NECK AND SHOULDER AILMENTS IN A GROUP OF FEMALE INDUSTRIAL WORKERS WITH MONOTONOUS WORK

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Abstract—The aim of the present paper was to study the comprehension of exposure to different physical and psycho-social factors at work, at home and during leisure time and the lifestyle of a group of unskilled female workers, and also their reports of musculoskeletal ailments, especially in the neck, shoulders and thoracic back. Furthermore an evaluation of the relevance of the methods used and the validity of the results are discussed. One hundred and seventy-three women, aged 20-45 years, from, in total, 26 large, medium-sized and small enterprises in three counties in Sweden participated in the study. Each woman answered a questionnaire in the presence of the project leader in a separate room close to her workplace. The questionnaires comprised questions on demographic, work-related and domestic factors; smoking habits, lifestyle and level of physical activity, leisure activities, health status and musculoskeletal problems. The prevalence of musculoskeletal ailments and the smoking habits among the 173 women was compared to a group of 153 women of the same age from the general population. The environmental factors reported as being most disturbing at work were noise, temperature and humidity, and the most frequent adverse physical factors were repetition of movements, precision and uncomfortable posture. The women in the studied group were largely responsible for domestic tasks such as laundry, cleaning and cooking but to a greater extent shared the responsibility for the children with their partners. The highest prevalence of ailments in the study group were in the neck (68%) and shoulders (74%); in the group from the general population these prevalences were 35 and 42%, respectively. The relevance of methods used and the validity of the results were found to be acceptable. Copyright © 1996 British Occupational Hygiene Society.

BACKGROUND

Several studies of musculoskeletal diseases have indicated a possible relationship between physical and psycho-social factors in the work environment and pain in the neck and shoulders. Women in monotonous and repetitive work are more prone to get problems or ailments in the neck and upper limbs than men; for example, women were found to have twice the rate of men (Dimberg et al., 1985), and to take sick leave more often than men (Brulin et al., 1990). Brulin et al. (1990) concluded that the fact that women worked more often in repetitive, monotonous work tasks than men was more important than gender per se, and Dimberg et al. (1985) found that short stature was as important as gender. Linton and Kamwendo (1989) compared medical secretaries with a poor or good psycho-social work environment, and found that those who worked in a poor environment reported neck and shoulder ailments three times as often as those who worked in a good environment. Levi et al. (1986) reported that stress was highest among workers with highly repetitive work tasks.

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who maintained the same position during work and who found it impossible to influence the pace of their work. The findings of these studies suggest that both physical and psychological work demands result in physiological stress. Finally, in a survey of studies using the Nordic questionnaires for musculoskeletal diseases, Kuorinka et al. (1990) stated that there appeared to be an increased risk of problems in the neck, shoulders and arms in monotonous and tensed work tasks performed in a sitting position.

These examples illustrate that there are different work-related causes that affect the health of men and women at work. Furthermore, stress reactions depend on factors both within the workplace and outside, and on personality (Levi, 1983). That social support can protect against different kinds of self-reported symptoms of chronic diseases has been reported by Orth-Gomér (1979).

There are no studies that have considered the total impact of work-related factors and factors related to family, leisure time and lifestyle on women's health. We postulate that such a combination of factors is of importance for the health of women at work. The main hypothesis to be examined here is that contracting musculoskeletal problems in the upper part of the body is not merely work-related, but also depends on social factors and lifestyle. To study this, a comprehensive investigation was undertaken with the aim of elucidating those factors which might be of importance for contracting musculoskeletal problems.

OBJECTIVES

The study was descriptive with the aim of evaluating the relevance of the methods we used and the validity of the subjects' comprehension of:

— their exposure to different physical and psycho-social factors at work, at home and during leisure time and lifestyle; and
— their musculoskeletal ailments, especially in the neck, shoulders and thoracic back.

