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## Prevalence and Associated Factors of Musculoskeletal Disorders Among the Roti Sai Mai Workers in the Phranakorn Sri-Ayuthaya District, Phranakorn Sri-Ayuthaya Province.

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### ABSTRACT

Musculoskeletal Disorders can be found among the group of Roti Sai Mai dessert workers because of There are the awkward postures, always bending and twisting the body, repetitive work and using excessive force to produce Roti dough and Sai Mai fluffs which is the popular dessert of Phranakorn Sri-Ayuthaya province. This research is the cross-sectional descriptive study in the Phranakorn Sri-Ayuthaya district, Phranakorn Sri-Ayuthaya province and the objectives are to study the prevalence and the associated factors of the musculoskeletal disorders among the 75 volunteers that are making the Roti Sai Mai, there are 49 volunteers that make the Roti dough and another 26 volunteers that are doing the Sai Mai fluffs. This research is done by questionnaire that modified from the Standard Nordic Questionnaire. However, the studied results found that the prevalence of musculoskeletal disorders of the volunteers that make Roti dough during 7 days, found 65.3% hands/wrists/fingers, 61.2% around lower back area and 51.2% around the shoulders. As well as, the past 12 months, found 81.6% around hands/wrists/fingers, 79.6% around lower back area, 71.4% around the shoulder respectively. However, for the prevalence of musculoskeletal disorders of the Sai Mai fluff workers, during the past 7 days, found that 84.6% around the shoulder, 80.8% around the lower back and 69.2% around the upper back. And for the past 12 days, found that 96.2% around the shoulder, 92.3% around the lower back and 76.9% around the upper back respectively. For the top 3 factors that have associated with the musculoskeletal disorders that can be clearly seen are the awkward postures and repetitive work (90.7%, p-value = 0.022), the duration in work factor (69.3%, p-value = 0.035) and the workstation factor (58.7%, p-value = 0.041) respectively. Therefore, this research is to acknowledge about the Roti Sai Mai descriptive works can be the risk results of musculoskeletal disorders for workers. So, there should be careful procedures and adjustment of workstation in order to prevent from these occupational injuries.

**Keywords:** Musculoskeletal Disorders, Postures Assessment, Ergonomics, Roti Sai Mai.

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## INTRODUCTION

Roti Sai Mai is one of the desserts that had 2 main ingredients, they are dough sheet and the other assorted part is the simmered sugar that cooks in the fluffy style called Sai Mai. When ready to eat, must bring Roti dough sheet to wrap up or roll with the Sai Mai fluff. Roti Sai Mai is the popular dessert of the Phranakorn Sri-Ayuthaya province of Thailand. Thus, it has also been selected as one of 5 stars products by the OTOP (One Tambon One Product) of the Karnharm Sub-district, Uthai District, Phranakorn-Sri Ayuthaya province. However, there are 2 main steps in making Roti Sai Mai. First, is the making of Roti dough sheet, which consists of the sub-step of flour fermented or to mix the dough and to press the ready mixed dough on a hot plate, in another word, to make the dough cooked on the hot plate. Secondly, is another sub-step to make the Sai Mai fluffs, its sub-step is to bring the leavening, stirred flour with vegetable oils that has ready prepared to mix with sugar and simmer until it can be stretched as fluffs.

Nowadays, the Roti Sai Mai dessert is still conserved as cultural labors instead of using machine in making dough and fluffy Sai Mai, the procedures of both steps in making Roti dough and Sai Mai fluff as mentioned have risks that may happen to health problems of the worker because according to the steps of making Roti dough must be in the postures of sitting for a long time and have upper extremities move in the repetitive motions. Thus, for the steps in making Sai Mai fluff are the steps of standing up position with repetitive exertions for about 15-20 minutes for each making. Moreover, the working postures are also the working of awkward positions due to limbs and body positions are moving with the unusual postures, for example, too much in twisting and turn or bend and stretch the body that can cause danger to body muscles, joints and tendons instantly or chronically. However, working with repetitive motions for long time may cause musculoskeletal disorders to the body.

