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## Early Symptoms of the Work-related Musculoskeletal Disorders in Hand and Upper Extremity in the Poultry Industry

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The aim of this study was to identify the early musculoskeletal symptoms of the hand and upper-extremity of the workers in the poultry industry. A group of 154 workers in the poultry industry participated in our study. Fifty nine of these workers were women mean aged 30.25 years  $\pm$  6.19; 95 were men mean aged 28.52 years  $\pm$  5.35. The majority of the female workers surveyed, 86%, expressed complaints in their hands, 27% in the arms, 27% in the shoulders, 20% in the forearms, 11% in the elbows and 53% of the male workers voiced some complaints in their hands, 14% in arms, 12% in shoulders, 7% in forearms and 4% in elbows. According to these results, both female and male workers were observed to have complaints mostly on the hands/wrists; these are followed by the arm/shoulder and forearm/elbow complaints. At the end of the study, depending on the early musculoskeletal findings in hand and upper extremities we determined to call attention to the following two points: 1. the necessity of providing the employers and the employees with the educational programs aiming at preventing these disorders 2. regular check ups should be given to the workers.

**Key words:** Poultry industry, hand and upper extremity, musculoskeletal disorders

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## INTRODUCTION

After the Industrial Revolution at the beginning of the 19th century, a marked increase was observed in work related disorders, increased level of production in industry also gave rise to more work related disorders. Musculoskeletal disorders are the most common conditions that workers complain about. Among these disorders, upper extremity disorders are the ones mostly quoted. Musculoskeletal disorders are mostly observed in inflammatory and degenerative conditions. Musculoskeletal disorders result in pain and functional insufficiency and may affect neck, shoulders, elbows, forearms, wrists and hands (Muggleton and Allen, 1999; Buckle and Devereux, 2002).

As well as affecting the worker and his family, work related musculoskeletal disorders can also have an effect on various organizations related to the industry, insurance and health. As these disorders decrease the level of production due to the lack of work force and entail medical care and expenses like accident insurance, they influence the economy negatively. The best way of preventing the negative effects and financial damage that these disorders may create is to attach importance to preventive medical care, before these disorders occur. This can bring medical, social and economic benefits for everyone (Amell and Kumur, 2001).

Neither in theory nor in practice is it possible to prevent all of the injuries and diseases. Despite this fact, we can considerably decrease the number of injuries and diseases. Ergonomic design of the work place, a multi disciplinary program involving health and security arrangements of the employers are most important to control the work related disorders (Muggleton and Allen, 1999; Amell and Kumur, 2001; Rystrom and Eversmann, 1998).

Diagnosing cumulative trauma symptoms early creates: more success in the treatment; decreases in disability; better morale for the workers and decrease in the expenses. In the philosophy of the occupational health, adjusting the job to the worker and orienting the worker to the job, entering the sector and periodic check ups are considered to be most basic matters. These days, preventing the work related musculoskeletal disorders are the primary concerns in the national programs of many governments. In the preventive approaches, we try to determine the cause and effect relationship ending in musculoskeletal disorders through well-prepared epidemiological studies (Amell and Kumur, 2001; Himmelstein *et al.*, 1995; Coutu-Wakulczyk *et al.*, 1997; Franits, 1999; Brouwer *et al.*, 2001; Spielholz, 2001; Werner *et al.*, 2002).

An increase in cumulative traumatic disorders has been noted after the use of full automatic system in modern poultry sector (Linder, 1995). In poultry processing, the same movement can be repeated 30.000 times over a period of 8 h. The increase in the "band" system causes an increase in the number of movements. Repetitive biomechanical stresses cause cumulative traumatic disorders, affecting the muscles, tendons-ligaments, joints and nerves (Rystrom and Eversmann, 1998; Linder, 1995).

