

Occupational-Related Musculoskeletal Disorders and Associated Factors among Beauty Salon Workers in Karachi: A Cross-Sectional Study

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ABSTRACT

Workers in beauty salons represent a distinct occupational group whose health and job performance may be affected by various physical and ergonomic factors. Their tasks often involve repetitive movements, prolonged standing, and awkward body postures, which increase the risk of developing work-related musculoskeletal disorders. Studies on the prevalence of WRMDs among beauty salon workers in Karachi, are limited. This study aims to determine the prevalence of work-related musculoskeletal disorders among beauty salon workers in Karachi. To determine the Prevalence of Occupational-related musculoskeletal disorders and associated factors among beauty salon workers in Karachi: A cross-sectional study. The study utilized was a cross-sectional study that focused on beauty salon workers currently employed in small, medium, and large-scale beauty salons in Karachi. Non probability convenience sampling was used for the selection of participants. Sample size was 131 which was statistically calculated by Open Epi version 3.01 with a 95% confidence level and $\pm 5\%$ margin of error. Data was collected through the Nordic Musculoskeletal Questionnaire to assess musculoskeletal pain, the patient's history covering demographics and associated factors. The data was analyzed by utilizing descriptive statistics SPSS version 26. The overall prevalence of work-related musculoskeletal disorders (WMSDs) was very high, with approximately 74% of participants reporting symptoms in at least one body region during the past 12 months. The lower back (71.0%) was the most commonly affected body region, followed by wrists/hands (66.4%), neck (62.0%), and shoulders (58.0%). Recent musculoskeletal symptoms (past 7 days) were also commonly reported in neck 63%, indicating ongoing occupational exposure and their discomfort is directly and significantly associated with risk factors such as long and immobile positions and repetitive motions, insufficient breaks and awkward postures (p value less than 0.05). This research is a strong demonstration that musculoskeletal disorders are very common among the beauty salon employees in Karachi. According to this study the overall prevalence of work-related musculoskeletal disorders (WMSDs) was very high. Most participants reported frequent exposure to prolonged standing, repetitive movements, awkward postures, high workload, and inadequate rest breaks and the prevalence of pain was found to be significantly correlated with these risk factors. Future recommendations would be preventative strategies which includes ergonomic interventions, workplace exercises, thoughtful job design and the formulation of proactive policies to set standards for preventing WMSDs.

Keywords: Work, musculoskeletal diseases, occupational health

INTRODUCTION:

Work-related musculoskeletal disorders (WMSDs) are conditions caused by occupational exposures that affect the musculoskeletal system. Occupational or workplace variables originally cause or exacerbate these ailments, which mostly affect the muscles, bones, connective tissues, joints, tendons, ligaments, nerve pathways, or vascular systems. They represent dysfunctions of body systems that result from poor physical health and harmful lifestyle choices. [1]

Work-related musculoskeletal symptoms (WMSs) are widespread unpleasant illnesses that affect the body's structure, specifically joints, tendons, muscles, and nerves. Symptoms may appear after several days, months, or years of exposure to occupational risks. These symptoms might affect the back, upper, and lower limbs. [2] These injuries can cause discomfort, soreness, disability, and malfunction due to injured muscles, ligaments, cartilage, or other connective tissues. [3]

The work environment and one's performance at work might contribute to these injuries of the muscles, nerves, tendons, joints, cartilage, and spinal disc. MSDs can affect the hands, wrists, elbows, shoulders, necks, low backs, feet, and legs. The low back, knees, and neck are the most often afflicted areas. [4] Additionally, WRMSD prevalence among female beauticians: 83% of individuals reported experiencing musculoskeletal pain in one or more body areas as result of their jobs. [5]

Professionals in the beauty industry perform cosmetic treatments on the body, hair, skin, and nails to enhance a person's appearance. In general, this line of work requires significant use of the upper limbs in an unsupported position while standing. The majority of tasks necessitate extended standing, back flexion and twisting static positions, and significant sagittal and lateral flexion motions. So, WMSDs, which are most prevalent in the upper limb, back, hand, and the lower limb, are caused by persistent postural deviations from normal and aberrant postures. [6]

