Work-related Musculoskeletal Disorders of the Workers in a Child Care Institution

Yi-Shiung Horng, Shih-Fu Hsieh, Hsin-Chi Wu, Chi-Tzu Feng, Ming-Chuan Lin
Department of Physical Medicine and Rehabilitation, Buddhist Tzu Chi General Hospital, Taipei Branch, Taipei.

The work-related musculoskeletal disorders among the child care workers could be high given the fact that the workers frequently lift the children and conduct physical actions under inappropriate postures. The objective of this study is to survey the musculoskeletal disorders and potential ergonomic risk factors among the workers in a child care center through an on-site visit and a questionnaire survey. We also used the Chinese Health Questionnaire (CHQ) as a screening questionnaire to detect the emotional distress of the workers.

There were 85 workers recruited in our study. Results showed that shoulder pain (57.0%), low back pain (54.7%) and neck pain (45.3%) were the most common musculoskeletal disorders. There were 72% of the workers considering their musculoskeletal disorders being work-related. There were significant correlations between absence-day and other variables, such as intensity of neck pain \(r = 0.38, p<0.01\), intensity of shoulder pain \(r = 0.38, p<0.01\), intensity of back pain \(r = 0.40, p<0.01\), and regular exercise \(r = -0.24, p<0.05\). The scores of CHQ also had significant correlations with the pain intensity of several body parts. Among them, the pain intensity of low back had the highest correlation coefficient with the CHQ \(r = 0.49, p<0.01\). As to the potential ergonomic risk factors, more than half of the workers had to lift child or heavy object, and worked in awkward postures.

The results showed that the prevalence of work-related musculoskeletal disorders were high among child care workers, and it might have a negative impact on absence-days. Further educational training for proper posture and improving of work environment are indicated to prevent work-related musculoskeletal disease. (Tw J Phys Med Rehabil 2008; 36(1): 15-21)

Key Words: work-related musculoskeletal disorders, ergonomic risk factor

INTRODUCTION

Despite the general health status of child care workers has attracted research attention for a long period of time, the field of the work-related musculoskeletal disorders specifically within the child care workers hasn’t brought up sufficient attention as it should be. There were researches of this field focused on improving the general working environment for adults caring for children in
day-care settings.[1] Some studies found high prevalence of voice disorders and higher risk of virus infection among child care workers.[2,3]

These cumulative micro-traumas of the musculoskeletal systems caused by repetitive strain during work were referred to as cumulative trauma disorders or work-related musculoskeletal disorders. According to the US Department of Labor Bureau of Labor Statistics, disorders associated with "cumulative trauma" account for 34% of all occupational illnesses in the United States during the period of 2002-2004; and the service-providing industries reported the most musculoskeletal disorders, accounting for 69 percent of all cases.[4] Thus, the work-related musculoskeletal disorders among the child care workers deserve long-term research attention since the disorders may induce a profoundly negative economic impact and long-term productivity loss.[5]

Some previous studies on musculoskeletal disorders among the child care workers have been conducted. Gratz and Claffey’s study found that 18% of 446 early child care workers in day-care centers and in-house day-care settings noted back pain; 30%–35% headaches; and 23%–36% fatigue on a weekly basis.[6] Calabro et al. found that 11.5% of child care workers suffered low-back pain and 21.5% suffered falls or trips related to the job in a survey of 240 child care workers in 34 day-care centers.[7]

Some ergonomic risk factors of the child care workers have also been studied.[8,9] Work sampling performed by Grant et al. indicated that 25% of workers’ time was spent sitting on small, child-sized furniture. 18% of teachers’ activities were involved in flexing at the trunk greater than 20°. The frequencies of working in awkward postures were higher for those working for younger children.[9]

The objective of this study is to investigate the musculoskeletal problems and potential ergonomic risk factors among child care workers. In our study, the participating workers were responsible for taking care of disabled children, such as those with cerebral palsy, mental retardation, congenital anomaly, etc. These children had poor body balance, increased spasticity or joint contracture; it was much difficult for the workers to lift or deliver them. Therefore the child care workers in our study might have presented higher risk of suffering ergonomic problems and musculoskeletal disorders.