The most effective method for dealing with the cumulative traumatic disorders is to take preventive strategies. In order to do this, ergonomic arrangements and necessary changes in the work environment should be made. We have to make risk assessment in terms of the risk factors. Health aid workers should pay more attention to preventing injuries and symptoms and try to decrease the number of injuries which may possibly be received. In addition, employers should be well-informed about these disorders, employees should be educated on health issues and preventive measures should be taken (Muggleton and Allen, 1999; Rystrom and Eversmann, 1998).

Workers are usually late in voicing their complaints about cumulative traumatic disorders and usually consider these complaints to be normal and unimportant. The fact that first aid provided by the workplace tends to postpone appropriate medical intervention and this delays taking early measures and aiding the patient, causing partial yet permanent impairments. This delay usually results in: remarkable amounts of expenses for medical treatment, the programs for regaining the functions, loss of time, the decrease in productivity of the worker and the work place. Early diagnosis, treatment and taking preventive measures all save the workers from being injured. Improving the conditions, which cause injuries, accelerates the treatment and increases the workers' possibility of working at the same capacity, at which they worked before the injury or the treatment (Rystrom and Eversmann, 1998; Werner *et al.*, 2002). To make this approach successful, we need to let continue the assessments and the programs aimed at the worker and the work place. The new workers should be joined in this program only after being assessed about their pre-employment period. In the strategy aimed at preventing the glaring defect, it is important to learn more about the characteristics of the person who had a work related defect and get a better understanding of the personal factors about the defect. We can, therefore, provide first aid for the workers who are at the high risk of being injured or wounded, adjusting the work environment to the worker, or employing the worker in a more proper job (Rystrom and Eversmann, 1998; Himmelstein *et al.*, 1995).

In this study, in order to take preventive measures about cumulative traumas and provide the basic information for early diagnosis and treatment, we examined the disorders on the hand and upper extremities of 154 workers employed in the poultry industry.

## MATERIALS AND METHODS

The present study took place in the bird-processing division in the poultry facilities in the city, Bolu, which is situated in the northwest of Turkey. It was conducted by Abant Izzet Baysal University School of Physical Therapy and Rehabilitation during 2002-2005 years. Of 173 workers in this division, 19 were not included in our study due to their chronic illnesses. The remaining 154 workers (59 female, 95 male) aged 18 to 44 were registered in the study. The assessments were made in the factory where the workers were employed.

A questionnaire was circulated in order to determine the demographic characteristics of the workers before starting the assessment. In this questionnaire, we asked for the following information: forename, surname, address, telephone number, age, weight, height, dominant hand, education, marital status, gender, previous employment, the employment period in poultry sector, present employment type, smoker or non-smoker and alcohol consumption, sporting activities, job satisfaction, sleeping disorders, chronic illnesses and the number of children. We inquired the female subjects on pregnancy, miscarriages and abortion.

Observing the workers at work, we assessed the workers for the following information: what movements they perform; which arm they use most; to what external factors they are exposed; whether they carry a load and what their work positions are.

Sixteen questions were asked to determine whether the subjects had any complaints about musculoskeletal disorders. We asked the subjects if they had stiffness, swelling, pins and needles, tingling, insensitivity, numbness, burning, fatigue, weakness, tightness, redness, loss of control, loss of skill, cramping, pain, or other complaints in the following parts: hand, forearm, elbow, arm, shoulder and the others. We investigated the subjects who declared to have pain in terms of how severe it is, when it started first, for how long it lasted, what he did to recover and if there was a stimulatory factor.

We used five sets of Semmes-Weinstein Monofilament of North Coast Firm for the sense assessment of the experimental group (Bell-Krotoski, 1995). We assessed two-point discrimination with Mackinnon-Delon Discriminator and the sense of

vibration with a diapozam of 256 cps (Louis *et al.*, 1984; Mackinnon and Dellon, 1985; Callahan, 1995).

We assessed the posture of the upper part of the body by making observations. We assessed joint angles of the upper extremities, while the active joint movements were being performed. With a goniometer, we measured the intervals of the joint movements in which we determined limitation. We administered manual gross test on the upper extremities. In addition, in the assessment of shortness, we tested pectoral muscles.