Another study aims to investigate the prevalence of WMSDs and associated factors among workers who are exposed to manual work. The overall prevalence of WMSDs symptoms among the participants in any body region during the last 12 months was 57.9%. Neck (24.7%), shoulder (22.1%), upper back (13.4%), and lower back (12.6%) showed the highest prevalence of WMSDs. The high frequency of WMSDs in the construction business may be due to the long-term exposure of construction workers to many physical risk factors (such as handling heavy manual materials, extended body postures, and continual usage of machines). [7]

With an emphasis on relevant risk factors and effects on occupational health, a study is being conducted to ascertain the prevalence of work-related musculoskeletal disorders (WRMSDs) among beauticians and hairdressers in Peshawar, 73.8% of respondents reported having a variety of musculoskeletal disorders, indicating a high incidence of WRMSDs. Ankles (62.1%), lower back (56.5%), hands/wrists (35.0%), and shoulders (34.4%) were the most frequently reported discomfort locations. [8] One study addresses a gap by analyzing the frequency of WMSDs in Kuwait and Denmark. Despite the better working conditions in Denmark, results showed that 78.72% of workers in Denmark reported experiencing discomfort in at least one part of their body, compared to only 52.14% of workers in Kuwait. [9]

WRMSDs account for the majority of the occupational illness burden and are mostly caused by ergonomic factors in the workplace. According to the World Health Organization (WHO), musculoskeletal problems are the most common causes of disability and limitations in everyday life and meaningful employment. Workplace ergonomics play a major role in WRMSDs, these hazards result in uncomfortable working

conditions for employees, which adds to the high burden of WRMSDs. Nurses may encounter a variety of challenges at work that contribute to WRMSDs. Patient handling responsibilities were identified as important contributing variables to WRMSDs among nursing personnel.^[10]

Musculoskeletal problems are estimated to affect over 1.71 billion individuals globally, making them the major cause of disability and misery. In 2017, the global prevalence rate of MSDs was greater in women than in men, and it was gradually increasing in older age groups, with some variance among countries.^[11]

One of the main causes of illness in the globe is musculoskeletal diseases (MSD), which are linked to musculoskeletal pain (MP). Nearly half a billion people worldwide had MSD in 2020, according to projections from the most recent Burden of Disease Study, making it the sixth most common cause of lost Disability Adjusted Life Years (DALY).^[12] WMSDs have become one of the leading causes of labor force decrease in the occupational population. According to research on the disease burden in 2019, among those aged 25 to 49, lower back pain ranks fourth globally in terms of disability-adjusted life years.^[13]

WMSDs account for one-third of workplace injuries and illnesses.^[14] In Japan, MSDs are the most common type of work-related sickness, accounting for one-third or more of all recognized occupational disorders.^[15] Beauty salon workers are collection of individuals whose working abilities and health condition might be altered by various work-related activities. Workers in beauty salons frequently experience postural issues such as excessive shoulder flexion and abduction, which are frequently brought on by using elbows at or above shoulder level. Furthermore, if the chair is not raised to proper height, trunk flexion may happen. Awkward wrist position when using scissors or shears are another issue, as is forward neck flexion. Working in a salon usually entails handling different chemicals, standing for extended periods of time in uncomfortable positions, and making repetitive hand motions. Beauty salon workers face physical and mental stress, as well as musculoskeletal ailments from repeated trauma diseases due to prolonged standing. Therefore, prolonged standing and sitting positions may put them at risk for decreased physical fitness.^[16]

The most popular tool for evaluating MSK pain in the Nordic nations is the Nordic Musculoskeletal Questionnaire (NMQ), which was specifically created to assess the prevalence and effects of MSK pain. Three items on MSK pain are included in the NMQ, which divides the body into nine anatomical regions: the impact on everyday activities and routine work, as well as the 7-day and annual prevalence of symptoms. It has excellent validity and reliability.^[17] The Nordic Musculoskeletal Questionnaire (NMQ) is an uncomplicated, well-defined questionnaire featuring a body map detailing nine functional locations exposing both sides, upper limbs, lower limbs, upper back, and lower back.^[18]

