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MILKING IS A HIGH-RISK JOB FOR YOUNG FEMALES

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ABSTRACT. The prevalence of and the impact of selected factors on self-reported musculoskeletal complaints in Swedish female milkers with special reference to symptoms in the upper extremities were investigated using data from mail-in surveys. An agricultural study group was formed of three subgroups: 161 active milkers, 108 non-milkers and 62 ex-milkers, women who had been milkers earlier but were no longer doing that kind of work. In the course of the analysis these subgroups were compared with each other and also, separately or in combinations, with a non-agricultural population consisting of 166 nursing assistants. Problems in the upper extremities were significantly more common in the agricultural group than in the non-agricultural group. Milkers ran a higher risk of developing symptoms in the wrists and hands than non-milking women. Symptoms such as numbness, coldness in the wrists and white fingers were more common in all agricultural subgroups than in the non-agricultural group. Numbness and white fingers were related to vibration exposure in the ex-milker and the non-milker groups but not in the milker group. Psychosocial factors such as occupational well-being were not related to the occurrence of symptoms. Milking in a modernized barn gave fewer problems in elbows than milking in a traditional barn. Milkers who had received ergonomic instruction on how to work in order to reduce muscle stress had fewer problems in the elbow region than those who had received no such information.

Key words: female milkers, agriculture, musculoskeletal disorders, upper extremities, hands, wrists.

INTRODUCTION

During recent decades awareness has increased of the growing problem of musculoskeletal disorders in neck and upper extremities of employees in different occupational groups. In a study by Lindén (17) it was shown that 58% of the work-related injuries in agriculture affected the locomotor system as compared with 49% in all Swedish industries. Women in agriculture suffered from work-related injuries in the wrists and hands to a greater extent than men, 33% and 8%, respectively.

A total of 48,000 women work in agriculture in Sweden (1991) including 27,000 engaged in farming and animal husbandry, where milking is a large part of the work (26). Gustafsson et al. (8, 9) reported high frequencies of work-related disorders in a sample of 3,000 Swedish milkers including 1,000 women. Pain, ache and discomfort in the shoulders were reported by 35% of the men and by 34% of the female milkers. The corresponding figure for pain in the wrists and hands was 18% for men and 35% for women. This prevalence of pain in the wrists and hands in men and women working in separate milking parlours was also confirmed by Stål & Pinzke (27).

It is well known that the work in dairy barns is associated with the lifting of heavy objects, and moving and carrying equipment (18). The attachment of the machine to the udder of the cows is still a typical manual task in which the milker holds the cluster in the hand (weight 2.0–3.5 kg). The total weight of a milking machine is about 6 kg. The milking machine is not adapted to handling by women. Thus the diameter of the base of the claw is 11 to 15 cm, which hardly fits the hand of a woman which is smaller than that of a man (24). When connecting the milking cluster to the pipeline, the forearm is in a maximally pronated position, and when the cluster is being attached to the udder, the claw is held with the arm elevated to about 90° and the elbow flexed only to a few degrees. Furthermore, the fingers are extended and the wrist is in a maximal dorsal flexion position. Extreme positions of the wrists can cause increased stress on sensitive tissues such as nerves, muscles, tendons and ligaments (2, 23). Each fixation of the milking machine to the udder

takes about 8 to 10 seconds. That means that milking also induces a heavy static load on the upper extremities. Furthermore, the work is repeated and must be done twice a day every day for the entire year.

The degree of mechanization of the milking equipment is of importance when discussing problems in the locomotor system. The normal system of milking in Sweden is milking tied cows, where the milkers must lift and carry the heavy milking units to the cows. Only about 5% of the 17,000 Swedish dairy farms have a loose housing system, where the milking equipment is stationed in the milking parlour.

It is strongly suspected that the musculoskeletal disorders in the upper extremities among female milkers are associated with the different environmental factors in milk production.

