disorder; though the latter is common. These disorders could arise in many job professions like Information technology

professionals, industrial workers, laborers, school teachers, health care professionals and so on. There are many studies done on some of the above mentioned populations, which concluded their higher risk to develop WRMSDs.[2-7]

Special school teachers, caregivers (like helpers, nursing personnel) at special schools may also be at risk of developing WRMSDs as they spend substantial time in lifting and transfers, assisting in the daily activities like toileting, changing diapers, feeding. Some of the special school children might also need help in dressing, donning and doffing of assistive devices and so on. This might, many a times require the caregivers to work in awkward postures or assume postures in which sustained contraction of muscles is needed like stooping, bending, kneeling, squatting, etc. This might further put them at risk of developing MSDs.

Few studies have been done overseas to address this issue; like a study conducted in Taiwan, on special school staff to identify the common sites of WRMSDs using a self-designed questionnaire indicated a high prevalence of WRMSDs mainly in low back, shoulders and wrists.[8] Another study conducted in Germany, using a self-administered questionnaire to identify WRMSDs and their associated factors in teachers of special schools, concluded a higher prevalence of lower back symptoms indicating a need of assessment followed by treatment.[9]

However, there is a dearth of literature to state that teachers as well as caregivers of differently abled children in special schools, day care centres and shelter homes might have WRMSDs; especially in the Indian scenario. Hence, there is need to check the physical load or demands placed on these workers, the occurrence of musculoskeletal symptoms and associated risk factors leading to increased exposure that can lead to development of WRMSDs in the Indian setup.

In many of the WRMSDs, pain is the chief complaint. Nordic musculoskeletal questionnaire (NMQ) is one of the best tools to identify the site of pain. It is an easy, inexpensive tool to assess musculoskeletal complaints regarding pain. It's been used in many populations which are predisposed to WRMSDs.[10] The NMQ has good validity with a Cronbach's Alpha value of >0.9 and reliability has ranged from 0 to 23% and it has been concluded as an acceptable screening tool.[11,12] So it can be used effectively as a screening tool for finding out musculoskeletal complaints among the study participants.

Besides NMQ, quick exposure check (QEC) is a useful observational tool to identify associated risk factors and exposure to WRMSDs. It provides a great measure to assess the exposure to ergonomic risks and helps to develop strategies to prevent WRMSDs. QEC considers many aspects including movement (from static/dynamic position), frequency, subjective forces, manipulated weight, vibrations and work rhythm which form risk factors for musculoskeletal problems.[13] The QEC is short, easy to use, easy to score and has the advantage that the workers' activities are not interrupted during the assessment. QEC evaluates the exposure level of participants to WRMSDs and also the associated factors of WRMSDs. This tool is found to be sensitive for assessing the change in exposure before and after an ergonomic intervention. The tool is also shown to be largely reliable and applicable to a wide range of sectors including industrial fields, and hospital workers.[14,15] It calculates the individual scores of the body regions exposed to MSDs and hence the results are more specific rather than generalized. QEC is formed of 2 components, the examiner's and worker's assessments. In the examiner's assessment, the examiner observes worker's posture during his work. Whereas the worker's assessment sheet is required to be filled by the worker himself. It considers the worker's perspective about his own work. Thus participative ergonomics is encouraged and helps to improve the objectivity of the findings by co-relating worker's and examiner's assessments. It might assist in ensuring better adherence to the further assessment and treatment as the worker's perception is also taken into consideration rather than just a one-way assessment.