Workplace exercise, relaxation times, and ergonomic adjustments are some of the therapies used to treat MSDs connected to ergonomics. In an effort to reduce the risk of MSDs at work, stretching exercises are growing in popularity.^[19]

Wearable technologies, which include devices designed to monitor physical activity or the movement of specific body parts, have gained popularity by incorporating sensing, processing, storage, and communication capabilities. As a result, a sensor is described as a device that detects a certain type of physical input, whereas an instrument quantifies or manipulates factors such as acceleration and magnetic fields. Wearable motion capture equipment and systems have numerous potential uses in risk management for the avoidance of WMSDs. The goal is to demonstrate wearable's broad possibilities in avoiding work-related musculoskeletal disorders (WMSDs).^[20]

In conclusion, work-related musculoskeletal disorders (WMSDs) are a significant global occupational health concern, particularly in occupations like healthcare, construction, and beauty salons that require repetitive tasks, awkward postures, and extended standing. Because of their forward head posture, elevated shoulders, bad wrist positions, and repetitive hand motions, beauty salon employees are particularly vulnerable. Physical, psychological, and personal variables all have an impact on WMSDs, which can result in discomfort, impairment, decreased productivity, and a low quality of life. They can be prevented and managed with the help of wearable technology, ergonomic treatments, workplace exercises, and appropriate job design.

METHODOLOGY:

Study Design:

This study followed a cross-sectional design.

Sampling Technique:

A non-probability convenience sampling technique was employed to recruit eligible participants from selected beauty salons across Karachi.

Outcome Measure:

During the course of this research, work-related musculoskeletal disorder and associated factors were evaluated. It was determined that the population was chosen had a high prevalence of work-related musculoskeletal disorders and associated factors based on the measurements through Nordic Musculoskeletal Questionnaire and self-administered Work-related risk factors assessment scale for beauty salon workers.

Data Analysis:

Data analysis was performed using SPSS software. Graphic measurements, such as means and standard deviations, were used to account for quantitative factors. To determine any importance association between subjective variables, the Chi-square test was used.

Ethical Considerations:

Ethical approval for this study was obtained from the institutional review board of university. All participants were clearly informed about the purpose, procedures, and voluntary nature of the research before data collection. Participation was completely voluntary, and beauty salon workers were given the option to withdraw at any point without any consequences. Written informed consent was obtained from each participant, and anonymity and confidentiality of the data were strictly maintained. The data collected was stored securely and used solely for academic research purposes. The study involved no physical or psychological risk to the participants and did not interfere with their academic or personal activities. There were no conflicts of interest declared by the researchers.

Reliability:

To ensure the reliability of the data collection tools, the internal consistency of the Nordic Musculoskeletal Questionnaire (NMQ) was evaluated using Cronbach's alpha through SPSS software. A Cronbach's alpha value between 0.70–0.79 is considered acceptable, 0.80–0.89 indicates good internal consistency, and 0.90 or above is regarded as excellent. In this study, the NMQ demonstrated satisfactory reliability. The self-

administered questionnaire was evaluated by experts to ensure that all items were clear, relevant, and suitable for measuring the intended variables in the selected population.

RESULTS AND FINDINGS

Introduction:

This chapter presents the results of the cross-sectional study conducted among beauty salon workers in Karachi to determine the prevalence of occupational-related musculoskeletal disorders (WMSDs) and their association with work-related risk factors. Data were collected using a structured questionnaire consisting of socio-demographic characteristics, the Nordic Musculoskeletal Questionnaire (NMQ), and a Work-Related Risk Factors Assessment Scale based on a 5-point Likert scale. A total of 131 participants completed the questionnaire. Data were analyzed using SPSS version 26 and presented as frequencies, percentages, and Chi-square tests.