Health problems of Roti Sai Mai occupational workers group are not yet profoundly acknowledged and understood by the society and the states, may be because of the lack of data collection system, statistical evaluation and analysis for problems assessments. Apparently, parts of it may happen because of the lack of knowledge and understanding of the workers themselves or workers never pay any attention to the occupational health and safety or the symptoms accumulation of the musculoskeletal disorders, such as the hurting symptoms at joints and muscles. Thus, it is the muscles that caused pain to various parts of the body from small severity to the high severe level which is responded to the study of Lee [1] that found 60-80% of the working age population group that work in many kind of occupations, used to have at least one backache symptom history during a lifetime of working. The same study of Keawduangdee, [2] that found the prevalence of the musculoskeletal disorders in Thailand of many occupational groups are in between 23-81% especially in the textile industry found 71.8% of prevalence in the musculoskeletal disorders during the past 7 days and 76% during the past 12 months.

From the past study regarding the ergonomics found that associated factors of the musculoskeletal disorders happened from many factors. However, the main principle factor found to be the cause of the abnormality is the working postures [3]. Lertrit, [4] found 70% of lower backache prevalence happens from the working postures that have relationships with the lower backache symptom. Besides, found the working postures are effect to the musculoskeletal disorders of many occupational groups, for example, stooping postures, twisting, lifting, the position of sitting down on the vibrated equipment can cause whole body vibration, the repetitive working and the prolonged working postures are all the risks that effect to the disorders [2]. Thus, same as the study of Chaiklieng, [5] that assessed the working postures of the broomstick workers, found that the working postures of the broomstick workers have relationships with the musculoskeletal disorders especially around the spinal areas and the upper extremities in the statistical significant. Especially found the movements of arms, hands and wrists that are moving up high, twisting in repetitive movements and the excessive bending over to the front when work.

From the primary survey, found that the working on the Roti dough, workers are working in the sitting position and are always whirling and turning the wrists, stooping and twisting the bodies. While working on the Sai Mai fluff, workers are working in the standing up position, stooping and twisting the body and exceedingly using strength in order to stretch the simmered sugar to become floss which has relationships with the musculoskeletal disorders. Yet, with the unavailable data of this occupational group, researcher felt interested in study the topic of prevalence and associated factors of musculoskeletal disorders in order to

continually be as basic information in health promotions of occupational workers and inclusively for health problems care for both short and long-term periods.

## MATERIALS AND METHODS

This research is the descriptive research with the cross-sectional study by purposive method of choosing 75 Roti Sai Mai voluntary workers from the Phranakorn Sri-Ayuthaya District, Phranakorn Sri-Ayuthaya province that have duty of working on Roti dough and Sai Mai fluffs. Sampling size calculated from infinite population with the designated random of 5% and 95% of reliability and that have no congenital disease, such as rheumatoid arthritis or osteoarthritis.

This research studied tools are questionnaire that modified from the Standard Nordic Questionnaire for the Analysis of the Musculoskeletal Symptoms [6], which has contents that cover 3 data parts. Part I is the basic personnel data. Part 2 is the past 7 days and the past 12 months of musculoskeletal disorders system which has divided the body parts into 12 parts, such as, neck, shoulders, upper back, lowerback, upper arms, elbows, lower arms, hands/wrists/fingers, hips/thighs, kneels, calves, ankles/feet. Part 3 is the data that related with the musculoskeletal disorders which have been examined content validity and reliability by specialists of the questionnaire tool that has Cronbach's Alpha correlation. Thus, the reliability value of the 3<sup>rd</sup> question equivalent to 0.90 distinguished by the 5 selected factors as health problems aspect, working duration aspect, repetitive work aspect, workstation aspect and working environmental aspect.

Data collected during the month of January–March, 2017 and processed data with SPSS program. Thus, general data analysis by descriptive statistics, such as, percentage, arithmetic mean, standard deviation and inferential statistics with 95% CI values of the prevalence of Musculoskeletal Disorders.

## RESULTS

### General Information of Volunteers

From the total of 75 volunteers that are Roti Sai Mai workers of the Phranakorn Sri-Ayuthaya district, Phranakorn Sri-Ayuthaya province, there are 49 volunteers that mostly are females (93.9%) working duty on the Roti dough and another 26 volunteers (100%) are all men that are working on the Sai Mai fluff. Yet, volunteers are all right-handed and 77.3% are doing the Roti Sai Mai as the main occupation, the remaining of 22.7% does it for additional incomes besides the working on farms and the hire professionals in general.