Until now, ergonomic analyses concerning postures in milk production have been focused on musculoskeletal disorders in the back and in the lower extremities (22, 28) and only to some extent on disorders in shoulder joints (1). To our knowledge, comparative studies with agricultural women and other groups of women performing heavy physical work have so far not been carried out. Among employed women in Sweden nursing assistants have reported the highest prevalence of work-related disorders (7). Three times more work-related loading injuries were reported in this group than in any other comparable group. Manual lifting predominates in agriculture work (18) as well as in hospital work (4).

Agricultural non-milking women might be working with the rearing of pigs and beef-cattle, where lifting and carrying also often occur. However, these women do not regularly have to handle equipment which does not fit the size of their hands, which is the case with milking women.

There are no studies on the impact of psychosocial factors on the development of musculoskeletal symptoms in female milkers.

The aim of the investigation was to study the prevalence of musculoskeletal problems with special emphasis on symptoms in the upper extremities in female professional milkers compared with a non-milking female agricultural group and a group of nursing assistants with physically demanding jobs. Furthermore, the purpose was also to study to what extent reported problems affected the ability to perform daily work tasks.

An additional aim was to investigate the influence of physical, psychosocial and environmental factors on reported musculoskeletal symptoms in the upper extremities among female milkers in Sweden.

SUBJECTS AND METHODS

Subjects

The original study population comprised a female agricultural group made up of active milkers as well as non-milkers, and a non-agricultural sample represented by a group of nursing assistants. All participants lived in the same area in the county of Halland in Sweden. This county was chosen because of its large number of family farms with intensive dairy production. Information about names and occupation was taken from registers belonging to the Federation of Swedish Farmers, the Relief-worker service, the Swedish Animal Husbandry Organisation and a hospital in the south of Sweden, respectively.

To participate in the study the milkers had to milk daily and the non-milkers were never to have been milkers in the past. Of the 202 female milkers who fulfilled the criteria, 40 (20%) refused to participate. Thus 161 female daily milkers remained in the investigation group, called *milkers*. The non-milker group consisted originally of 229 women of whom 59 (25%) refused to participate. Among the remaining there were 62 women who had been milkers before but were so no longer. They formed the study group *ex-milkers*. Only 9% had stopped milking because of musculoskeletal problems. A total of 55% had stopped because milk production had been reduced and/or they had another job. The farmers had for example switched their production from dairy cattle to beef production.

Thus the final non-milker group consisted of 108 women working with poultry and/or swine production or plant production. They had never milked cows or handled heavy milking equipment.

A total of 211 nursing assistants were selected, all with nursing as a main task. Forty-five (21%) women refused to participate in the investigation and thus the fourth group consisted of 166 women.

The agricultural groups have all an indoor job, especially during the cold season. Thus all the investigation groups worked under almost the same temperature conditions.

The groups were compared with regard to the occurrence of musculoskeletal symptoms as follows. At first all the women in the agricultural group ($n = 331$) were compared with all the nursing assistants ($n = 166$). Then each of the agricultural groups (milkers, non-milkers, ex-milkers) was compared with the nursing assistants, and finally each of the agricultural groups was compared with the others.

Methods

Questionnaires: 1. The general standardized Nordic questionnaire for the analysis of musculoskeletal symptoms was used. It contains questions regarding symptoms in nine different parts of the body during the preceding 12 months and preceding seven days, and asks whether the problems had prevented the individuals from doing their daily work (16). The questionnaire uses a nominal yes or no scale. It was distributed in the autumn of 1990 and the spring of 1991. After two reminders the total response rate for the different groups was 81% (milkers), 75% (non-milkers, ex-milkers) and 79% (nursing assistants).

2. Occurrence of numbness and a tingling sensation, weakened muscles and trembling, combined with white fingers and coldness in wrists and hands during the preceding

Table I. *Background factors of the subjects*
Mean and median value, range (R) and standard deviation (sd)