Socio-Demographic Characteristics:

Table 1: Socio-Demographic Profile of Participants (n = 131)

<i>Variable</i>	<i>Category</i>	<i>Frequency (n)</i>	<i>Percentage (%)</i>
<i>Age (years)</i>	18–25	38	29.0
	26–35	56	42.7
	36–45	37	28.3
<i>Gender</i>	Female	131	100
<i>Marital Status</i>	Single	72	55.0
	Married	59	45.0
<i>Work Experience</i>	<2 years	34	26.0
	3–5 years	49	37.4
	>5 years	48	36.6
<i>Working Hours/day</i>	4–6 hours	29	22.1
	7–9 hours	63	48.1
	>9 hours	39	29.8

The demographic profile (Table 1) of the study participants shows that the majority belonged to the 26–35 years age group (42.7%), followed by those aged 18–25 years (29.0%) and 36–45 years (28.3%), indicating a predominantly young to middle-aged working population. Females constituted a substantial proportion of the sample (100%), reflecting a female-dominated workforce in the studied setting. Regarding marital status, slightly more than half of the participants were single (55.0%), whereas 45.0% were married. In terms of work experience, most respondents had between 3–5 years of experience (37.4%), closely followed by those with more than 5 years of experience (36.6%), suggesting a relatively experienced cohort. Concerning daily working hours, nearly half of the participants (48.1%) reported working 7–9 hours per day, while 29.8% worked more than 9 hours, highlighting prolonged working durations among a considerable proportion of the study population.

Job Task Distribution:

Based on questionnaire responses regarding specific tasks performed:

Table 2: Distribution of Job Tasks Performed

<i>Task Performed*</i>	<i>Frequency (n)</i>	<i>Percentage (%)</i>
<i>Hairstyling</i>	89	68.0
<i>Makeup</i>	74	56.5
<i>Facial Treatments</i>	61	46.6
<i>Manicure/Pedicure</i>	58	44.3
<i>Threading/Waxing</i>	53	40.5
<i>Henna Application</i>	36	27.5

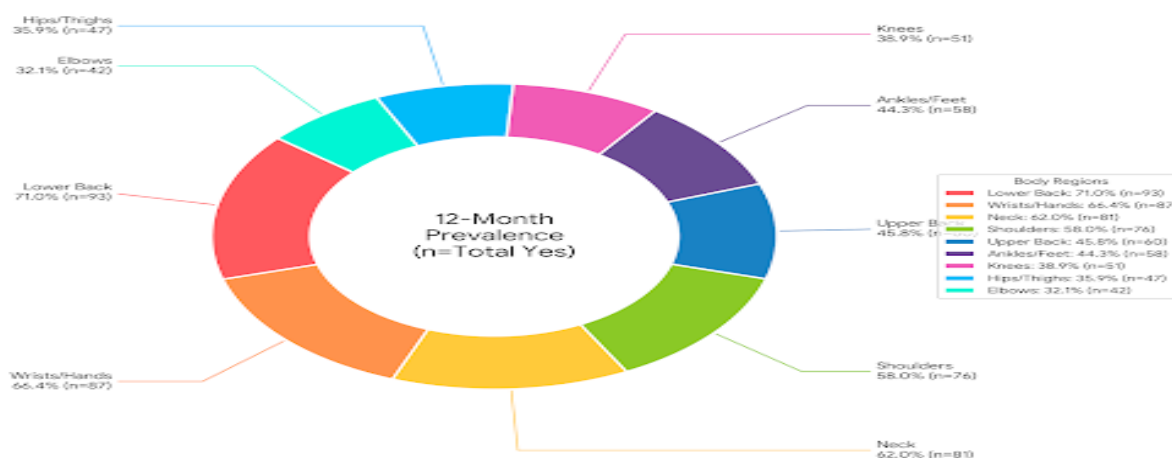
The distribution of tasks performed by the participants indicates that hairstyling was the most frequently reported activity, undertaken by 68.0% of respondents. This was followed by makeup services, performed by 56.5% of participants, reflecting a high level of involvement in cosmetology-related procedures. Facial treatments were reported by 46.6% of the participants, while manicure and pedicure services were carried out by 44.3%, showing moderate engagement in skin and nail care activities. Threading and waxing were performed by 40.5% of respondents, whereas henna application was the least commonly reported task, undertaken by 27.5% of the participants. Overall, the findings suggest that workers were involved in multiple tasks requiring repetitive hand movements, prolonged standing, and sustained postures.