Identification of the site of WRMSDs as well as the factors that increase the risk of developing them can help in the planning and implementation of specific strategies aimed towards their prevention. This data can serve as a baseline which can help to incorporate individualized programs of work hardening and conditioning. In 1986, the American occupational therapy association's (AOTA) commission defined a work hardening program as one that is "an individualized, work-oriented activity process that involves a client in simulated or actual work tasks. These tasks are structured and graded progressively to increase psychological, physical and emotional tolerance and improve endurance and work feasibility. In 1988, the Commission for Accreditation of Rehabilitation Facilities (CARF) expanded the AOTA definition by stating that the work hardening program must be "highly structured and goal oriented, interdisciplinary, and combine both work simulation and work conditioning. In 1993, American Physical Therapy Association's (APTA) guidelines introduced the concept of work conditioning as a "separate and distinct" program, which is an appropriate alternative to work hardening for patients with less complex conditions and those with chronic conditions. Work conditioning was defined as a program with an emphasis on physical conditioning that addresses the issues of strength, endurance, flexibility, motor control, and cardiopulmonary function. The term work hardening was reserved for interdisciplinary programs that address the need of patients with "vocational and behavioural dysfunction," utilizing a graded work simulation approach and psychosocial intervention.[16] Both work conditioning and hardening play role in improving a person's not just physical and biomechanical aspects but also their neuromuscular, cardiovascular and psycho-social functioning. This data can also help in designing work site

modifications which will be individual specific as different tasks might overload different structures increasing the risk of wear and tear or degenerative changes; hence uniform or generalized modifications might not help in achieving the goal of reducing the risks of development of WRMSDs.

Thus, this study was formulated to identify common musculoskeletal disorders and to find out the associated risk factors causing WRMSDs in teachers and caregivers of differently abled children. We also assessed the perception of participants about their own posture and also the importance of exercise in the prevention or in the reduction of risk of WRMSDs. In addition to this, we also intended to understand their perception of participants towards the need of physiotherapeutic interventions for prevention of WRMSDs in special schools, day care centres, and shelter homes.

METHODS

This was a cross-sectional study. This study was planned and conducted on the teachers and caregivers of special schools for differently abled children. This study was conducted over a period of 6 months (i.e. from May 2022 to December 2022). The study included 8 special schools in Pune city viz. Prism Foundation, The Rewachand Bhojwani Academy, Ankur Vidya Mandir, Kamayani Special School, Eshanya Special School, Aashayein Special School, Spandan Special School, and Savali – a shelter for care.

Along with NMQ and QEC, a questionnaire was designed which included five domains, viz., demographics, musculoskeletal symptoms, physical activity level, postural awareness and perspective towards physiotherapeutic interventions at worksite.

Demographic data domain included age, gender, occupation, work experience. The participants were also asked to report their height and weight and body mass index (BMI) was calculated and the participants were categorized in the BMI classes ranging <18.5 kg/m^2 for underweight, 18.5–24.9 kg/m^2 for normal, 25.0–29.9 kg/m^2 for overweight, 30.0–34.9 kg/m^2 for obese grade 1, and 35-39.9 kg/m^2 for obese grade 2 and >40.0 kg/m^2 for obese grade 3.[17] The questionnaire also included the activities that the study participants were mostly engaged in like assisting in bathing and toilet activities, aiding in dressing/undressing, helping in feeding, transferring and giving mobility assistance, aiding in donning-doffing of assistive devices.

Second domain enquired about the musculoskeletal symptoms like stiffness, fatigue. Along with this NMQ was used to identify the site of pain. QEC was also used to evaluate the exposure level of the participants to WRMSDs and to evaluate nature of musculoskeletal symptoms. The Worker's assessment component of QEC was provided to the participant. Along with this, the examiner observed the participant while working and thus evaluated the worker by filling out the observer's assessment component of QEC.

Postural awareness domain assessed the perception of the participants towards their own body posture. Participants were provided with photographs of different postures both in sagittal as well as coronal planes without any description mentioned under them. Photographs depicting normal spine, increased thoracic kyphosis, increased lumbar lordosis, flat back posture were included in the section of sagittal view. Coronal view had photographs depicting normal spine, primary scoliosis and secondary scoliosis. Participants were asked to choose a picture from both the views that best represented the perception of their own posture.

Domain of physical activity emphasized on the awareness of regular exercising in preventing or reducing the risk of developing WRMSDs among the participants and if they are engaged in any form of exercise outside of their workplace for at least 30 minutes a day or 150 minutes a week.