SUBJECTS

The study was performed in three counties in mid Sweden. To avoid biases depending on the sizes or location of the workplaces a thorough selection procedure was performed, with the assistance of statisticians. All the companies in the metal and food industries in the counties were listed according to number of employees. The companies were divided into three categories: small (20–99 employees), medium (100–699 employees) and large (>700 employees). A number of companies were then proportionally and randomly selected from the counties. In this way it was proposed to recruit a quota of 200 women: from the six large companies selected, 95 women were to be recruited (15 from each of five companies and 20 from one) and from the 15 middle-sized and six small companies, 105 women were to be recruited (five from each company). The selected companies were contacted and asked if they would allow their employees to participate in the study. This was necessary as it was important to have their permission for employees to participate during working hours. The unions were asked for permission on behalf of the women employed.
Twenty-six companies finally agreed to participate and provided lists of the women they employed as unskilled workers who were then randomly selected and invited to participate. One large company would not let their employees participate because major changes were in progress at the time of the study. This company was replaced by a second division from within the same large company from which another division had originally been selected; the two divisions were in separate workplaces. It was not possible to recruit the final company within the small group as many small companies in one of the counties had been forced to close down because of the recession.

To be included in the study the women were required to meet the following criteria:

1. to be an unskilled worker (industrial work or service), in a metal-working or food processing company with more than 20 employees and have a work task which involved monotonous work;
2. to be aged between 20 and 45 years and have been working in her present job for the previous 6 months; and
3. to volunteer to participate in the study.

If any of those who were invited did not meet these criteria, the next woman on the list in the appropriate age group was invited.

METHODS

In the presence of the project leader each woman was asked to complete a questionnaire. This was done in a separate room close to her workplace and gave her an opportunity to obtain clarification if there were any difficulties in understanding the questions. All the women spoke Swedish including those who were immigrants. The questionnaire comprised five parts with a total of 184 questions.

1. Demographic factors—22 questions.
2. Work-related factors—72 questions.
3. Domestic factors—17 questions.
4. Lifestyle, that is, smoking, physical activity level and leisure activities—43 questions.
5. Health status and musculoskeletal problems—30 questions.

1. The demographic factors included age, stature, weight, handedness and civic status. Body mass index (BMI) was calculated from the formula, body weight in kg/stature in m². BMI was divided into four categories, slender (<21 kg m⁻²), medium (21.1-24.9 kg m⁻²), overweight (25-30 kg m⁻²) and obese (>30 kg m⁻²) based on Bray and the Surgeon General as described by Nathan et al. (1992).

2. The work-related factors comprised education, occupation, total years of gainful employment and present tasks, weekly working hours, shift pattern and payment system, commuting time and vehicle used. The questionnaire also included questions on physical and environmental work factors, adapted from an earlier questionnaire described by Ekberg et al. (1991, 1994a,b) and modified with her cooperation. Ten dichotomous (yes or no) questions included disturbance by
environmental factors (noise, draught, bad lighting, heat, cold, vibration, gases or solutions, smoke or dust, bad ventilation and smell) and nine similar yes or no questions were included to assess the presence of physical loading factors (heavy lifts, repetition of movements, pace, precision, fixed and monotonous work positions, concentration required, uncomfortable work postures, eye straining tasks, sitting positions). With the help of a time scale, each woman also reported during how much of her work day she had to maintain a specific posture (positions with back, neck and arms in sitting or standing, repetition of movements and tasks requiring high precision). The number of working hours per day spent in different positions was calculated from the percentage value marked on the time scale for each variable. Factor analysis of the variables was performed using principal component extraction and varimax rotation.

For psychological demands and autonomy of decision making at work a Swedish version of Karasek's questionnaire was used (Alfredsson and Hammar, 1989; Karasek and Theorell, 1990; Theorell et al., 1988, 1990, 1991; Wahlstedt and Edling, 1994). This gives a model for the evaluation of the impact of the degree of work demands and the latitude of decision making on psychosomatically or physiologically influenced diseases. The model provides four different characteristics of the work: active, passive, tensed and not tensed. The questions provide measures of psychological demands (five items), intellectual discretion (four items) and authority over decisions (two items). The questions were, for example "Does your job require very hard work?", "Do you have the freedom to decide how your work should be performed?". The four possible answers were: yes, often; yes, sometimes; no, seldom; and no, never. Questionnaires about psycho-social factors at work devised by the same authors (Karasek and Theorell, 1990; Theorell et al., 1988, 1990), were used with two added questions (Wahlstedt and Edling, 1994) making a total of 16 questions in all. They were put in the form of suggestions such as, "The atmosphere in my workplace is quiet and comfortable", "I am often in conflict with my superiors". The four possible answers were: agree completely, agree partly, disagree partly and, disagree completely. These answers were transformed into two indices. One included questions regarding the degree of positive factors and the other included questions regarding the degree of negative factors.