	Milkers $n = 161$			Non-milkers $n = 108$			Non-milkers who have milked earlier $n = 62$			Nurse assistants $n = 166$		
	Mean R	Median	sd	Mean R	Median	sd	Mean R	Median	sd	Mean R	Median	sd
Age (years)	44 20–71	44	11	44 24–71	44	11	49 22–64	53	9	40 20–71	40	10
Number of years with present task	17 1–56	15	12	15 1–45	14	9	21 1–55	20	13	13 0.5–56	12	9
Weekly working hours	39 4–90	40	17	34 4–70	37	15	42 14–80	40	17	31 8–40	30	7
Weight of the body (kg)	66.2 46.0–98		9.7	65.6 45.0–99		9.9	64.3 46.5–85		8.4	63.5 44.0–90		8.7
Height (cm)	165.8 145–182		6.2	165.4 151–176		5.5	164.6 150–179		6.2	166.2 154–182		5.9
Body Mass Index (kg/m^2)	24.07 18.07–34.89	23.67	3.22	23.94 18.37–35.16	23.31	3.41	23.78 17.24–32.46	23.71	3.51	23.01 16.98–33.87	22.58	3.09

12 months were registered using a special questionnaire. This consisted of 15 questions, constructed and evaluated by Johansson & Hagberg (14). This questionnaire has earlier been used in a study of people exposed to vibrations. Four degrees of discomfort were registered from "none at all" to "very much discomfort". However, in this report the scale was transformed to a nominal yes or no scale, e.g. "no" on one side and "moderate or severe discomfort" on the other side.

Furthermore, four questions regarding the exposure to vibration during work were added.

3. Psycho-social factors such as occupational well-being and other environmental factors were studied among the female milkers, partly by using a modified questionnaire which has been tested earlier by Gellerstedt (6). Some questions related to physical stress such as fatigue experienced during and after the milking work, were added under the heading "Physical Demands". A series of hypotheses has been tested concerning the relationship between symptoms in each part of the upper extremities considered in the questionnaire (16) and different independent variables characterizing the female milkers and their working environment, i.e. the number of cows milked per day, the milking system and the total milking time for each milking event. The risk factors were introduced into the analysis as dichotomized variables above, versus below, the median value.

Furthermore the milkers were divided into subgroups with respect to years in this occupation (short versus long working time), work-time per week (short–long time), height (tall–short), weight (heavy–light), numbers of cows (a few–many) and concerning milking time (short–long) in order to test the relationship between symptoms and these independent variables. Body Mass Index (kg/m^2) was dichotomized above and below the median value.

4. A questionnaire to record muscle stress using a category ratio (CR-10) scale according to Borg (3) was used for the milker group. The purpose was to determine the ratio of intensity of perceived muscle stress in different working movements respectively and in different parts of the body, with special emphasis on the upper extremities. In this study the scale has been dichotomized to non-perceived muscle strain (0–2) or perceived muscle strain (3–10).

Statistical methods

To assess the degree of association between the potential risk factor of interest prospectively and an outcome event of injury occurrence, relative risks (RR) were estimated.

Student's *t*-test was used in the analyses of means as a complement to Duncan's multiple range test. The odds ratios were calculated for 2 by 2 tables with random marginals.

When using age as a covariate (controlling for confounding) in the model the quartiles for the age distribution were used to define the subgroups ($q_1 = 35$, $q_2 = 43$, $q_3 = 52$).

With respect to the milker group, the association between occurrence of problems and different dichotomized independent variables characterizing the milkers was studied using univariate analysis and a multiple logistic regression test.

All results are presented as 95% confidence intervals (CI 95%) and the level of significance was set at 5%.

RESULTS

An overall description of the study material is presented in Table I. As the sub-populations are age

dependent by definition there are significant differences between milkers/non-milkers and the two other groups. The non-milkers who have milked earlier, of course show a higher number of years in the present profession.

Prevalence of pain, ache and discomfort during the last 12 months

Out of the 161 women who regularly milked cows, only 26 (16%) did not report problems from the musculoskeletal system. A total of 136 individuals (84%) had experienced pain in different parts of the locomotor system at some time during the preceding 12 months. The corresponding numbers for the three other groups non-milkers, ex-milkers and nursing assistants were 85%, 87% and 75%, respectively.