**MATERIALS AND METHODS**

This study was conducted through a questionnaire survey and an on-site observation on the workers of a child care institute in Northern Taiwan. The child care workers took care of the disabled children including those with cerebral palsy and mental retardation. Each worker was asked to complete a set of questionnaire, which included musculoskeletal disorders, potential ergonomic risk factors, basic information and Chinese Health Questionnaire (CHQ).

The CHQ was derived from a Chinese translation of the General Health Questionnaire, with the addition of specially designed, culturally-relevant items. There were four categories of questions in it covering the assessment of (1) anxiety and depression, (2) the respondent’s concern over sleep disturbance, (3) somatic symptoms/concern, and (4) interpersonal difficulties. We used the CHQ as a screening questionnaire to detect the emotional distress of the workers. A higher score represents a greater degree of emotional distress and a lower score represents a lesser degree of emotional distress.[10]

Musculoskeletal disorders were recorded as the presence of pain over several parts of the musculoskeletal systems in the past two weeks, including neck, shoulder, upper back, elbow, low back, hand/wrist, thigh, knee, and ankle/foot. The intensity of pain was marked on a Numerical Rating Scale and the types of treatments were recorded as well. The Numerical Rating Scale involved in asking the participating workers to grade their pain from 0 to 10, with the understanding that 0 represents no pain at all and 10 stands for maximal extent of pain as bad as it can be. The workers were asked to indicate which scale best represented the pain intensity for the body part.[11]

We also asked the workers to rate the relationship between the musculoskeletal disorders and their works. The “absence days” was defined as the work absence days during the past 6 months caused by musculoskeletal disorders. The self-awareness of potential ergonomic risk factors during work was asked in the following aspects: (1) heavy object lifting or child lifting; (2) working in awkward postures (e.g. trunk bending or twisting); (3)
working in prolonged standing, squatting or kneeling; (4) repetitive and monotonous movement of hand and wrist; (5) reaching repetitively above shoulder height; and (6) work stress.

**STATISTICAL METHODS**

Descriptive statistics were used to describe the frequency and pain intensity of the musculoskeletal disorders, work-related, potential ergonomic risk factors and types of treatment. Correlation values among CHQ, absence days, and individual musculoskeletal disorders were analyzed by the Pearson correlation test.

**RESULTS**

Eighty-five workers were recruited in our study. Table 1 lists the demographical characteristics and the basic information of the participants. The mean age of the workers was 41.2±9.5 years, and the mean work duration was 6.1±5.1 years. The majority of the participants were female. Only 28 of the participating workers exercised regularly; and 11 of them had to take care of toddlers at home. About two third of the participants had ever received treatment for the musculoskeletal pain. Among them, herbal medicine, manipulation, medicine and physical therapy were the most popular modes of treatments. The level of work satisfaction of the participants was also high. Sixty-six percent of the participants rated their satisfaction as very satisfied and eight percent of them rated as extremely satisfied.

The prevalence and pain intensity of musculoskeletal disorders over various body parts are as below: shoulder (57.0%, 4.1±2.1), low back (54.7%, 4.3±2.3), neck (45.3%, 3.7±1.9), hand (38.4%, 4.4±2.3), upper back (37.2%, 4.5±1.7), knee (37.2%, 4.3±2.4), ankle (32.6%, 4.1±2.2), elbow (29.1%, 4.2±2.5) and thigh (20.9%, 4.3±2.8). About 72% of the participating workers considered their musculoskeletal disorders being work-related. There were only 8 workers (9.3%) who took sick leave because of musculoskeletal disorders during the previous 6 months. The mean absence days due to musculoskeletal disorders during the previous 6 months was 0.16±0.53 days. The mean CHQ score was 1.2±1.9.

There were significant correlations between absence-day and other variables, such as intensity of neck pain ($r = 0.38$, $p<0.01$), intensity of shoulder pain ($r = 0.38$, $p<0.01$), intensity of back pain ($r = 0.40$, $p<0.01$), and regular exercise ($r = -0.24$, $p<0.05$). The scores of CHQ also had significant correlations with the pain intensity of several body parts (see Table 2). Among them, the pain intensity of low back had the highest correlation coefficient with the CHQ ($r = 0.49$, $p<0.01$). Table 3 demonstrates the frequency of potential ergonomic risk factors committed by the workers. More than half of the workers noted that their jobs involved lifting children or heavy objects and they had been working in awkward postures. These results were also confirmed by the on-site observations.