From Table 1 of the Roti dough volunteers, found that average ages are equivalent to 36.9 (SD=10.95) and mostly are youngsters in the age between 20-30 years old (42.9%) and have Body Mass Index (BMI) value averagely of 22.1 (SD=3.33) kilograms per square meter. Most of the volunteers have normal Body Mass Index level (65.3%) and most volunteers are completed only secondary level or vocational level of 55.1%, and a few are completed bachelor level (12.2%). For the experiences in working on the Roti dough, found that majority have been working on this profession between 1–5 years (36.7%) with the period of more than 10 years (34.7%) respectively.

For the volunteers that are working on Sai Mai fluff, found that the average ages equivalent to 36.9 (SD=9.52), 42.3% are in the working age of ages between 31-40 years old with Body Mass Index of 23.1 (SD=1.79) kilograms per square meter and have normal Body Mass Index level (50%). Most volunteers are completed secondary level or vocational education by 42.3% and another 28.5% graduated from secondary level and mostly have experienced in working Sai Mai fluff between 1–5 years (46.2%).

**Table 1: General information of the Roti Sai Mai workers (n=75).**

Information	Roti Dough (n=49) Total (Percentage)	Sai Mai Fluff (n=26) Total (Percentage)	Information	Roti Dough (n=49) Total (Percentage)	Sai Mai Fluff (n=26) Total (Percentage)
<b>Genders</b>			<b>Working Experiences</b>		
Male	3 (6.1)	26 (100)	Less than 1 year	2 (4.1)	1 (3.8)
Female	46 (93.9)	-	1-5 years	18 (36.7)	12 (46.2)
<b>Ages</b>			5-10 years	12 (24.5)	5 (19.2)
20-30 years	21 (42.9)	6 (23.1)	More than 10 years	17 (34.7)	8 (30.8)
31-40 years	10 (20.4)	11 (42.3)	Mean (SD)	9.1 (7.31)	9.0 (8.91)
41-50 years	11 (22.4)	6 (23.1)	<b>Working Hours per Day (Hours)</b>		
51 onward	7 (14.3)	3 (11.5)	Less than 4 hours	-	26 (100)
Mean (SD)	36.9 (10.95)	36.9 (9.52)	4-6 hours	47 (95.9)	-
<b>Occupations</b>			7-8 hours	2(4.1)	-
Main profession	35 (71.4)	23(88.5)	More than 8 hours	-	-
Additional Incomes	14 (28.6)	3 (11.5)	<b>Working Days per Week (Days)</b>		
<b>Body Mass Index</b>			Less than 5 days	8(16.3)	3(11.5)
Mean (SD)	22.1 (3.33)	23.1 (1.79)	5-6 days	40 (81.6)	23 (88.5)
Underweight (<18.5)	5 (10.2)	1 (3.8)	More than 6 days	1(2.1)	-
Normal (18.5-23.4)	32 (65.3)	13 (50.0)	<b>Records of muscles pain</b>		
Overweight (23.5-28.4)	10 (20.4)	12 (46.2)	Never	5 (10.2)	2 (7.7)
Obesity (≥28.5)	2 (4.1)	-	Used to	44 (89.8)	24 (92.3)
<b>Educational Levels</b>			<b>Aching Cure</b>		
Elementary level	-	3 (11.5)	Let the pain goes away by itself.	25 (56.8)	10 (41.7)
Secondary Education	16 (32.7)	10 (38.5)	Take pain medicine/balm massage	17(38.6)	14 (58.3)
High School Education/Vocational Level	27 (55.1)	11 (42.3)	Go to see doctor	2 (4.6)	-
Bachelor /Vocational Certificate	6 (12.2)	2 (7.7)			
Higher than Bachelor	-	-			

**Duration of Works**

Most Roti dough volunteers are women and will spend time of working between 4-6 hours daily (95.9%) and mostly will work for 5-6 days per week (81.6%). Everyone works with the sitting postures of knee bending on the low chair that have no backrest and always have hands and wrists turning in order to press the Roti dough on the hot pan and by doing this repeatedly in that same postures in the long hours. When asking volunteers if they have ever got muscles pain from working or not, the survey found that 89.8% used to have

muscles pain along many organs from the working and 56.8% will let the pain go away by itself, only 38.6% will take pain relief medicines or use balm to massage to relieve the pains and another 4.6% will go to see the doctors for cure.