We used Jamar hydraulic hand dynamometer (Schmidt and Toews, 1970) (Preston Jackson, Michigan 49203) to assess grip strength. Pinch strength was assessed in tip position, lateral position and palmar position. The test was done with Jamar pinch meter (Sammons Preston Bolingbrook, IL, 60440) (Mathiowetz *et al.*, 1984). In determining grip and pinch strength, we made the person repeat each grip position three times and registered the average of these three measurements as in kilograms.

In order to assess the fine hand functions, we applied the components of right hand, left hand, both hands, right+left+both hands and the assembly component of the Purdue Pegboard Test. Model No. 32020 Purdue Pegboard Test was used to assess (Instructions and Normative Data for Model No. 32020 Purdue Pegboard, Lafayette Instrument Company, USA). We measured the gross hand skills using the Model No. 32023 of the Minnesota Manual Dexterity Test in our study ("Minnesota Manual Dexterity Test" Test Administrator's Manual No. 32023 (1998) Revised Edition, Lafayette Instrument Company, USA).

As impingement tests, we used: supraspinatus test, impingement test; as biceps tests: Yergason's test; as provocative tests: Adson maneuver, Hyperabduction maneuver, Tinel's sign and Phalen's test (Vender *et al.*, 1998; Sagerman and Truppa, 1998).

**Statistical analysis:** In statistical analyses, we used  $\chi^2$  test and Fisher's Exact  $\chi^2$  Test for assessing the non-parametric variables; a Student-t test for assessing the parametric variables. The significance value was accepted as  $p < 0.05$  and as two tailed.

## RESULTS

Total 173 workers employed in the poultry industry participated in our study. Of 173 people, 19 (12 female, 7 male) who declared to have heart diseases (4 female, 1 male), respiratory illnesses (2 male), rheumatic diseases (1 male), allergic diseases (4 female, 2 male), migraine (1 female) and other systematic diseases (3 female, 1 male) were excluded from the study. In conclusion; 154 workers (59 female, 95 male) were assessed.

The mean age of the female workers was 30.25 years  $\pm$  6.19, weight 63.41 kg  $\pm$  10.49, height 158.74 cm  $\pm$  6.01 and body mass index was 25.18 kg m<sup>-2</sup>  $\pm$  4.11. The mean age of the male ones was 28.521 years  $\pm$  5.35, weight 72.38 kg  $\pm$  10.46, height 171.35 cm  $\pm$  6.17 and body mass index was 24.64 kg m<sup>-2</sup>  $\pm$  3.11. There was no significant difference between the ages ( $t = 1.84$ ;  $p > 0.05$ ) of the female and male workers and the body mass indexes ( $t = 0.90$ ;  $p > 0.05$ ). The body weight ( $t = 5.16$ ;  $p < 0.001$ ) and height ( $t = 12.52$ ;  $p < 0.001$ ) were statistically more significant in the male workers. 71.4% of the workers graduated from secondary schools and there was no educational difference between genders ( $\chi^2 = 0.003$ ;  $p > 0.05$  [according to Pearson  $\chi^2$  test]). Of the workers, 56 female 86 male (in total 142 workers) stated their content with the job; whereas 3 female and 9 male (in total 12 workers) did not.

Of the subjects, 40.9% (40.7% female and 70.5% male) was in the habit of smoking, more male workers than female ones had smoking habit ( $\chi^2 = 30.98$ ;  $p < 0.001$ ). None of the subjects had the habit of taking alcohol.

30.5% of the women were single, 69.5% were married; and 24.2% of the men were single; 75.8% were married. There was no significant difference between the two genders with respect to their marital status ( $\chi^2 = 0.73$ ;  $p > 0.05$ ). Thirty nine percent of the women had never become pregnant. 3.4% of the women became pregnant once, 23.7% twice, 20.3% three times and 13.6% more than four times. 40.4% of the women and 59.6% of the men had no children.