Table II. *Age-standardized ($q_1 = 35, q_2 = 43, q_3 = 51$) rate ratios (RR) with 95% confidence intervals (CI 95%) for the shoulder, elbow and wrist/hand symptoms during the preceding 12 months in nursing assistants ($n = 166$) and milkers ($n = 161$)*

Age		Nursing assistants $n = 166$	Milkers $n = 161$
Shoulder			
<35	RR*	1.00	1.52
	CI 95%		0.96–2.40
35–51	RR*	1.00	1.41
	CI 95%		0.96–2.09
>51	RR*	1.00	0.89
	CI 95%		0.59–1.36
All	RR*	1.00	1.35
	CI 95%		1.05–1.73
Elbow			
<35	RR*	1.00	1.38
	CI 95%		0.48–3.98
35–51	RR*	1.00	2.68
	CI 95%		1.37–5.25
>51	RR*	1.00	0.86
	CI 95%		0.39–1.88
All	RR*	1.00	1.84
	CI 95%		1.16–2.92
Wrist/hand			
<35	RR*	1.00	1.97
	CI 95%		1.13–3.44
35–51	RR*	1.00	1.79
	CI 95%		1.22–2.63
>51	RR*	1.00	1.05
	CI 95%		0.60–1.84
All	RR*	1.00	1.67
	CI 95%		1.27–2.21

* Adjusted for age.

Risk ratio (RR) of symptoms in the neck and upper extremities during the preceding 12 months

The risk ratio (RR) was significantly higher in the total agricultural group (milkers, non-milkers and ex-milkers) than in the nursing assistant group with respect to symptoms in the neck in the age group 35–51 years (RR = 1.76, CI 95% = 1.15–2.70), shoulders (RR 1.53 CI 95% = 1.09–2.15), elbows, (RR 2.67, CI 95% = 1.43–5.00). Wrist and hand symptoms were also more often seen in the younger agricultural group (RR = 1.78, CI 95% = 1.05–3.02).

A significantly increased risk of developing symptoms in wrists and hands was found only among active milkers as compared with nurses (Table II). This was the case not only in the age group 35–51 years but also among those who were younger.

Ex-milkers reported almost the same number of upper limb problems as the milkers but with respect to symptoms in wrists and hands the differences were

Table III. *Age-standardized ($q_1 = 35, q_2 = 43, q_3 = 51$) rate ratios (RR) with 95% confidence intervals (CI 95%) for the shoulder, elbow and wrist/hand symptoms in the nursing assistants and non-milkers ($n = 108$)*

Age		Nursing assistants $n = 166$	Non-milkers $n = 108$
Shoulder			
<35	RR*	1.00	1.16
	CI 95%		0.61–2.21
35–51	RR*	1.00	1.52
	CI 95%		1.03–2.24
>51	RR*	1.00	0.79
	CI 95%		0.46–1.35
All	RR*	1.00	1.28
	CI 95%		0.97–1.69
Elbow			
<35	RR*	1.00	0.97
	CI 95%		0.21–4.41
35–51	RR*	1.00	2.66
	CI 95%		1.34–5.28
>51	RR*	1.00	0.71
	CI 95%		0.27–1.93
All	RR*	1.00	1.82
	CI 95%		1.10–3.00
Wrist/hand			
<35	RR*	1.00	1.66
	CI 95%		0.82–3.35
35–51	RR*	1.00	1.23
	CI 95%		0.78–1.92
>51	RR*	1.00	1.00
	CI 95%		0.52–1.93
All	RR*	1.00	1.30
	CI 95%		0.94–1.81

* Adjusted for age.

significantly higher only in the total group compared with the nursing assistants. Non-milkers had higher risk ratios as compared with nurses with regard to problems in the neck, shoulders and elbow but not in the wrists and hands (Table III). With respect to age, most complaints were reported in the 35–51-year-olds.

As compared with non-milkers, active milkers reported significantly more often pain and discomfort in wrists and hands, especially in the age group 35–51 years (Table IV). There was no significant difference within the agricultural groups with regard to symptoms in the neck, shoulder or elbow region.