The last domain included the perception of the participants towards physiotherapeutic interventions. In this, the participants were asked questions like, have they ever undergone any assessment/treatment by a physiotherapist, whether they recommend regular screening for work related musculoskeletal symptoms by a physiotherapist, have they ever been explained about safe and ideal postures to handle children with special needs at the workplace, in order to prevent WRMSDs and would they like to attend a training program regarding the same conducted by a physiotherapist. This domain was thus designed to highlight the awareness and perception of the participants towards physiotherapeutic interventions and practices towards worksite wellness and also in reducing the burden of WRMSDs.

Sample size (n) was calculated to be 66 using the formula.

$$n = z^2 \times p \times q/E$$

Absolute precision (E) was set at 11 and z value was 1.96. P value was considered to be 29.3, which was calculated from the study which concluded that 29.3 % of the participants' work performance was moderately to severely affected due to WRMSDs.[1] The q value was calculated as 70.7. The inclusion criteria of this study was teaching staff, caregivers of special schools having minimum work experience of 6 months with minimum work duration of 4 hours per day. Subjects with musculoskeletal disorders not related to work were excluded. After conceptualization of the study protocol, approval from the institutional ethics committee was sought. All the employees of the listed schools were screened for participation, after categorizing them in accordance with the inclusion and exclusion criteria, and those willing to participate in the study were included.

Participants were then provided with the subject information sheet. They were explained in detail about the study procedure and how can it benefit them in eventually reducing the risk for development of WRMDS. Post this informed consent was sought from the participants and they were then included in the study. Participation in the study was entirely voluntary. The data was analysed using statistical package for the social sciences (SPSS) software (version 23) and was represented as descriptive statistics.

RESULTS

Demographic domain

Total 66 candidates (n=66) were interviewed and assessed for the study of which 36 (54.5%) participants were teachers and 30 (45.5%) were caregivers. 54 (81.8%) of the study participants were females and 12 (18.2%) were males. The age of the participants ranged from 24 to 67 years. The median age calculated was 34 years. Mean height of the participants was 1.55 meters with a standard deviation (SD) of ±0.04. And the median weight of the participants was 60 kg. BMI was calculated, Table 1 shows the distribution of the study participants into different BMI categories.

Table 1: Distribution of the study participants into BMI categories.

BMI range (kg/m^2)	Number of participants	Percentage (%)
<18.5 (underweight)	7	10.6
18.5–24.99 (normal)	31	47.0
25–29.9 (overweight)	20	30.3
30 and above (obese)	8	12.1

All the candidates worked for at least 6 and a maximum of 8 hours. 66 (97%) participants were right hand dominant. The work profile of the participants included activities like assisting the children with special needs for toileting and bathing; dressing – undressing, feeding, assisting in transferring them from one place to other, aiding in donning and doffing of assistive devices and fine activities. The participants were involved in more than one form of activity throughout their working hours. Distribution of the same is depicted in Figure 1.

19 (28.8%) participants had work experience of about 0-5 years. 10 (15.2%) had an experience of 6-10 years, whereas, 12 (18.2%) participants had work experience of 10-15 and 16-20 years and 13 (19.7%) participants had work experience of more than 20 years.

Musculoskeletal symptom domain

Among the total number of participants, 50 (80.3%) participants stated to be having discomfort in form of stiffness, fatigue or both. Only 7 (13.2%) participants had consulted a doctor regarding their discomfort. The remaining 46 (86.8%) participants had not consulted a doctor for their discomfort. Table 2 represents the details regarding the type of discomfort felt by participants.

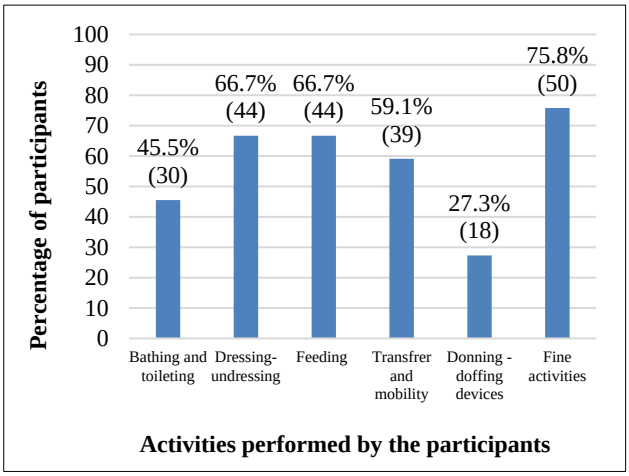

Figure 1: Distribution of the study participants into the types of activities that they are engaged in at work site.