Prevalence of Musculoskeletal Disorders:

Table .3: Prevalence of Musculoskeletal Symptoms in the Past 12 Months

<i>Body Region</i>	<i>Yes n (%)</i>	<i>No n (%)</i>
<i>Neck</i>	81 (62.0)	50 (38.0)
<i>Shoulders</i>	76 (58.0)	55 (42.0)
<i>Elbows</i>	42 (32.1)	89 (67.9)
<i>Wrists/Hands</i>	87 (66.4)	44 (33.6)
<i>Upper Back</i>	60 (45.8)	71 (54.2)
<i>Lower Back</i>	93 (71.0)	38 (29.0)
<i>Hips/Thighs</i>	47 (35.9)	84 (64.1)
<i>Knees</i>	51 (38.9)	80 (61.1)
<i>Ankles/Feet</i>	58 (44.3)	73 (55.7)

Prevalence of Musculoskeletal Symptoms (MSD) by Body Region



The prevalence of musculoskeletal symptoms varied across different body regions among the participants. Lower back pain was the most commonly reported complaint, affecting 71.0% of respondents, followed by wrist and hand discomfort reported by 66.4%, and neck pain experienced by 62.0% of participants. Shoulder pain was also highly prevalent, reported by 58.0% of the study population. Moderate levels of discomfort were observed in the upper back (45.8%) and ankles/feet (44.3%). In contrast, comparatively lower frequencies of symptoms were reported in the knees (38.9%), hips/thighs (35.9%), and elbows (32.1%). Overall, the findings indicate a high burden of musculoskeletal problems, particularly in the lower back, upper extremities, and neck regions, likely associated with prolonged standing, repetitive movements, and poor ergonomic practices.

Functional Limitation Due to Musculoskeletal Problems:

Table 4: Work Limitation Due to Musculoskeletal Symptoms (12 Months)

<i>Body Region</i>	<i>Prevented from Normal Work n (%)</i>
<i>Lower Back</i>	52 (39.7)
<i>Wrist/Hand</i>	47 (35.9)
<i>Neck</i>	41 (31.3)
<i>Shoulder</i>	38 (29.0)

A substantial proportion of workers reported functional limitations, indicating not only pain but also reduced occupational performance.

<i>Body Region</i>	<i>Yes n (%)</i>	<i>No n (%)</i>
<i>Neck</i>	63 (48.1)	68 (51.9)
<i>Shoulder</i>	57 (43.5)	74 (56.5)
<i>Wrist/Hand</i>	69 (52.7)	62 (47.3)
<i>Lower Back</i>	78 (59.5)	53 (40.5)