Multilocal pain, ache and discomfort in the upper limbs experienced by the women in the study group

Among the different groups pain, ache and discomfort was reported in more than one localisation, e.g. in the neck, the shoulders and in the elbows/wrists/hands. The occurrence of neck and upper extremity problems is shown in Fig. 1. In the milker group, 35 women (21%) reported problems in both neck, shoulders, and elbows/wrists/hands. The corresponding figures for the non-milkers were 20%, ex-milkers 19% and nursing assistants 12%. The difference between the milker and the nursing assistant group was significant (OR = 1.92, CI 95% 1.06–3.47). When excluding the neck region, 54 (33%) of the 161 milkers reported pain in the shoulders as well as in the wrists/hands and elbows. The corresponding figures for non-milkers were 33 (30%), ex-milkers, 22 (34%) and nursing assistants, 28 (16%). A significant difference was found when comparing milkers and nurse assistants (OR = 2.49, CI 95% 1.48–4.19).

Table IV. *Age-standardized ($q_1 = 35, q_2 = 43, q_3 = 51$) rate ratios (RR) with 95% confidence intervals (CI 95%) for the shoulder, elbow and wrist/hand symptoms in non-milkers ($n = 108$) and milkers ($n = 161$)*

Age		Non-milkers $n = 108$	Milkers $n = 161$
Shoulder			
<35	RR*	1.00	1.31
	CI 95%		0.71–2.41
35–51	RR*	1.00	0.93
	CI 95%		0.66–1.32
>51	RR*	1.00	1.14
	CI 95%		0.69–1.88
All	RR*	1.00	1.06
	CI 95%		0.82–1.36
Elbow			
<35	RR*	1.00	1.31
	CI 95%		0.71–2.41
35–51	RR*	1.00	0.93
	CI 95%		0.66–1.32
>51	RR*	1.00	1.14
	CI 95%		0.69–1.88
All	RR*	1.00	1.06
	CI 95%		0.82–1.36
Wrist/hand			
<35	RR*	1.00	1.19
	CI 95%		0.64–2.22
35–51	RR*	1.00	1.46
	CI 95%		1.00–2.13
>51	RR*	1.00	1.05
	CI 95%		0.60–1.84
All	RR*	1.00	1.28
	CI 95%		0.97–1.70

* Adjusted for age.

Inability to work during the preceding 12 months

Of those in the milkers, non-milkers, ex-milkers and nursing assistants groups with problems in the upper part of the body, very few had been unable to work due to the reported pain. Problems in wrists and hands which had prevented the women from carrying out their daily work were reported by 5%, 8%, 7% and 6% in the milkers, non-milkers, ex-milkers and nursing assistants groups, respectively.

Nocturnal numbness, white fingers and coldness during the preceding 12 months

The occurrence of numbness experienced in the hands and fingers was significantly more frequent in

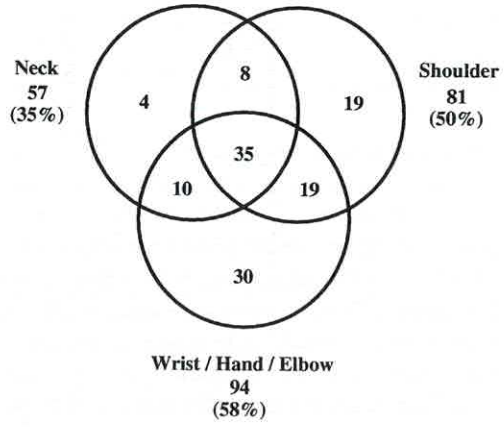

Fig. 1. Multi-local pain, ache and discomfort in neck, shoulders, wrist/hand/elbow experienced during the preceding 12 months by 161 female milkers.

all agricultural groups, milkers, 42%, non-milkers, 32%, and ex-milkers, 41%, than in the group of nursing assistants, 16%. However, within the agricultural groups there were no differences. In order to study the effect of age, the groups were divided using age standardization to above or below the median age of 43 years. There was a significant difference in experience of numbness in younger milkers as compared with younger nursing assistants (OR = 4.17 CI 95% 2.09–8.31) as well as between those above 43 years in corresponding groups (OR = 3.04 CI 95% 1.37–6.75).

Problems such as a feeling of coldness were reported significantly more often in milkers (20%) and ex-milkers (16%) than in nursing assistants (7%). The odds ratio for younger milkers was 3.21 (95% CI 1.25–8.37).