Table 2: Distribution of the responses into the parameters of discomfort.

Parameters	Number of cases	Percentage (n=66)
Stiffness	41	62.12
Fatigue	5	0.07
Stiffness+fatigue	4	0.06

Among 41 participants, 30 (45%) participants experienced stiffness for more than 12 months whereas 7 (10.6%) and 4 (6.06%) participants experienced stiffness for less than 6 and in between duration of 6-12 months respectively.

20 (30.3%) participants out of 66, reported to have pain in one or more than one of the body regions. 46 (69.69%) participants did not experience pain in any of the body regions. The common areas affected were evaluated using Nordic musculoskeletal questionnaire; Figure 2 demonstrates the distribution of responses.

No one experienced much insufficiency at the workplace because of their musculoskeletal complaints and were able to carry on their day to day activities.

Exposure profile evaluated by quick exposure check

Assessment with the help of QEC revealed that among 66 participants, 39 (59.09%) participants were exposed at a lower level to the risk factors causing WRMSDs. 22 (33.34%) were moderately exposed and only 5 (3.57%) participants were exposed at a higher level to the risk factors leading to WRMSDs. Table 3 depicts the responses and analysis of the same. The total score of QEC percentage was calculated by the participant's obtained

score(X) divided by the total score (Y) of the back, shoulder/arms, wrist/hand, and neck multiplied by 100. [QEC score total percentage = X/Y×100].

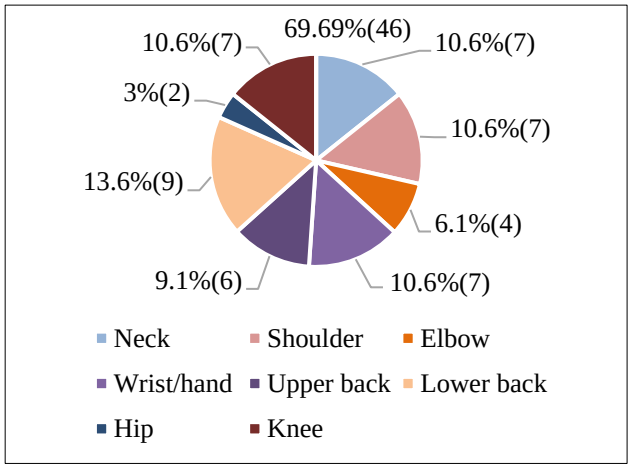

Figure 2: Distribution of the responses as per Nordic musculoskeletal questionnaire.

Table 3: Distribution of responses in accordance with the exposure levels given by quick exposure check.

QEC score (%)	Level of exposure	Number of workers	Percentage of participants
≤40	Low	39	59.09
41-50	Moderate	22	33.34
51-70	High	5	3.57
>70	Very high	0	0

QEC questionnaire also considers exposure levels of the participants for individual components of back, shoulder/arms, wrist/hand, neck, driving, vibration, work pace and stress. Table 4 represents the responses analyzed for these individual components.

Postural awareness domain

The participants were provided with pictures depicting different postures in both sagittal and coronal views and were asked to choose one posture from each view that best represented their posture; Table 5 demonstrates the responses regarding the same.

Physical activity domain

26 (39.4%) of the total participants were not involved in any form of structured physical activity. 40 (60.6%) participants were involved in regular physical activity in form of structured exercises including trekking, walking and so on; of which 17 (47.22%) were teachers and 9 (30%) were caregivers. Majority of them; 59 (89.4%) of the participants stated that regular exercise reduces the risk of developing musculoskeletal symptoms. This involved 33 (91.67%) teachers and 26 (86.67%) caregivers.