(3) Questions on home duties and children's activities were adopted from Kecklund et al. (1989). Home duties and children's activities considered the extent to which the woman herself undertook cleaning, shopping, cooking, gardening, house book-keeping, planning of vacations, contacts with relatives, child morning and night duties, reading stories, supervising homework, attending parents' meeting and being at home with sick children. The four possible answers were: generally me; generally my partner; both of us to the same extent; and neither of us.

(4) Leisure activities were assessed using questions adapted from Kecklund et al. (1989) and included the extent to which the woman was active in sports, hobbies such as handicrafts and knitting, club and amusement activities, political and union activities, education, reading books and papers and watching television. The four answers here were seldom/never, once/week, 2–3 times/week, and more than 4 times/week. Questions about smoking habits were taken from the study of Gerner Björksten et al. (1990) and Norbäck and Edling (1991) and from a questionnaire used for the promotion of non-smoking. It consisted of questions about current and
earlier smoking habits (number of cigarettes, in which situations the women used to smoke and for what reason).

(5) Questions about health status included those on general health, headaches, nervousness, dizziness and medication for those symptoms. The questionnaire about musculoskeletal problems was a modified Nordic Questionnaire (Kourinka et al., 1987), the modifications being that the 12 months prevalence used in the original was altered to 3 months and that the body map was not included. The questions concerned the neck, shoulders, thoracic and lumbar back, elbow joints, wrists/hands, hip joints, knee joints and ankles/feet. The women were able to get explanations about the different parts of the body from the project leader if necessary. The alternative answers were yes or no.

The complete questionnaire was tested in one of the large companies before the main study was performed. Slight modifications in the demographic part of the questionnaire were made, but they were trivial and the results from the 18 of selected 20 women, participating in the pilot study were therefore included in the final study, as the criteria and selection for participating were the same as for the main study.

Statistical analysis
Frequencies, mean values and factor analysis were calculated using SPSS/PC+. Confidence intervals between the proportions of ailments in the studied population \((p_1)\) and the women in a general population \((p_2)\) were calculated according to the formula: \(p_1 - p_2 \pm z \times SE(p_1 - p_2)\), where \(SE(p_1 - p_2)\) represents the standard error of the difference between the observed proportions.

RESULTS
One hundred and seventy-three (87%) of the 200 women invited participated in the study. A slight difference was found between the large and small companies, where the participation rates were 89 and 88%, respectively, and the medium-sized companies, where the participation rate was 83%. Age was the only variable for which it was possible to compare participants (mean = 34) and non-participants (mean = 29); this difference was significant \((P = 0.0011)\).

Demographic factors
The mean age, stature and body weight are shown in Table 1(a). Nineteen per cent of the women were slender, 42% medium, 32% were overweight and 6% were obese according to the BMI index. Seventy-four per cent of the women lived in a partnership and the rest were single. Fifty-one per cent \((N = 128)\) of those living with a partner and 31% \((N = 45)\) of the single women had children under the age of 13 years [Table 1(b)]. Fifty per cent of the women were smokers at the time of the interview with a mean début age of 17 years (range 11–38 years). Twenty per cent were former smokers. (Results not shown.)

Work-related factors
The women worked a mean of 37 h per week with a range of 20–43 h. Sixty-eight per cent worked full time and 93% worked 30 h or more a week. Shift work was performed by a third of the women, mainly on a two-shift rota and most liked their
work rota. Forty per cent had been working overtime during the previous 3 months. Some of the women lived 5 min from their workplace, while others had a daily commuting time of up to 4 h added to the effective working time. A little less than two-thirds were paid on a regular basis, the rest on piece work. (Results not shown.)