Numbness and white fingers were experienced significantly more often in those exposed to vibrations in non-milkers and ex-milkers (OR = 10.50, CI 95% 1.77–62.20, OR = 5.69, CI 95% 1.53–21.15) but not in the milker group.

Physical and environmental factors related to symptoms among 161 female milkers

Those women who experienced milking cows as a physically tiring job, had a higher prevalence of problems, especially in the wrists and hands, than milkers who did not, the odds ratio being 2.36 (CI 95% 0.99–5.61). The pattern was similar for pain in the shoulder region (OR = 2.29, CI 95% 0.96–5.45).

With respect to elbow symptoms there was a significant difference between those female milkers who had received ergonomic instructions on how to work in order to reduce the muscle stress, and those women who had not had any ergonomic information at all.

Furthermore there was a significant difference with respect to problems experienced in the elbows between women working in a traditional dairy barn and women working in a modernized barn where certain work environment improvements had been carried out. However, there were only 13 milkers who had the opportunity to work under those conditions.

The occurrence of symptoms in the upper extremities was not related to the number of cows.

There was no significant difference with respect to reported symptoms like numbness, coldness or white fingers in wrists and hands between the milkers who sometimes had worked with vibration tools compared with those who had not been using this kind of equipment.

Perceived physical stress estimated by two groups of milkers

The results of the female milkers' estimate of perceived muscle stress during ten different milking tasks are shown in Figs. 2 and 3.

The difference between the estimate of the mean value of the two groups of milkers, with and without problems in wrists and hands, was significant in many of the milking tasks. Milkers with problems made a higher assessment than milkers with no symptoms.

The tasks which were rated highest were carrying and lifting one or two milking machines, pre-milking, disconnecting and removing the milking unit, and attaching the cluster to the udder (Figs. 2, 3).

Psycho-social environmental factors

There was no relationship between the factors dealing with social demands, well-being and civil status and symptoms in the upper extremities among the 161 female milkers; nor was there any relationship between symptoms and smoking. Only 9% of the milkers smoked every day.

Background factors

Shorter milkers (145–158 cm) experienced significantly more symptoms in the shoulders than did the taller milkers (174–182 cm).

With respect to the Body Mass Index (kg/m^2) it was found that short and stout milkers reported a significantly higher frequency of problems in the shoulders than tall and thin milkers.

Concerning working hours per week, milkers with a shorter working week (4–20 hours) reported significantly more problems in the shoulders than did the milkers who were working 60–90 hours.

DISCUSSION

This study is based on a postal survey, using different questionnaires (4, 6, 14, 16) which have been tested and evaluated by others (12, 14, 15). About 20% of the women in the different groups did not answer the questionnaire. The drop-out frequency in the study