**DISCUSSION**

The results showed that musculoskeletal disorders related pain is common among child care workers. Among various body parts, the prevalence rate ranged
The higher prevalence rates were found in the shoulder, the low back and the neck. The pain intensity of these three body parts had a significantly positive association with work absence days. This association implicated that the musculoskeletal disorders had negative impact on work ability and job performance. Although most of the workers (63.5%) received treatment (such as medication, physiotherapy, herb medicine, acupuncture and manipulation) for musculoskeletal disorders, only eight of them (9.3%) had sickness absence because of musculoskeletal disorders in the previous 6 months. The rate of sickness absence of them was low, which might be due to cultural factors. Confucianism, which is perceived as the mainstream value of Taiwanese culture, appreciates hardworking and perseverance. Growing up in such a society, people have traditionally been taught to tolerate pain and discomfort. Sick leave is taken only if one is beset by intolerably severe sickness.

Table 2. Correlation among CHQ and pain intensity of various body parts

<table>
<thead>
<tr>
<th></th>
<th>CHQ</th>
<th>Neck</th>
<th>Shoulder</th>
<th>Upper back</th>
<th>Elbow</th>
<th>Low back</th>
<th>Wrist</th>
<th>Thigh</th>
<th>Knee</th>
<th>Foot</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHQ</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Neck</td>
<td>0.36**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shoulder</td>
<td>0.36**</td>
<td>0.57**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper back</td>
<td>0.38**</td>
<td>0.65**</td>
<td>0.76**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elbow</td>
<td>0.30*</td>
<td>0.19</td>
<td>0.51**</td>
<td>0.36**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low back</td>
<td>0.49**</td>
<td>0.28*</td>
<td>0.37**</td>
<td>0.31**</td>
<td>0.31***</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hand</td>
<td>0.33*</td>
<td>0.20</td>
<td>0.34**</td>
<td>0.29*</td>
<td>0.53**</td>
<td>0.33**</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Thigh</td>
<td>0.32*</td>
<td>0.25**</td>
<td>0.49**</td>
<td>0.17</td>
<td>0.40**</td>
<td>0.48**</td>
<td>0.20</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Knee</td>
<td>0.25*</td>
<td>0.27*</td>
<td>0.27*</td>
<td>0.16</td>
<td>0.09</td>
<td>0.49**</td>
<td>0.21</td>
<td>0.40**</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>Foot</td>
<td>0.45**</td>
<td>0.18</td>
<td>0.30*</td>
<td>0.23</td>
<td>0.30*</td>
<td>0.44**</td>
<td>0.44**</td>
<td>0.48**</td>
<td>0.33**</td>
<td>1.00</td>
</tr>
</tbody>
</table>

* Correlation is significant at the 0.05 level (2-tailed).  ** Correlation is significant at the 0.01 level (2-tailed).

Table 3. Frequency distribution of the potential ergonomic risk factors committed by the child care workers

<table>
<thead>
<tr>
<th>Risk factors</th>
<th>Workers (N = 85)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy object lifting or child lifting</td>
<td>55 (64.7%)</td>
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<tr>
<td>Working in awkward postures</td>
<td>48 (56.5%)</td>
</tr>
<tr>
<td>Working in prolonged standing, squatting or kneeling</td>
<td>40 (47.1%)</td>
</tr>
<tr>
<td>Repetitive and monotonous movement of hand and wrist</td>
<td>24 (28.2%)</td>
</tr>
<tr>
<td>Reaching repetitively above shoulder height</td>
<td>6 (7.1%)</td>
</tr>
<tr>
<td>Work stress</td>
<td>22 (25.9%)</td>
</tr>
</tbody>
</table>

As to the ergonomic risk factors of work-related musculoskeletal disorders, more than half of the participating workers’ jobs involved: (1) lifting heavy objects or children, and (2) working in awkward postures. Similar risk factors were identified in some previous studies. For example, Owen identified lifting, bending, and stooping were the most physically stressful tasks for child care workers. King et al. also cited similar biomechanical stressors in a worksite analysis of 125 child care workers. In our study, the workers often used inadequately sized furniture, sat unsupported on the floor, and reached repetitively above shoulder height.

Our on-site observation also noted that workers’ strains could result from continuously spending in awkward postures at the work place. For examples, since the height of the beds are quite low, the workers must bend forward when they performed body rolling, percussion, and changing diapers for those disabled children; to feed
children in the wheelchairs, the workers stood beside the wheelchairs and bent forward with waist twists; and when performing some certain activities, the workers needed to squat themselves or to sit unsupported on the floor.