Table 4: Distribution of responses into categories of exposure levels for individual components of quick exposure check.

Level of exposure	Number of cases	Percentage (n=66)
Back		
Low	20	30.3
Moderate	27	40.9
High	17	25.8
Very high	2	3.0
Shoulder/arm		
Low	21	31.8
Moderate	40	60.6
High	5	7.6
Very high	0	0
Wrist/hand		
Low	38	57.6
Moderate	28	42.4
High	0	0
Very high	0	0
Neck		
Low	47	71.2
Moderate	16	24.2
High	3	4.5
Very high	0	0
Driving		
Low	66	100
Moderate	0	0
High	0	0
Vibration		
Low	66	100
Moderate	0	0
High	0	0
Work pace		
Low	55	83.3
Moderate	11	16.7
High	0	0
Stress		
Low	33	50.0
Moderate	28	42.4
High	5	7.6
Very high	0	0

Perspective towards physiotherapy

None of the participant reported to have undergone any assessment or treatment by a physiotherapist ever. 55 (83.3%) out of 66 participants which included 27 (75%)teachers and 28 (93.3%) caregivers, did recommend regular screening for WRMSDs by a physiotherapist. All of the 66 (100%) participants stated that they would like to attend a training program regarding safe and ideal ways to handle children with special needs in order to prevent WRMSDs. This study also revealed that 28 (77.78%) teachers and only 12 (40%) caregivers, i.e. 40 (60.6%) out of the total 66 participants have been explained about safe

and ideal postures to help handle children with special needs at the worksite by occupational therapists, early intervention educators, special educators and so on. But remaining 26 (39.4%) participants were not explained about the same ever.

Table 5: Distribution of responses regarding their perceived posture in sagittal and coronal view.

View and postures	Responses (%)	
	Teachers (n=36)	Caregivers (n=30)
Sagittal view		
Normal spine	16 (44.44)	9 (30)
Increased kyphosis	3 (8.33)	3 (10)
Increased lordosis	10 (27.78)	11 (36.67)
Flat back	7 (19.44)	7 (23.33)
Coronal view		
Normal	32 (88.89)	25 (83.33)
Scoliosis (primary)	2 (5.56)	2 (6.67)
Scoliosis (secondary)	2 (5.56)	3 (10)

DISCUSSION

The work profile of teachers and caregivers of special schools encompasses numerous tasks which play an important role in meeting the physical and emotional demands of children with special needs. They have long working hours which can be hectic and stressful for many. They are involved in tasks ranging from assisting in bathing and toileting activities, dressing- undressing, transfers, to helping in donning and doffing of the assistive devices to feeding and so on. This may put them at risk of developing varied WRMSDs. Many of the activities at their worksite, require them to bend or stoop or work in awkward postures for a substantial amount of time. As a result of exposure to such activities, WRMSDs are bound to happen sooner or later. If appropriate measures are taken well in advance, these disorders can be delayed and the individual can be equipped enough to deal with it in a better way.

In our study we found that musculoskeletal pain was predominantly found in the lower back, shoulder/arms, and neck followed by wrist/hand and knees. Bending, stooping or working in awkward position could be attributable to this. Along with the unfavourable position it is also the load that they carry or is placed on their system which contributes to the increased stress on them. The results of our study were similar to those, obtained in other studies conducted in this population overseas.[8,9,18]

Along with the pain, fatigue and stiffness were also seen in the participants. In addition, analysis of QEC revealed that stress while working was also a predominant factor in these participants. This additional stress can also contribute towards the development of WRMSDs. Almost 60% of participants were exposed at a lower level, 33.34% participants were exposed at moderate level whereas only 3.57% participants were exposed at a higher level to the risk factors associated with or leading to WRMSDs. The risk factors prevalent in these participants were stress, activities performed by the participants at the work site, handling weights, working in awkward postures along with the duration of time spent on these activities. This suggests the need to evaluate and take appropriate measures to reduce the risks and exposures associated with the development of WRMSDs. The teachers and caregivers of special schools need to be taught about appropriate work ergonomics, things that they should alter or modify in order to reduce the stressors. As the activities on their work profile cannot be altered to a great extent; some ergonomic modification for each of these activities, can help in reducing the risk of development of WRMDS.