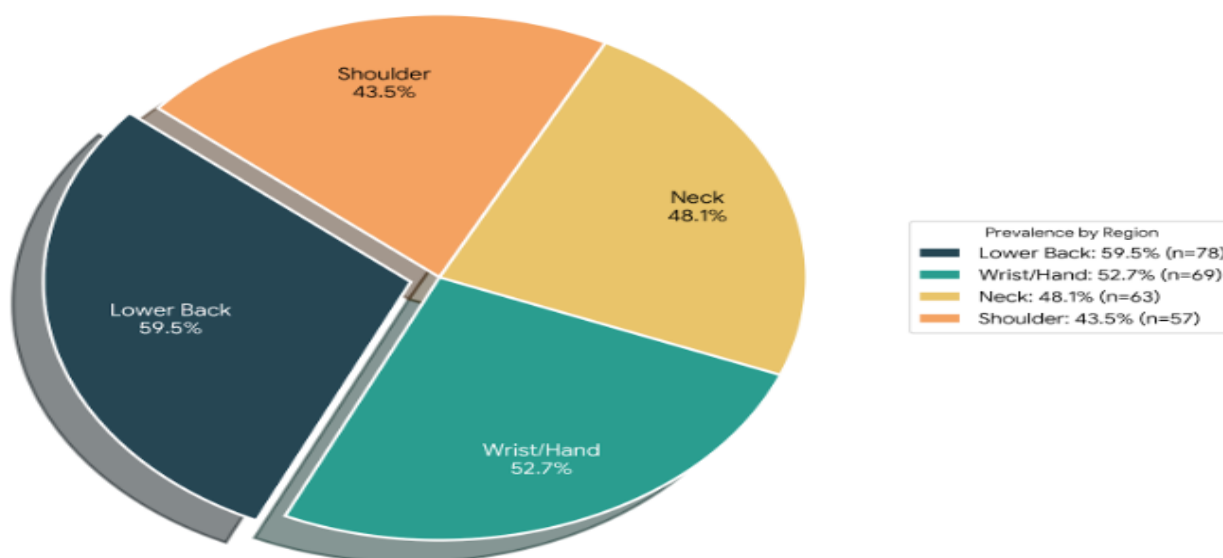


Fig 2: 7-Day Prevalence of Musculoskeletal Symptoms

Work-Related Risk Factors (Likert Scale Analysis):

Table 6: Distribution of Work-Related Risk Factors

<i>Risk Factor</i>	<i>Often/Always n (%)</i>
<i>Prolonged standing</i>	96 (73.3)
<i>Repetitive movements</i>	98 (74.8)
<i>Awkward postures</i>	91 (69.5)
<i>Forceful exertion</i>	77 (58.8)
<i>Inadequate breaks</i>	79 (60.3)
<i>High workload</i>	84 (64.1)

Most participants reported frequent exposure to ergonomic risk factors, especially prolonged standing and repetitive movements.

Association Between Risk Factors and WMSDs (Chi-Square Tests):

Table 7: Prolonged Standing vs WMSDs

<i>Prolonged Standing</i>	<i>WMSDs Yes</i>	<i>WMSDs No</i>	<i>Total</i>
<i>Often/Always</i>	83	13	96
<i>Never–Sometimes</i>	14	21	35

$\chi^2 = 26.41, df = 1, p = 0.001$

Table 8: Repetitive Movements vs WMSDs

<i>Repetitive Movements</i>	<i>WMSDs Yes</i>	<i>WMSDs No</i>	<i>Total</i>
<i>Often/Always</i>	86	12	98
<i>Never–Sometimes</i>	11	22	33

$\chi^2 = 31.28, df = 1, p = 0.001$

Table .9: Inadequate Breaks vs WMSDs

<i>Break Availability</i>	<i>WMSDs Yes</i>	<i>WMSDs No</i>	<i>Total</i>
<i>Inadequate</i>	68	11	79
<i>Adequate</i>	29	23	52

$\chi^2 = 15.64, df = 1, p = 0.001$

Hypothesis Testing:

Table 10: Summary of Hypothesis Testing

<i>Hypothesis</i>	<i>Test</i>	<i>p-value</i>	<i>Decision</i>
<i>Working hours vs WMSDs</i>	Chi-square	<0.005	Significant
<i>Repetitive movements vs WMSDs</i>	Chi-square	<0.005	Significant
<i>Prolonged standing vs WMSDs</i>	Chi-square	<0.005	Significant
<i>Inadequate breaks vs WMSDs</i>	Chi-square	<0.005	Significant
<i>There is no significant relationship between working in beauty salons and the prevalence of occupational-related musculoskeletal disorders.</i>	Overall Null Hypothesis		Rejected
<i>There is a significant relationship between working in beauty salons and the prevalence of occupational-related musculoskeletal disorders</i>	Alternative Hypothesis		Accepted

SUMMARY OF RESULTS:

The overall prevalence of work-related musculoskeletal disorders (WMSDs) was high, with approximately 74% of participants reporting symptoms in at least one body region during the past 12 months. The lower back (71.0%) was the most commonly affected body region, followed by wrists/hands (66.4%), neck (62.0%), and shoulders (58.0%).

A substantial number of participants reported that musculoskeletal symptoms interfered with normal work activities, particularly involving the lower back, wrists/hands, neck, and shoulders.

Recent musculoskeletal symptoms (past 7 days) were also commonly reported, indicating ongoing occupational exposure. Most participants reported frequent exposure to prolonged standing, repetitive movements, awkward postures, high workload, and inadequate rest breaks.