All of the workers surveyed in our study were working 10 h a day and taking one-hour break for eating and resting. Workers were working in shifts. After certain periods of time, they changed night and day shifts. During our study period, 66.1% of the women and 67.4% of the men were in day shifts. Between both genders, there was no difference with respect to the shifts ( $\chi^2 = 0.023$ ,  $p > 0.05$ ). Of the subjects, 45.5% (41 female, 29 male, 70 in total) declared that they had irregular sleep and 35.1% (23 female, 31 male, in total 54) had sometimes sleep-related problems and also stated that night shifts ruined their sleep.

Thirteen percent of the subjects (5.1% female; 17.9% men) said that they were engaged in sporting activities regularly at least 3 days a week. The types of the activities were: walking, cycling, or playing soccer.

The total working time period of the subjects were: 62.31 months  $\pm$  37.49 in women and 87.57 months  $\pm$  59.96 in men. The total working time period of the men was statistically more than the time period of the women ( $t = 2.86$ ;  $p < 0.05$ ). Before working in the poultry industry, 10.16% of the women (six persons) were employed in work places in which more hand work was involved, 27.11%

(16 persons) were not employed in such work places; 41.05% of the men (39 persons) were employed in work places which demanded more hand work, 32.63% were not employed in such places. 27.3% (42 persons) of the subjects had never been employed in sectors except for poultry industry. The working period in poultry industry was 50.20 months  $\pm$  27.54 in women, 31.06 months  $\pm$  27.83 in men. Working period of women in the poultry industry was statistically longer than of men ( $t = 4.16$   $p < 0.001$ ).

The grip strength values for right hand were 29.71 kg  $\pm$  4.18 in women and 44.61 kg  $\pm$  7.25 in men and for left hand 28.83 kg  $\pm$  4.24 in women and 43.68 kg  $\pm$  7.31 in men. The lateral pinch strength values for right hand were 3.58 kg  $\pm$  1.04 in women and 5.87 kg  $\pm$  1.65 in men and for left hand 3.42 kg  $\pm$  0.92 in women and 5.65 kg  $\pm$  1.57 in men. The Purdue Peg Board Test results were 15.88 pins  $\pm$  1.60 in women and 15.16 pins  $\pm$  1.63 in men for right hand; 15.46 pins  $\pm$  1.51 in women and 14.47 pins  $\pm$  1.85 in men for left hand; 12.53 pins  $\pm$  1.37 in women and 11.49 pins  $\pm$  1.45 in men for both hands; 43.87 pins  $\pm$  4.00 in women and 41.13 pins  $\pm$  4.17 in men for right+left+both hands; 36.61 pins  $\pm$  5.38 in women and 32.22 pins  $\pm$  5.56 in men for assembly.

In this study, the female laborers completed the placement stage of the Minnesota Manual Dexterity Test in 241.14  $\pm$  20.66 sec and the male ones in 248.44  $\pm$  24.78 sec. The female laborers completed the turning stage in 201.10  $\pm$  20.73 sec and the male ones in 211.05  $\pm$  25.74 sec.

**Results of observations in terms of the work requirements demanded of the workers:** As there was a system of job rotation in different divisions of this sector, the workers performed push, pull, grip and stretch movements according to their work divisions. The workers were observed to be in the habit of using their right and left hands at the same time while working. Always two workers worked in the cold store (between -32 and -18 °C). The other workers entered the cold store from time to time over short periods of time. The heat in smash and chest divisions was generally between 0 and 6°C. In divisions like processing and quality control, it was 12°C. Although it was 12°C in some divisions of the factory, the workers worked with cold ingredients.

The workers carried the packages demanded of them. They performed this job now and then during the day. The load was generally about 10 kg. Heavier loads were carried with vehicles.