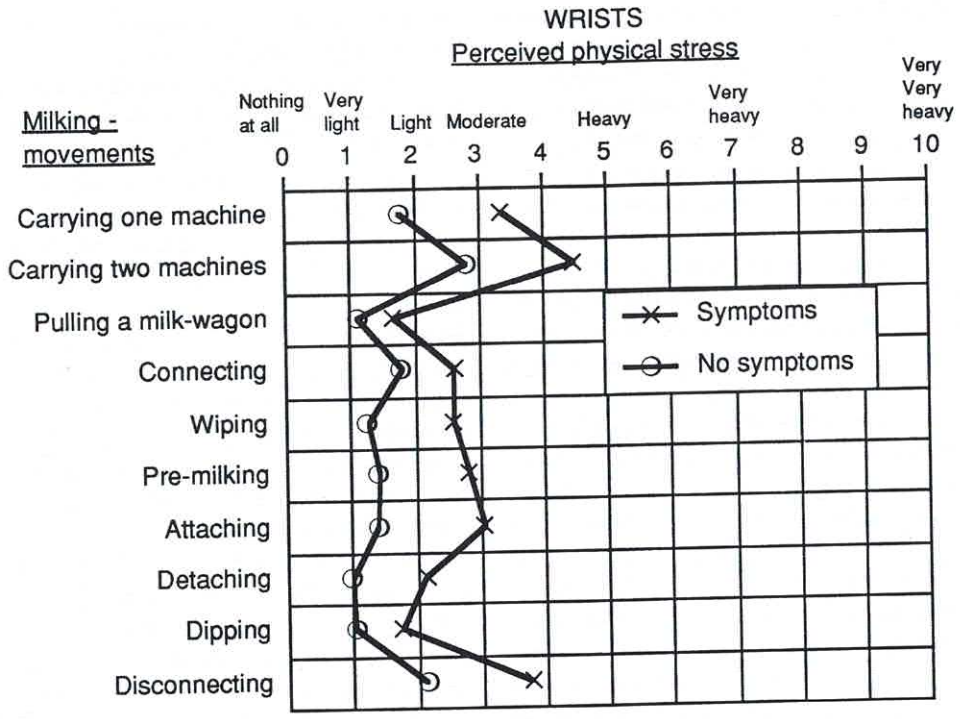

Fig. 2. Perceived physical stress in the wrists during different milking tasks among 161 active milkers, with and without complaints.

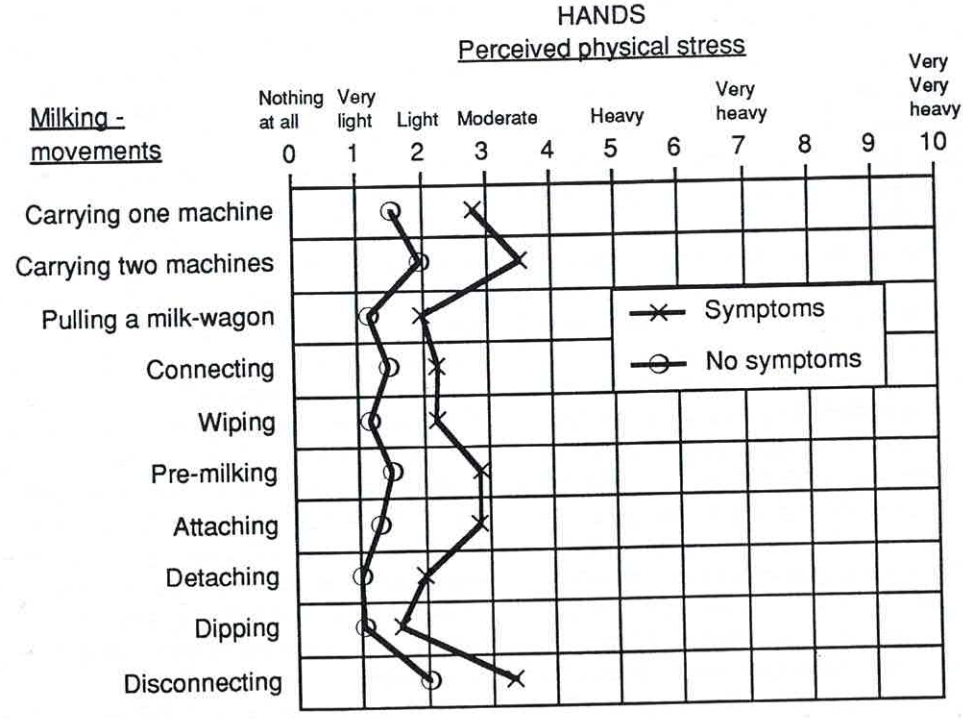

Fig. 3. Perceived physical stress in the hands during different milking tasks among 161 active milkers, with and without complaints.

was about the same in all the groups. It has not been possible to investigate the drop-outs. Thus we do not know either age, prevalence of pain and discomfort or the reason why they did not answer. However, studies of other occupational groups indicate that the prevalence of musculoskeletal problems does not differ significantly between those who answer and those who do not (13).

The group of agricultural women who did not work with milk production mostly worked with swine- and poultry breeding and plant cultivation. In this group, there were 61 women who had previously been milkers but no longer were so.