Chi-square analysis revealed statistically significant associations between WMSDs and:

- Prolonged standing
- Repetitive movements
- Inadequate break time
- Longer daily working hours
- Increased work experience
($p < 0.05$ for all)

The null hypothesis was rejected, and the alternative hypothesis was accepted, confirming a significant relationship between beauty salon work and occupational-related musculoskeletal disorders.

STUDY LIMITATIONS:

The research helps to create a very important foundation to WMSDs within the Pakistani beauty industry. It identifies the necessity of more specific biomechanical measurements (e.g., electromyography, posture analysis) as a means to measure levels of exposure. Also, longitudinal research is needed to provide causal associations and trace the evolution of diseases. A qualitative study of the perceptions of workers, coping strategies and obstacles to illness reporting would give invaluable background to the ability to develop effective interventions.

Although this study has significant findings, it has a number of weaknesses that should be recognized. One, cross-sectional design restricts the possibilities of assumption of causality. Although we had very strong associations, we cannot say that the risk factors were the cause of the WMSDs; just that they are correlated. Second, there is recall bias and subjectivity to the use of self-reported data in the NMQ and on the risk factor scales. The respondents might have under- or over-reported the symptoms due to his perception or worries about his job safety. The study did not involve clinical or physical examinations to unbiased establish the self-reported musculoskeletal disorders, i.e., prevalence rates need not be consistent with clinical diagnoses. Third, sampling approach (non-probability, convenience sampling) restricts the extrapolation of the results. The sample was not completely representative of all the beauty salon workers in Karachi or the rest of Pakistan since it was confined to certain regions of the city. Fourth, the research has failed to fully evaluate psychosocial factors, including job stress levels, job demand-control, or social support that are characterized as contributing factors in WMSDs development and reporting levels. Lastly, the rather limited sample size ($n=131$) is sufficient to conduct preliminary analysis, however, which might not be powerful to conduct more complex multivariate analyses to control potential confounders such as age, experience, and specific job tasks at the same time.

RECOMMENDATIONS FOR FUTURE RESEARCH:

Future recommendations of this study includes carrying out longitudinal cohort research to determine the time-relation of exposure to risks and the occurrence of WMSDs in this group, Use mixed methods research that will incorporate both quantitative surveys and qualitative research methods (using in-depth interviews and focus group discussions) to achieve an overall picture of the socio-cultural and economic backgrounds of WMSD risk and reporting, Conduct objective ergonomic evaluations with the aid of such tools as Rapid Upper Limb Assessment (RULA) or direct observation/electromyography to measure postural loads and confirm the self-report risk factors, Further randomized controlled trials on the effectiveness of customized ergonomic interventions should be investigated, evaluating the effects of equipment adaptation, exercise programs and schedules of work and rest, Investigate the contribution of the psychosocial factors of work and how they interact with the physical risks within Pakistani salon setting.

CONCLUSION:

This research is an excellent demonstration that musculoskeletal disorders are a very common and paralyzing phenomenon among the beauty salon employees in Karachi. The most susceptible parts of the body are the lower back, wrists/hands and neck, and their discomfort is directly and significantly associated with the ergonomic hazards that can be modified at the workplace: long and immobile positions and repetitive motions, insufficient breaks and awkward postures. The results transcend the description of a problem; they point out to a serious public health and labor rights concern in an important but unacknowledged sector of the urban economy. The prevalence of work- limiting pain is very high, and this fact necessitates an action. This needs a multi-prolonged approach that entails strict scientific studies to inform the intervention, formulation of proactive policies to set standards, ergonomic innovation at the salon level and empowering the workers through educational efforts. It is dangerous to overlook these results as the health and livelihood of thousands of workers is in danger, and the health issue and problem will cause a considerable social and economic impact over time. Thus, it is necessary that government agencies, industry groups, medical practitioners, and even the employees themselves work together to modernize the beauty salon as a musculoskeletal injury outbreak instead of a safe and sustainable workplace.

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No financial or commercial ties were existent as to raise the potential for conflict of interest during the research was being conducted.

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