For the volunteers that working on the Sai Mai fluff, mostly are men and usually only working not over 4 hours daily (100%) and work between 5-6 days per week (88.5%). However, everyone always works in the postures of stooping, using upper limbs in order to stretch the simmered sugar to Sai Mai fluffs and also having the unusual postures inclusively working repetitive works for a long hour about 10–15 minutes in order to produce 2 kilograms of Sai Mai fluffs each time. It found that 92.3% of volunteers have muscles ache from various part of organs and 58.3% take pain relief pills or massage by using balm in order to reduce pains, the rest of 41.7% will leave the pains to go away by itself.

However, volunteers are always able to have break periodically throughout the working period and the working quantity of each day will be more or less, it depends on day offs or holidays. If there are day offs or holidays, workers will have to spend more times on work.

**The Prevalence of Musculoskeletal Disorders (MSDs)**

The Prevalence of Musculoskeletal Disorders in volunteers that have Roti Sai Mai occupation are considered as 12 parts of the various parts of the body and by dividing the prevalence of the disorders into 2 periods, that are the past 7 days and the past 12 months as according to Table 2.

The case of Roti dough making, after the past 7 days found that the prevalence of musculoskeletal disorders has the first 3 high levels in the various parts of the body, they are around the wrists/hands/fingers areas for 65.3%, the lower back area for 61% and the shoulder area for 51% and other parts of the body found the prevalence musculoskeletal disorders lower than 50%. For the past 12 months, found the same prevalence as the first 3 high levels of the past 7 days, they are around the wrists/hands/fingers for 81.6%, 79.6% by the lower back area and around the shoulders for 71.4%.

While the making of the Sai Mai fluff, during the past 7 days found the prevalence of musculoskeletal disorders that have the first 3 high levels, they are 92.3% at the shoulder areas, 80.8% at the lower back area and 69.2% at the upper back area. For the prevalence of musculoskeletal disorders for the past 12 months, found the first 3 high levels are the same prevalence as the past 7 days, they are 100% around the shoulders area, 92.3% are around the lower back and 76.9% are around the upper back.

**Table 2: The prevalence of the musculoskeletal disorders of the past 7 days and the past 12 months of the Roti Sai Mai volunteer workers.**

Body Parts	Roti Dough Work (n=49)		Sai Mai Fluff Work (N=26)	
	The past 7 days Prevalence (%)	The pas 12 months Prevalence (%)	The past 7 days Prevalence (%)	The past 12 months Prevalence (%)
1. Neck	8 (16.3)	11 (22.4)	4 (15.4)	8 (30.8)
2. Shoulder	25 (51.0)	35 (71.4)	22 (84.6)	25 (96.2)
3. Upper back	12 (24.5)	20 (40.8)	18 (69.2)	20 (76.9)
4. Lower back	30 (61.2)	39 (79.6)	21 (80.8)	24 (92.3)
5. Upper arms	20 (40.8)	24 (48.9)	15 (57.7)	16 (61.5)
6. Elbows	5 (10.2)	6 (12.2)	8 (30.8)	8 (30.8)
7. Lower arms	17 (34.7)	19 (38.8)	12 (46.2)	13 (50.0)
8. Wrist/hands/fingers	32 (65.3)	40 (81.6)	3 (11.5)	3 (11.5)
9. Hips/Thighs	10 (20.4)	10 (20.4)	8 (30.8)	9 (34.6)
10. Knees	3 (6.1)	5 (10.2)	5 (19.2)	7 (26.9)
11. Calf	3 (6.1)	4 (8.2)	8 (30.8)	10 (38.5)
12. Ankles/feet	5 (10.2)	5 (10.2)	2 (7.7)	2 (7.7)

**Risk factors related to the prevalence of musculoskeletal disorders of workers during the past 12 months**

Risk Factors that brought for study in order to find that relationships of the 75 volunteers' prevalence of the Musculoskeletal Disorders for the past 12 months are designated for 5 postures factor, they are the health factor, the duration of work factor, the work postures and repetitive work factor, the workstation factor and the work environmental factor as shown by Table 3, found that many factors have effect to the Musculoskeletal Disorders around the lower back in the statistical significant (p-value < 0,05), such as, the work postures and repetitive work factor for 90.7% (p-value = 0.022), the duration of work factor 69.3% (p-value = 0.035) and the workstation factor for 58.7% (p-value = 0.041) respectively.