The environmental factors which were reported as being disturbing at work are shown in Table 2(a). Those most often reported as disturbing were noise and indoor climate. Physical loading factors most frequently encountered at work were, in descending order, repetition of movements followed by precision tasks, uncomfort-

Table 2(a). Numbers and per cent of women disturbed by environmental factors at work \( (N=173) \)

<table>
<thead>
<tr>
<th>Factor</th>
<th>( n )</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise</td>
<td>95</td>
<td>55</td>
</tr>
<tr>
<td>Poor ventilation</td>
<td>85</td>
<td>49</td>
</tr>
<tr>
<td>Draughts</td>
<td>78</td>
<td>45</td>
</tr>
<tr>
<td>Cold</td>
<td>76</td>
<td>44</td>
</tr>
<tr>
<td>Heat</td>
<td>71</td>
<td>41</td>
</tr>
<tr>
<td>Dust</td>
<td>54</td>
<td>31</td>
</tr>
<tr>
<td>Poor lighting</td>
<td>42</td>
<td>24</td>
</tr>
<tr>
<td>Smell</td>
<td>38</td>
<td>22</td>
</tr>
<tr>
<td>Evaporation</td>
<td>34</td>
<td>20</td>
</tr>
<tr>
<td>Vibration</td>
<td>17</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 2(b). Numbers and per cent of women reporting adverse physical loading factors at work \( (N=173) \)

<table>
<thead>
<tr>
<th>Factor</th>
<th>( n )</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repetitive movements</td>
<td>151</td>
<td>87</td>
</tr>
<tr>
<td>Precision</td>
<td>144</td>
<td>83</td>
</tr>
<tr>
<td>Uncomfortable position</td>
<td>116</td>
<td>67</td>
</tr>
<tr>
<td>Lifting heavy loads</td>
<td>111</td>
<td>64</td>
</tr>
<tr>
<td>Constrained movements</td>
<td>108</td>
<td>62</td>
</tr>
<tr>
<td>Eyestraining tasks</td>
<td>93</td>
<td>54</td>
</tr>
<tr>
<td>High work rate</td>
<td>83</td>
<td>48</td>
</tr>
<tr>
<td>High concentration</td>
<td>70</td>
<td>41</td>
</tr>
<tr>
<td>Sitting still</td>
<td>59</td>
<td>35</td>
</tr>
</tbody>
</table>
able postures, heavy lifts, fixed work movements and eyestraining work tasks [Table 2(b)]. The variables regarding time spent in different work positions were evaluated by factor analysis which resulted in four factors with the lowest factor loading at 0.48. Internal consistency for the factors, as measured by Cronbach’s alpha, varied between 0.64 and 0.83. The variables were grouped logically according to the nature of the postures and movements: (1) standing (except for the variable standing with bent back, which grouped in the factor concerning standing posture but also in the factor concerning work with lifted arms); (2) sitting; (3) arms and hands lifted above shoulder height; and (4), repetition of movements and careful movements with hands at table height. The positions with the reported highest mean daily duration were repetition of movements, careful movements and standing (4 h, respectively), hands at table height (3 h) and sitting with the back bent, and standing with the neck bent (2 h).

The questions concerning demands and decision making at work were analysed by means of the two-dimensional model of demand and control with the four characteristics of the work. In this model, the women were distributed so that 30% fell into the low tensed group, 27% into the high tensed group, 16% into the passive group and 28% into the active group. (Results not shown.)

The questions in the psycho-social questionnaire were analysed as indices such that the better the situation, the lower the points scored. The positive index points varied from 6 to 24, with a mean of 11 (SD = 2.61) while the score on the negative index varied from 10 to 40 points with a mean of 15 (SD = 3.71). (Results not shown.)