To reduce the risk of musculoskeletal strain, the employer provided some small chairs with casters to reduce the frequency of squatting or kneeling. They also offered a mechanical lift for their workers to move and transfer the disabled children. However, the mechanical lift was underutilized. The workers were hesitant to use the lift since it was difficult to be moved around in the extremely restricted space environment. In addition, operating the lift alone is time-consuming. Under these circumstances, the workers lifted, moved, and transferred children manually. It was not unusual to handle a child who weighs over 40kg. Thus, to improve workers’ knowledge level on safe lifting is as important as to improve workers’ working conditions by providing technical innovation.

Psychosocial factors were also examined in our study. Our study found that the child care workers had high level of job satisfaction and low CHQ score. Their job satisfaction might come from the progress of the children and the ability of the parents to cope with their children with disabilities. As Mak’s study pointed out, most of the special child care workers consider their jobs as meaningful and challenging since they had chance to utilize their professional knowledge and skills to train the ill children and to educate patients’ parents. The statistical results also showed that the CHQ scores of the workers had significant correlations with pain intensity of workers’ various body parts. Among them, pain intensity of the low back had the highest correlation coefficient with the CHQ (r =0.49, p<0.01). This indicates significant interactions between pain intensity and the psychological factors.

Historically, the programs to prevent musculoskeletal disorders (e.g., “the back school” program) were often performed in the hospital. However, the effectiveness of those programs would be limited if the patients could not apply the biomechanical knowledge to their working situations. For a better handling of work-related musculoskeletal disorders, it is mandatory to perform an on-site work analysis followed by subsequent intervention programs (including ergonomic risk modification, proper posture education, and exercise training) that are desirably needed for the best interests of the patients.

This study was a cross-sectional on site survey, further investigations, such as conducting a longitudinal ergonomic intervention, are warranted in order to gain comprehensive knowledge about the causative effect of the risk factors on musculoskeletal disorders among the child care workers.

REFERENCES


某兒童教養院工作人員之工作相關肌肉骨骼疾病

洪怡珣  謝仕福  吳欣治  馮紀慈  林銘川

佛教慈濟綜合醫院台北分院復健科

身心障礙兒童的照護者，常需抱持及搬運兒童，且經常以彎腰蹲跪等不協調姿勢工作，因而造成肌肉骨骼酸痛等問題。本研究針對某專門收容照顧身心障礙兒童之教養院員工，以現場觀察及問卷調查方式了解其工作相關肌肉骨骼疾病以及潛在之人因工程危險因子，另藉助「華人健康量表」調查其心理健康狀況。

共有 85 位員工參與本研究。研究結果顯示，最常發生肌肉骨骼酸痛的部位分別為：肩部(57.0%)、下背部(54.7%)、頸部(45.3%)，72%的員工認為其肌肉骨骼疾病與工作有相關性。照護者的「缺勤天數」與頸部疼痛程度($r = 0.38, p<0.01$)、肩部疼痛程度($r = 0.38, p<0.01$)、背部疼痛程度($r = 0.40, p<0.01$)以及有無規律運動習慣($r = -0.24, p<0.05$)等變項有顯著相關。「華人健康量表」分數亦與各部位之疼痛程度有顯著相關，其中又以下背部疼痛程度與「華人健康量表」的相關性最高($r = 0.49, p<0.01$)。在人因工程危害方面，超過半數的員工經常需要搬運重物或抱持院童上下輪椅，且因遷就兒童身高，常需以彎腰、蹲跪等不協調的姿勢工作。

本研究結果顯示，身心障礙兒童教養院員工之工作相關肌肉骨骼疾病盛行率高，並影響其缺勤天數，因此需要進一步的教育訓練以及改善工作環境，以預防工作相關肌肉骨骼疾病的發生。（台灣復健醫誌 2008；36(1)：15 - 21）

關鍵字：工作相關肌肉骨骼疾病(work-related musculoskeletal disorders)，人因工程危害因子(ergonomic risk factor)

通訊作者：林銘川醫師，慈濟醫院台北分院復健科，台北縣 231 新店市建國路 289 號
電話：(02) 66289779 轉 3510    e-mail：micola@tzuchi.com.tw