**Results of the evaluations with respect to the musculoskeletal disorders:** In this study, the musculoskeletal complaints voiced by the workers were shown in Table 1. One hundred and fifty two workers

**Table 1: The complaints that the subjects voiced about the musculoskeletal disorders**

Complaints	No. of extremities according to the areas effected																													
	Hand						Forearm						Elbow						Arm						Shoulder					
	Right		Left		Right and left		Right		Left		Right and left		Right		Left		Right and left		Right		Left		Right and left							
	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M						
Stiffness	1	-	-	-	-	-	1	1	-	-	-	-	2	-	-	1	-	-	-	-	1	-	2	2						
Swelling	4	-	3	-	8	2	1	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-							
Pins-needles	5	4	-	3	4	4	1	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-							
Tingling	10	7	1	2	10	4	1	1	-	-	-	-	1	-	-	-	-	-	1	1	-	-	-							
Insensitivity	4	2	1	4	-	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-							
Numbness	11	7	1	2	4	10	2	-	-	-	-	2	1	-	1	-	-	-	1	-	1	-	-							
Burning	1	3	-	-	4	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-							
Fatigue	2	8	-	2	2	4	3	-	-	1	2	2	1	-	-	-	2	2	5	1	1	2	4							
Weakness	1	1	-	4	-	4	1	1	-	1	-	-	-	-	-	-	-	2	-	1	2	2								
Tightness	2	2	1	-	-	-	2	-	-	-	2	-	2	-	-	-	-	2	1	-	4	2								
Redness	-	-	1	-	6	-	1	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-							
Loss of control	3	-	1	2	-	2	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-							
Loss of skill	2	2	-	1	2	2	-	-	-	1	-	-	-	-	-	-	-	-	-	1	-	-	-							
Cramping	-	1	1	1	-	-	-	-	-	-	-	-	1	-	-	-	-	2	-	-	-	-	2							
Pain	1	4	3	2	2	2	2	-	-	1	2	-	2	2	-	1	2	-	2	-	2	2	-							
Total N%	47	41	13	23	42	36	17	3	-	5	6	6	8	4	1	2	4	2	14	3	6	10	12							
	80	43	22	24	71	38	29	3	-	5	10	6	14	4	2	2	7	2	24	3	10	11	20							

F: Female (n = 59); M: Male (n = 95); N = Number of extremities according to the areas effected

**Table 2: Results of the special test**

Special test results		Clinical findings determined in extremities							
		Right				Left			
		Female		Male		Female		Male	
		n	(%)	n	(%)	n	(%)	n	(%)
Supraspinatus	Positive	3	5.09	2	2.10	1	1.69	2	2.10
Test	Negative	56	94.91	93	97.90	58	98.31	93	97.89
Impingement	Positive	1	1.69	1	1.05	1	1.69	-	-
Sign	Negative	58	98.31	94	98.95	58	98.31	95	100
Yergason's	Positive	1	1.69	1	1.05	-	-	-	-
Test	Negative	58	98.31	94	98.95	59	100	-	-
Adson	Positive	-	-	-	-	-	-	-	-
Maneuver	Negative	59	100	95	100	59	100	95	100
Tinel's	Positive	5	8.47	2	2.10	5	8.47	4	4.21
Sign	Negative	54	91.53	93	97.90	54	91.53	91	95.79
Phalen	Positive	4	6.77	5	5.26	2	3.38	6	5.30
Test	Negative	55	93.23	90	94.74	57	96.62	89	93.70

\*There was no statistical significance between female and male at special test results

stated that fatigue and working conditions and the work environment are the causes of their complaints. These complaints resulted from long working periods during the day. Two workers explained that their complaints resulted from psychological problems. It was stated that redness in hands resulted from allergy and working in cold environment. During the study, we did not observe any abnormalities on the hand skins.

The present study was conducted to examine the workers in the poultry sector for musculoskeletal disorders. Eighty six percent of the women in poultry processing division had complaints about hands, 27% about arms, 27% about shoulders, 20% about forearms, 11% about elbows; 53% of the men expressed complaints about the hands, 14% about the arms, 12% about the shoulders, 7% about the forearms 4% about the elbows.