**Domestic factors**

The women assumed the responsibility for home duties to a great extent. The number of different tasks which the women who lived in a partnership performed is shown in Table 3 where it can be seen that the tasks which they were most likely to perform themselves were laundry (84%), cleaning (66%) and cooking (63%). The responsibilities for the children were shared with their partners to a much greater degree as can be seen from Table 4. Of the women living in a partnership and with children below 13 years, 40% took sole care of the children in the morning, 39% attended parents’ meetings at school, 33% helped the children with their homework and read books, while 54% took sole care of the children when they were ill.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Most often me</th>
<th>Most often my partner</th>
<th>Both of us</th>
<th>Neither of us</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weekly cleaning</td>
<td>66</td>
<td>3</td>
<td>31</td>
<td>0</td>
</tr>
<tr>
<td>Laundry</td>
<td>84</td>
<td>1</td>
<td>16</td>
<td>0</td>
</tr>
<tr>
<td>Housework</td>
<td>32</td>
<td>38</td>
<td>30</td>
<td>0</td>
</tr>
<tr>
<td>Food shopping</td>
<td>45</td>
<td>6</td>
<td>50</td>
<td>0</td>
</tr>
<tr>
<td>Cooking</td>
<td>63</td>
<td>8</td>
<td>30</td>
<td>0</td>
</tr>
<tr>
<td>Gardening</td>
<td>9</td>
<td>29</td>
<td>46</td>
<td>16*</td>
</tr>
<tr>
<td>Planning for vacation</td>
<td>11</td>
<td>2</td>
<td>85</td>
<td>2</td>
</tr>
<tr>
<td>Contact with relatives</td>
<td>17</td>
<td>4</td>
<td>79</td>
<td>0</td>
</tr>
</tbody>
</table>

*Probably because they had no gardens.
Table 4. Ranking of responsibility for activities with children for women living with partners and with children younger than 13 (N=65)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Most often me</th>
<th>Most often my partner</th>
<th>Both of us</th>
<th>Neither of us</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morning activities</td>
<td>40</td>
<td>11</td>
<td>49</td>
<td>0</td>
</tr>
<tr>
<td>Reading stories/home work</td>
<td>33</td>
<td>5</td>
<td>60</td>
<td>2</td>
</tr>
<tr>
<td>Night activities</td>
<td>27</td>
<td>5</td>
<td>62</td>
<td>6</td>
</tr>
<tr>
<td>Parents' meeting</td>
<td>39</td>
<td>2</td>
<td>54</td>
<td>5</td>
</tr>
<tr>
<td>Driving children to activities</td>
<td>21</td>
<td>10</td>
<td>62</td>
<td>7</td>
</tr>
<tr>
<td>Doing things together with children</td>
<td>14</td>
<td>6</td>
<td>79</td>
<td>0</td>
</tr>
<tr>
<td>Caring for sick children</td>
<td>54</td>
<td>3</td>
<td>43</td>
<td>0</td>
</tr>
</tbody>
</table>

Table 5. Prevalence of reported musculoskeletal problems during previous 3 months and previous 7 days (N=173)

<table>
<thead>
<tr>
<th>Body region</th>
<th>3 months</th>
<th>7 days</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>Neck</td>
<td>116</td>
<td>68</td>
</tr>
<tr>
<td>Shoulders</td>
<td>127</td>
<td>74</td>
</tr>
<tr>
<td>Elbows</td>
<td>41</td>
<td>24</td>
</tr>
<tr>
<td>Wrists/hands</td>
<td>74</td>
<td>43</td>
</tr>
<tr>
<td>Thoracic back</td>
<td>80</td>
<td>47</td>
</tr>
<tr>
<td>Lumbar back</td>
<td>88</td>
<td>52</td>
</tr>
<tr>
<td>Hips</td>
<td>38</td>
<td>22</td>
</tr>
<tr>
<td>Knees</td>
<td>52</td>
<td>32</td>
</tr>
<tr>
<td>Ankles/feet</td>
<td>25</td>
<td>15</td>
</tr>
</tbody>
</table>

Leisure time activities
The most common activity performed more than twice a week during leisure time was reading (84%), followed by watching or listening to television or radio (65%) and physical exercise (45%). Very few of the subjects took part in club and/or union activities or in further education. (Results not shown.)

Health status and musculoskeletal ailments
Sixty-three per cent of the women rated their health to be reasonably good, but 26% often suffered from headache, 5% often suffered from dizziness and 11% often felt nervous. (Results not shown.)

Ninety-four per cent of the women reported some kind of musculoskeletal problems in the 3 months prior to the study. The highest prevalence of ailments reported during the previous 3 months and during the previous 7 days were in the neck and shoulder regions (Table 5).