It is also essential to educate them regarding the correct postures. They might perceive to have a good posture, which might not always coincide with the biomechanical evaluation of posture. There are many studies that have concluded that altered posture is associated with the risk of development of WRMSDs.[19,20] Thus the importance of good posture needs to be emphasized and their postural weaknesses need to be addressed.

Regular physical activity is essential in maintaining not just physical but also psychosocial wellbeing of an individual. Regular physical activity has great benefits in not just musculoskeletal domain but also emotional, psychological and psychosocial domain. 40 (60.6%) participants were involved in regular physical activity for at least 30 minutes a day or 150 minutes a week. 26 (39.4%) participants were not engaged in regular physical activity. World Health Organization recommends regular physical activity of moderate intensity for atleast 30 minutes a day or 150 minutes a week.[21] Thus regular physical activity needs top promoted in order to maximize the potential effects of physical activity and minimize the hazards of physical inactivity.

Our study revealed that none of the participants have undergone any assessment or treatment by a physiotherapist. 55 (83.3%) out of 66 participants recommended regular screening for WRMSDs by a physiotherapist. It is well established that physiotherapists play a major role in planning and implementing worksite wellness programs. With the sound knowledge of biomechanics and exercise physiology they can help identify the risk, the individual could be at and also plan strategies to address the same. 26 (39.4%) participants had never been explained about safe and ideal postures to handle children with special needs at your workplace, in order to prevent WRMSDs. This could be as a result of lack of awareness about this aspect of physiotherapy. Awareness needs to be created that physiotherapy plays a vital role in not just the treatment of WRMSDs but also in identification of the same, as well as in identification of risk factors that might predispose to the development of WRMDS. With proper planning and implementation of worksite wellness programs, physiotherapists can help

address many issues that the employees might face at their workplace. This awareness will help in early identification of signs and symptoms and prevent the development of MSDs. Even though the participants had never seeked physiotherapeutic intervention for their impairments, all (100%) participants stated that they would like to attend a training program regarding safe and ideal ways to handle children with special needs in order to prevent WRMSDs. Thus they have identified the need for implementation of apt strategies in order to train them and prepare them in a better way to deal with the majority of the stressors that come as a part of their work profile. This study will thus help in planning and implementing strategies at worksites in order to improve their body mechanics, ergonomic modifications, thereby reducing the risk and occurrence of WRMSDs.

The strength of our study was that we tried addressing many aspects like sites of pain, exposures and risk factors, physical activity level and perception towards physiotherapy in WRMSDs in teachers as well as caregivers of special schools. We also used QEC for the same which evaluates risk factors and exposure levels from not just assessor's but also the worker's perspective. Limitation of our study was that we did not include objective assessment of complaints, and postures. Clinical implication of our study would be to promote awareness of physiotherapeutic interventions to reduce the occurrence of musculoskeletal complaints, their exposure to the risk factors leading to WRMSDs. This could be done by implementing worksite health promotion; environmental modification strategies. Future scope would be analysis of similar components using more of objective assessment methods.

CONCLUSION

The results of this study stated that 42.4% of the participants belonged to overweight and obese categories.80.3% participants had discomfort in the form of stiffness, fatigue. Musculoskeletal pain was predominantly in the lower back, shoulder/arms, and neck region. Almost 60% of participants were exposed at a lower level, followed by 33.34% of participants at moderate, whereas only 3.57% of participants were exposed at a higher level to the risk factors associated with or leading to WRMSDs. 39.4% of the participants were not engaged in regular physical activity.39.4% of the participants had never been explained about safe and ideal ways to handle children with special needs in order to prevent WRMSDs. All of the study participants stated that they would like to attend a training program regarding safe Work Ergonomics to handle children with special needs in order to prevent WRMSDs by a physiotherapist.

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