**Table 3: Factors associated to the lower backache of volunteers. (n = 75).**

Factors	Total (Percentage)	p-value
1. Health Factor	10 (13.3)	< 0.753
2. Work Duration Factor	52 (69.3)	< 0.035
3. Work Postures and the Repetitive Work Factor.	68 (90.7)	< 0.022
4. Workstation Factor	44 (58.7)	< 0.041
5. Work Environmental Factor	8 (10.7)	< 0.625

**Table 4: Risk factors that associated with the musculoskeletal disorders (N = 75).**

Variables	Total (Percentage)	Variables	Total (Percentage)
<b>1. Health problems aspect</b>		3.4 Frequently use fingers or hands or often move hands.	50 (66.7)
1.1 Backache or Neck ache	45(60.0)	3.5 Unusual movements and postures.	75 (100)
1.2 No congenital disease, such as high blood pressure, diabetic, heart disease.	50 (66.7)	3.6 Cannot easily change working postures.	40 (53.3)
1.3 Taking medicines/balm to relieve pain	31 (41.3)	<b>4. Working station</b>	
1.4 Have enough rest.	60 (80.0)	4.1 Have ample spaces around workstation to move and reach for things or in and out the areas.	60(80.0)
<b>2. Work duration aspect</b>		4.2 No lifting machine to assist in lifting and make work easier.	73 (97.3)
2.1 Have long working hours.	50 (66.7)	4.3 Workstation height cannot be adjusted.	50 (66.7)
2.2 Have long continuous working hours.	35 (46.7)	4.4 Working areas are plain without any barriers.	55 (73.3)
2.3 Have enough days off	69 (92.0)	4.5 Convenient to pick or touch equipment and equipment can clearly be seen.	35 (46.7)
2.4 Irregularly in having quantity of work each day	70 (93.3)	<b>5. Work environment aspect.</b>	
2.5 Each quantity of work is unequal.	62 (82.7)	5.1 Have light problem in workplace.	4 (5.33)
<b>3. Working postures and repetitive work aspect</b>		5.2 Have heat problem in workplace.	58 (73.3)
3,1 The lifted item is very heavy.	5 (6.7)	5.3 Have good ventilation	60(80.0)
3.2 Have work that use more exertion.	26 (34.7)	5.4 Have cleanliness maintain in workplace.	70(93.3)
3.3 Have repetitive work type.	75 (100)		

## DISCUSSIONS

From the studied results of the Roti Sai Mai volunteer workers of the Phranakorn Sri-Ayuthaya District, Phranakorn Sri-Ayuthaya province found that most of the workers are female volunteers of (93.9%) because of the light descriptive work that in the position of sitting, but the working is the repetitive work by using hands and wrists to work mostly and always work by the hot plate, that is the reason why found the prevalence of disorders around the hands/wrists/fingers during the past 7 days for 65.3%, and also found the pain at the same areas in the past 12 months at 81.6% due to because of the working postures are always in hands and wrists motions throughout the working period, followed by the lower back disorder that found in the 2<sup>nd</sup> high level and are 61.2% and 79.6% in the past 7 days and past 12 months respectively. As according to the work postures that workers have to sit down and work for a long period of time and the inappropriate working postures because of the high and low of the work station, all of these studies are responded to the study of [5] that found the prevalence of pain during the past 12 months around the wrists/hands (78.8%) and the lower back for (68.9%) of the informal sector workers of hand operated rebar bender due to the work description is the same work that always have to use hands/wrists and the study of [2] found that the Musculoskeletal Disorders in the broomstick occupational workers especially around the areas of spine and upper extremities during the past 3 months by 92.5%, thus, the cause is because of the postures of long sitting in the same position and 51.2% is because of the workstation level is lower than the elbow level.