DISCUSSION
The women in this study reported a large number of musculoskeletal problems in the 3 months prior to the inquiry. In general, they worked 30 h per week or more and many had jobs which were repetitive with a demand for precision, but they reported a good psycho-social working environment. They were largely responsible for domestic tasks such as laundry, cleaning and cooking but shared the responsibility...
for the children with their partners to a greater extent. Very few were obese although a third were overweight; half exercised regularly but a high proportion were, or had been, smokers. The following discussion focuses on the relevance of methods used and the validity of the results, compared with other studies of similar groups.

The study included women working in companies of different sizes and living in both urban and rural neighbourhoods. The way the selection of the industries and the women was performed was considered to give a representative sample of the age group of women working in the metal and food industries in the region. The non-participation rate was 13% and the non-participants were, on average, 5 years younger than the participants. The study design did not allow for controls of sickness absence rates. Seventy-two per cent of all Swedish women, aged 20–44 years lived in a partnership in 1991 (Statistics Sweden, 1993) and in the study population 74% did so. With a high rate of participation, it seems reasonable to assume that the group of 173 women is representative.

The different parts of the questionnaire had all been used in similar studies previously and were thus well tried and tested (Kecklund et al., 1989; Kuorinka et al., 1987, 1990; Gerner Björksten et al., 1990; Karasek and Theorell 1990; Norbäck and Edling 1991; Ekberg et al., 1994a,b; Wahlstedt and Edling 1994). The modifications made in the present study related to only two of the forms. Thus, we used a modification of the Nordic Questionnaire without a body chart and the participants were able to ask the project leader if they had any doubts about the names of the various parts of the body. Secondly, to avoid problems with poor memory, the prevalence of symptoms was reported for the previous 3 months, rather than 12 months as in the original version. The use of a 3-month period for prevalence studies at work was recently recommended by a group of Nordic researchers (Örhede, 1994). Finally, the duration of exposure for different physical loading at work was evaluated using questions adapted from a questionnaire published by Ekberg et al. (1994a,b). These authors used verbally expressed fixed alternatives, whereas a time scale was used in the present study. Factor analysis of the variables in our study and in Ekberg’s (personal communication) gave the same factors, except for one variable, standing with bent back. These last questions were tested for validity in a separate study (Arvidsson, 1995). Acceptable agreement was obtained if the 90% confidence interval of the mean of the differences between the subjects’ and the observer’s scores fell within a 10 mm limit from perfect agreement. The results showed acceptable agreement for most of the variables. However, the subjects showed a tendency toward overestimation compared to the observer. The scores for sitting with forward bent back and standing with forward bent neck did not fulfil the criteria for agreement. Arvidsson (1995) concluded that this questionnaire is not suitable to judge the exposure of individuals but only that of groups of workers.

Most of the women (94%) in the study had had some musculoskeletal problems in the previous 3 months. It could be argued that subjective reports of both exposure and effect may introduce recall bias. The study by Arvidsson (1995) also tested possible covariation between ailments and estimation of work postures or movements but no such tendency was found. Toomingas et al. (1995) studied high or low rating behaviour among subjects in an epidemiological study of musculoskeletal disorders and the effects of such rating behaviour on exposure–effect risk estimates. They reported no consistent pattern of high or low rating behaviour.
Also, according to Bergqvist et al. (1995) 'negative affectivity', for example, 'anger, disgust, scorn, guilt, fearfulness and depression' may influence the reporting of physical discomfort. However, as the subjects in this study scored the psychosocial environment as being relatively good, with 73% falling into non stressed groups, and as they also scored positively regarding support at work, a bias towards over-reporting of musculoskeletal problems seems unlikely.

For comparison of the 3-month prevalence of musculoskeletal ailments and the smoking habits, a group of 153 women from the general population was used. The women in this group were randomly selected from the civil registration register from the same three counties and were in the same age groups (20–45 years) as the subjects. They had participated in a comprehensive study 3 years earlier by answering a mailed questionnaire (Gerner Björksten et al., 1990; Norbäck and Edling, 1991). By comparison with that group (Table 6), the study group reported significantly more problems at all anatomical sites except the hips and feet. The confidence intervals for the difference in the proportions of ailments between the subjects and the group from general population are shown in Table 6 and it can be seen that there were significant differences for all body regions except the hips and the ankles/feet. Problems in the hips are not known to be work related except in those undertaking heavy manual work (Vingård et al., 1991), and as the prevalence of hip complaints was the same among the subjects in our study and those in the general population it seems likely that our subjects were not over-reporting complaints elsewhere. The high prevalence of neck and shoulder complaints must, therefore, be analysed further to determine the extent to which it can be generalized to other women working in similar jobs.