Based on these results, we observed both genders had complaints mostly on hand/wrists and these complaints are followed by the complaints on arm/shoulder and forearm/elbow complaints.

In this study, female workers expressed more musculoskeletal disorders on their right parts (hand, forearm, elbow, arm and shoulder). Men, however, had complaints on forearm, elbow, arm, shoulder on right and left parts of their bodies. Their complaints were more on their left hands. They voiced complaints such as tingling, insensitivity, numbness and pain mostly in hands; fatigue, tightness, pain and numbness in forearms; pain and fatigue in elbows; fatigue, pain, stress and weakness in arms and shoulders.

54.2% (32 persons) of the female and 53.9% (41.1 persons) of the male workers reported having pain in hand and upper extremities. We did not observe any

difference between both genders considering pain. ( $\chi^2 = 2.54$ ;  $p > 0.05$ ). Workers stated that long periods of working with no rest, carrying heavy things, fatigue and spending too much effort triggered the pain. To deal with the pain, they rested, did physical exercises and relaxed by massage. Eighteen of the workers asserted that they succeeded in dealing with the pain without engaging in any of such activities.

We determined postural impairments in 62.7% (37 female) and 65.3% (62 male) of the workers surveyed in this study. We did not observe any difference between both genders considering postural impairments ( $\chi^2 = 0.01$ ;  $p > 0.05$ ). We observed round shoulder in 57 workers (23 female, 34 male); inequality in shoulder levels in 40 workers (14 female, 26 male); and hollow chest in two male workers. Round and sunken shoulders occurred due to postural habits. After administering the shortness test concerned with upper extremities, we observed slight shortness in pectoral muscles of the three workers. We did not observe any shortness in 151 people. Percent distribution of the upper extremities of the subjects by related special test are given in Table 2.

## DISCUSSION

In this study, we examined the workers in poultry processing division to find out whether they had any complaints about hand and upper extremities. Even grip and pinch strength and dexterity values of the workers were in normal ranges the workers had early musculoskeletal symptoms on the hands and upper extremities. The workers and employers did not care the symptoms. The results of our study showed them that the workers had early work-related musculoskeletal complaints of the upper extremities.

In this study, it was observed that both genders had complaints mostly on hands/wrists; and these complaints are followed by arm/shoulder and forearm/elbow complaints. In Silverstein's study (Silverstein *et al.*, 1998), it was observed that upper extremity disorders occur mostly on hands/wrists in the first place and then on shoulders and on the elbow in the least. These results showed that we should care hands and all upper extremities in the early stage. Otherwise the serious injuries and diseases related to work could be in the future.

Werner *et al.* (2002), reported that 39% of the dental hygienists had upper extremity complaints at the end of the day and 13% of these complaints were shoulder tendinitis, 6% elbow/forearm tendinitis and 7% hand/wrist/finger tendinitis.

Scheuerle *et al.* (2000) reported that 31% of them had musculoskeletal disorders on hands/wrists and 29% on shoulders. However, it was observed that the rate of the shoulder problems was between 18.3 and 16.2% and that clinical diagnosis was supraspinatus (Herbes *et al.*, 1984).

Present study, the rates of musculoskeletal disorders concerned with upper extremities, primarily on hand/wrist parts, were higher than the rates observed in the other studies (Scheuerle *et al.*, 2000; Nathan *et al.*, 1992). We think this resulted from the fact that we registered even complaints which could be disregarded. We should remember that the early symptoms could be slight. But they could indicate the serious work-related health problems in the future.