Musculoskeletal problems in professional Swedish milkers, both men and women, have been described earlier by Gustafsson et al. (8, 9). In Gustafsson's study, the prevalence of problems in wrists and hands, for example, was much lower, 35% as compared with 51% in this investigation. However, in both studies younger milkers had more complaints than older milkers. The standardized Nordic questionnaire was used in both studies but the two studies were presented to the participants in different ways. In the study by Gustafsson, mapping of working environment problems was the most important. However, in the present study, the emphasis was on pain and discomfort with special reference to the neck and upper extremities. The prevalence of reported problems has also increased during the last three years in occupational groups in general (10, 20), which could partly explain the differences in the result. After the age of 52, the problems decreased, which could be explained by a healthy worker effect (29).

Milkers and ex-milkers had begun milking at almost the same age, 25 and 24 years. The highest prevalence of problems in wrists and hands appeared within nine years of milking, in comparison to 10 to 19 years of work for non-milkers and nursing assistants.

In a study on milkers Arborelius et al. (1) showed that the work load on the upper extremities is heavy, specially on the side on which the claw is held when the four teat cups are attached to the udder. The different loads on the body were measured by means of electromyography in combination with biomechanical calculations of the torque in the shoulder, but unfortunately not in the wrists and hands. The study was not carried out in farm surroundings, but in a laboratory. The result of the measuring could have been different if the study had been carried out on live cows. A laboratory study can never be fully compared with a real situation where an additional accident risk when handling animals exists (19).

Several studies have been carried out with respect to occupational injuries in hospitals and the work loads in different kinds of work have been measured (4, 5). When giving lifting assistance to patients, the weight of the burden exceeded the recommendations for permissible weights for single and repeated lifts several times (4). In a French study (5) it was shown that the main cause of sick leave was musculoskeletal disorders among female hospital workers. Many working postures such as stooping, twisting and lifting heavy objects are similar for hospital nurses and agricultural women. However, the prevalence of pain, ache and discomfort in the upper extremities was much higher in general in the agricultural group than in the nursing group, and particularly in wrists and hands in the young and middle age milker group compared with the nursing assistants group.

In this study it was shown that it is not only the daily milking that constitutes a risk of developing pain and discomfort in wrists and hands but most probably also milking earlier in life. Young active milkers reported great problems in wrists and hands. Many young people are interested in agricultural jobs in general and the milking of cows in particular. Therefore it is important to create a work situation which can be conducted safely and comfortably. Many women among milkers and ex-milkers reported pain in both hands. Work in dairy barns also involves, for example, lifting and moving heavy feed sacks (11), which are not easy to hold making their handling even more difficult. In addition, in some milking operations the milkers do change hands and most of the work in agriculture requires the use of two hands. However, in certain milking motions one hand is more loaded than the other, especially the hand which is holding the claw during the attaching of the claw to the udder. The prevalence of symptoms like numbness and coldness was increased in the agricultural groups, which could be due to the use of vibrating tools. However, there was no significant difference in experience of numbness, coldness or white fingers among milkers who were using or had used vibrating tools as compared with the group of milkers who had never done so. The experience of numbness indicates that peripheral nerves might be affected (25).

Looking upon the occupational factors of importance for developing injuries in female milkers, it appears that the kind of milking system might have

an effect on the development of symptoms of the upper limbs. In this study it was also shown that milkers who are working in a modernized dairy barn have fewer problems in the upper extremities than women working in the traditional barn. There was a significant difference with regard to the level of rating of the most strenuous milking tasks among milkers with and without complaints from the upper extremities. The rating varied from about moderate to rather strong muscle stress when carrying milking machines to the cows, pre-milking, disconnecting and removing the machine from the milking pipe line and finally when attaching the cluster to the udder. The problems with poor working movements of the arm make it imperative to develop milking equipment to make it more comfortable for the milkers who are suffering from pain, but also to prevent work-related disorders. Equipment should be more adjustable to all kinds of people regardless of sex, physical strength and body dimensions. To adjust the work environment in dairy barns in general to the physical characteristics of the individual is the ultimate goal in order to reduce musculoskeletal disorders in female professional milkers.

The present study on the occurrence of pain, ache and discomfort was based on questionnaires. The results permit no conclusions with regard to the type of tissue injury causing the symptoms. Therefore, a clinical study will be carried out with special regard to symptoms in wrists and hands.

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