According to Brattberg et al. (1989), who reported on a survey of persistent pain in the general population in a county of Sweden, the frequency of pain in the neck, shoulders, arms and back was highest in the 45–64 year age group. This suggests that by excluding women above 45 years of age we have avoided the inclusion of painful symptoms due to age and to so-called degenerative factors, since our study included only women aged between 20 and 45 years. In their study of 305 women (18–59 years) randomly chosen from the general population in a community in southern Sweden, Ekberg et al. (1994a) found 53% with neck problems and 40% with

<table>
<thead>
<tr>
<th>Body region</th>
<th>Industrial workers (%)</th>
<th>General population (%)</th>
<th>Mean difference</th>
<th>95% CI of mean difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neck</td>
<td>68</td>
<td>35</td>
<td>33</td>
<td>23–43</td>
</tr>
<tr>
<td>Shoulders</td>
<td>74</td>
<td>42</td>
<td>32</td>
<td>22–43</td>
</tr>
<tr>
<td>Elbows</td>
<td>24</td>
<td>14</td>
<td>10</td>
<td>2–18</td>
</tr>
<tr>
<td>Wrists/hands</td>
<td>43</td>
<td>27</td>
<td>16</td>
<td>6–26</td>
</tr>
<tr>
<td>Thoracic back</td>
<td>47</td>
<td>24</td>
<td>24</td>
<td>14–34</td>
</tr>
<tr>
<td>Lumbar back</td>
<td>52</td>
<td>36</td>
<td>16</td>
<td>5–26</td>
</tr>
<tr>
<td>Hips</td>
<td>22</td>
<td>18</td>
<td>4</td>
<td>−4 to 13</td>
</tr>
<tr>
<td>Knees</td>
<td>32</td>
<td>20</td>
<td>12</td>
<td>2–21</td>
</tr>
<tr>
<td>Ankles/feet</td>
<td>15</td>
<td>14</td>
<td>1</td>
<td>−7 to 8</td>
</tr>
</tbody>
</table>
shoulder problems over a 6-month period, which is slightly more than in the group of women from the general population (Gerner Björkstén et al., 1990) (Table 6).

Ohlsson et al. (1989) reported a study of a group of 148 female assembly workers (16–61 years) of whom 39% reported neck problems, 55% shoulder problems and 33% upper back problems, a prevalence lower than that found in our study. The fact that the women in our study reported more problems than the women in Ohlsson’s study may be due to a number of factors. One could be related to age. In another study (Ohlsson et al., 1995), which investigated 82 female assembly workers aged between 21 and 64 years, the prevalence of problems in the neck, shoulder and thoracic back combined was slightly lower than in ours (78 and 84%, respectively). In Ohlsson et al.’s study only 69% of the women worked more than 30 h per week, compared with 93% in the present study, and this difference in working hours may have affected the prevalence of musculoskeletal ailments.

In our study 50% of the group were current smokers and a further 20% were former smokers; in the general population (Gerner Björkstén et al., 1990; Norbäck and Edling, 1991), 38% of women were current smokers and 19% former smokers. In the study by Ekberg et al. (1994a) 27% were smokers among 305 women aged 18–59 years. The proportion of daily smokers in the studied group was 46%, compared with 30% in the actual age group in the general population 1991, according to Brian Wicklin, Statistics Sweden (personal communication), referring to the report “Living conditions”, (Statistics Sweden, 1991). It appears that there are more smokers in the studied group than in other groups in Sweden and the possibility that smoking may influence the prevalence of reported ailments should be examined in more detail.

The women in the studied group were largely responsible for domestic tasks such as laundry, cleaning and cooking but to a greater extent shared the responsibility for the children with their partners. The possibility that the engagement in domestic duties may influence the prevalence of reported ailments should also be examined in more detail.

The relevance of the methods used here and the validity of the results were found to be acceptable and further analysis of these data will focus on possible relations between exposure and outcome.

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