The characteristics of the poultry sector of mass production are mechanical pacing of work, repetitiveness and minimum skill requirement. The job is divided into minutes and requires surface mental attention. Workers are supposed to perform movements repeatedly requiring grip strengths during the whole day, working for long periods as their wrists are bent. While working, bending the elbows and reaching for the objects are frequently performed. Workers need to catch up with the speed of the band. If a rise in the production is demanded, the speed of the band system is increased. Rise in the working speed and repetitive movements make the muscles get contracted once again, without their getting relaxed. This causes a higher rate of cumulative traumatic disorders. Working in wrong postures for long periods of time results in strain in soft tissues and micro-traumas, increasing the rate of cumulative traumatic disorders (Linder, 1995). Therefore we think that the observed early musculoskeletal symptoms of hands and upper extremities of the worker who attended our study could be increased if the preventive methods are not applied. In order to prevent cumulative traumatic disorders, education should be given to the workers on how to use the knife and other materials. Work places, with the help of the ergonomists, should be arranged taking into account the characteristics of each worker. Employers should take preventive precautions to prevent cumulative traumas, considering the symptoms happened before.

Amell and Kumur (2001) remarked that the rate of musculoskeletal disorders was stated to be high due to socio-political reasons. The reasons for these higher rates were cited to be: the fact that the workers expressed their usual muscle pain and fatigue as musculoskeletal disorders; the increased effects resulting from ageing; the financial expectations of the doctors and ergonomists; and the worker compensation system rewarding the workers for the work done.

Research related musculoskeletal disorders are complicated phenomena and emphasized that we should not take account of only psycho-social factors but also the bio-mechanical and physical factors (Amell and Kumar, 2001). Amell and Kumur (2001) pointed out that a tissue damage occurred as a result of biomechanical and physical factors and that people are usually treated after disorders occur. It was expressed that the new insurance philosophy focuses on the preventive methods before the injury is received and the dose-response relationship about musculoskeletal disorders could be defined with well arranged epidemiological studies.

Coutu-Wakulczyk *et al.* (1997) reported that cross-hatching studies should be carried out to prevent and control work related disorders and subjective methods be used for diagnosing these disorders in earlier stages and these methods provide a foundation for the objective tests.

Information about the musculoskeletal complaints gathered in our questionnaire will help organize programs for preventing the work related disorders and guide through the future studies in this field.

In this study, women expressed more musculoskeletal disorders on their right sides (hand, forearm, elbow, arm and shoulder) of the bodies. Men, however, expressed forearm, elbow, arm, shoulder complaints on both sides and they had more complaints on their left hands. It was also stated that tingling, insensitivity, numbness and pain were mostly in the hands; pain and fatigue in elbows and fatigue, pain, stress and weakness were felt in the arms and shoulders.

Dealing generally with the complaints that the workers voiced, we determined nerve related contractions in hand areas and tendinitis related findings mostly in shoulder and elbow areas. Repetitive hand movements cause complaints like tingling and insensitivity, affecting the circulation negatively. Working in cold and damp work environment, between 6 and 12°C also affect hand circulation negatively. Shoulders stabilized upper extremities while repetitive and swift hand movements were done with the hands. For the sake of stability, keeping the same arm positions for a long time causes fatigue in rotator cuff and in trapezius and deltoid muscles, pain and tendinitis in the coming periods. During the activities such as extending the arms upward, carrying and placing the packages, strenuous exertion occurs in shoulders, which increases the risk of tendinitis. Sutherland (1995) also remarked that lifting up the objects are static and heavy movement of shoulder, which can lead to musculoskeletal disorders like tendinitis in these body parts. Also, Herberts *et al.* (1984) determined shoulder problems in female workers employed in the band system.

In our study, when musculoskeletal complaints about the upper extremities considered, it was determined that female workers had more complaints. Derebery (1998), Benjamin (1997) and Defabachew (1997) also remarked that women had more health related problems.

Benjamin (1997) stated that the equipments used in the work places are adjusted to the men and that work environments are not adapted physically for women, which cause more musculoskeletal disorders in women. In addition, even if the work environment was arranged for women; pregnancy, giving birth, being a housewife and a mother would make women feel the work-related stress more strongly. Butler and Liao (2002) also noted that being a married woman increases the risks for having musculoskeletal disorders in upper extremities.