In making the Sai Mai fluffs, workers are men that work in the standing position including the postures of twisting and turn in order to stretch the simmered sugar to the Sai Mai fluff. Thus, each round of producing the Sai Mai fluffs can be able to produce 2 kilograms within 10-15 minutes and that mainly found the Musculoskeletal Disorders around the shoulder and the lower back. By the past 7 days and the past 12 months, found 92.3% at the shoulder pain and 100% respectively. For the lower back pain are calculated to 80.8% and 92.3% respectively. The postures of this occupations are similar to the volunteers' work that work as farmers because there are always the postures of stooping that has been studied by [7, 8] that found the prevalence of the Musculoskeletal Disorders at the lower back and shoulder during the past 7 days are from the lower back for 56.9%, at the shoulder for 25.1% and for the past 12 months are around the lower back for 73.3% and the shoulder areas for 36% respectively.

Musculoskeletal Disorders of the Roti Sai Mai workers are clearly accumulated pains and responded to the hurting organs. Even though some workers (17 cases) or 22.7% may have hurt from the additional extra works, for example doing farming or hire professional in general. However, found that most volunteers' disorders or pains in working for the Roti Sai Mai have minor symptoms and most of the volunteer workers for Roti dough of 61.2% will let the pain goes away by itself because the work descriptions are light and without excessive exertion. But for 34.7% will cure the pains by taking pain relief medicines or massage by balm, only for 4.1% will pay visit to doctor in order to cure the pains. For the volunteer workers that work on Sai Mai stretching are using more strength to stretch the simmered sugar, 57.7% will cure the pains by taking pain relief pills or massage with balm and for another 42.3% will let the pain goes away by itself. From Table 1, it appears that most of the volunteer workers for the Roti Sai Mai are 36% youngsters (ages between 20-30 years old) and 28% are the working age (ages between 31-40 years old) whom are having strong and better health.

The Musculoskeletal Disorders that are normally found around in many occupations and can be effect in both short and long-term period workers, namely, for short period will reduce the effectiveness in work and will cause stress and tediousness in job and that can cause risk accidents while working. For the long-term period, it may cause Musculoskeletal pain accumulations in which symptoms can be slightly or severely revealed until it cannot be able to restore back to normal condition and will continually effect to family and society.

Many risk factors that related to the Musculoskeletal Disorders in this study is designated for 5 aspects but found only 3 aspects that related to the disorders with the statistical significant, they are the work postures and the repetitive work aspect, the duration of work aspect and the workstation aspect, while the health aspect and the working environment have not significant relationships.

The prevention of the Musculoskeletal Disorders problems in the Roti Sai Mai workers can be prevented with many methods, such as workers should have correct knowledge and understanding in appropriate working postures, manage to have enough rest, periodically do muscle relaxation by exercising in

order to ease the muscles or massage with hot compress inclusively manage to find suitable environmental areas to work, for example, heat problems, light and ventilation system problems including adjusting the working places, such as, work station height, chair with backrest in order to ease muscles contraction to stretch in the long period of times, the ranging distance of reaching for equipment including to look for machine to help in the productive roles in order to reduce exertion and the repetitive works.

### CONCLUSIONS

This research is the studied survey of the prevalence and risk factors that related to the Musculoskeletal Disorders of the Roti Sai Mai volunteer workers of the Phranakorn Sri-Ayuthaya District, Phranakorn Sri-Ayuthaya province. The studied result, are clearly seen that the mentioned occupation has relationship with the Musculoskeletal Disorders. Thus, with the making of Roti dough will affect in aching symptom or the disorder of the 3 first organs, they are hands/wrists/fingers (65.3%), the lower back areas (61.2%) and the shoulder areas (51.2%) during the first 7 days and at the areas of hands/wrist/fingers (81.6%), the lower back area (79.6%) and the shoulder areas (71.4%) in the past 12 months. While the making of Sai Mai fluffs effect the pains and the disorders of the first 3 organs, they are the shoulder areas (84.6%), the lower back areas (80.8%) and the upper back areas (69.2%) for the past 7 days and the shoulder areas of (96.2%), the lower back areas of (92.3%) and the upper back area (76.9%) during the past 12 months with the risk factors that related to the Musculoskeletal Disorders in the 3 significant aspects, they are the working postures and the repetitive work aspect for 90.7% (p-value = 0.022), the duration of work aspect for 69.3% (p-value = 0.035) and the workstation aspect for (58.7%) (p-value = 0.041 respectively. This studied results can continually be brought for basic information of risk evaluation in ergonomics and preventive study in order to prevent the Musculoskeletal Disorders in this type of profession.

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