Among the workers surveyed in our study, there was no difference between men and women considering marital status. When the number of children of the women and the men compared, it was seen that men had more children. In addition, pregnancy in women brought an additional burden and doing housework and taking care of the children increased their working hours. At work places, on the other hand, both women and men were working for 10 h and taking one-hour break.

Butler and Liao (2002) and Osterman (1995) warned that working for long hours causes an increase in work related disorders. In our study, when home environment considered, we see that women are disadvantageous to men considering working hours.

Benjamin (1997) also indicated that women prefer working at night to shoulder home responsibilities, which affects their body functions negatively.

Benjamin (1997) pointed out that women have less work experience, thus rendering work places more risky for them. Butler and Liao (2002) also remarked that the fact that women have less work experience increases the risk of cumulative traumatic disorders. According to our study, female workers employed in the poultry sector worked for longer hours than men did. This showed the women had more work experience.

According to Upton (1987), workers should be inquired about previous employment while being assessed. In our study, before entering the poultry sector, men worked more than women did in the other sectors. In their second previous jobs, men said they had worked more in the sectors requiring manual effort; in their third and fourth jobs, however, they worked in the fields which required less manual effort. When total working time period was taken into consideration, we observed that men worked longer than women did. McMahan and Phillips (1999) explained that cumulative traumatic disorders grow by degrees over a matter of months and years. If this fact was taken into account, we



would possibly accept that men's working for long hours may well be a contributing factor for the risk of musculoskeletal disorders.

In this study, we found no difference between both gender with respect to pain complaints. The workers surveyed in our study said they had pain complaints mostly in hands and wrists, then shoulders, elbows, arms and forearms in the order of severity. Also, according to the survey on the study groups of Werner *et al.* (2002) and Scheuerle *et al.* (2000), pain was found to be mostly on hands.

In this study, workers dealing with the pain mostly employed the following methods in order; resting, doing exercises and getting a massage. Eighteen of the workers said their pain eased without applying any of the methods. Also in Scheuerle's *et al.* (2000) research firstly resting and secondly warm application were used in dealing with pain.

Coutu-Wakulczyk *et al.* (1997) pointed out that tactile sense impairments decrease the skills and should be taken into account.

According to our sensibility test results, there was no remarkable sense loss in the workers. Our sensibility test results will help in tracking the workers and also guide through the objective tests that will be conducted in the future. Coutu-Wakulczyk *et al.* (1997) also stressed the use of subjective tests for the objective tests.

Among the women surveyed in our study, we determined two points: 1. Tinel's symptoms were mostly on both right and left hands 2. Phalen and supraspinatus tests were positive on the right sides. On the other hand, among the men, we observed that Tinel and Phalen tests were positive on their left hands; and supraspinatus tests were equally positive on their right and left sides. There was no difference between female and male workers in these tests.

62.72% of the women and 65.26% of the men had postural disorders. We found no difference between men and women with respect to these disorders. Given the upper extremity shortness results, a very slight shortness was found in pectoral muscles in three people. Musculoskeletal complaints were found, after the hands, to be mostly on arms and shoulders. Fatigue, stress and weakness were most of the complaints that they expressed.

It was remarked that bad postural and working habits could give rise to forward head tilt, round shoulder and shortness in pectoral muscles, pain, fatigue and soft tissue disorders (Pheasant, 1991; Bettencourt, 1995). According to our survey results, bad posture led to fatigue in the shoulder and arm areas of the workers.

Apart from making ergonomic arrangements in the work place and work environment, implementing

educational programs, continuing with the periodic checkups related with musculoskeletal disorders of the workers, early treatment if necessary will prevent disorders, accidents and economic loss.

At the end of the study, depending on the early musculoskeletal findings in hand and upper extremities we determined to call attention to the following two points: 1. the necessity of providing the employers and the employees with the educational programs aiming at preventing these disorders 2. regular check ups should be given to the workers.

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