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Musculoskeletal Disorders (MSDs) Risk Level at Cleaning Service Workers in Integrated Facility Services

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Abstract

Background: Cleaning service workers are among occupational groups with a high potential for ergonomic risks due to the predominantly manual nature of their work activities. A preliminary study utilizing the Nordic Body Map (NBM) questionnaire revealed that all cleaning service workers surveyed (100%) reported experiencing musculoskeletal disorder (MSD) symptoms.

Objective: To analyze the risk level of Musculoskeletal Disorders (MSDs) among cleaning service workers at Integrated Facility Services.

Methods: This study employed a descriptive-analytic approach with a cross-sectional design. The research was conducted at Integrated Facility Services in South Tangerang. Primary data were collected using the Nordic Body Map (NBM) questionnaire and the Rapid Entire Body Assessment (REBA) tool. Univariate data analysis was performed using computerized statistical applications.

Results: Among cleaning service workers at Integrated Facility Services, 26 individuals (55.3%) reported a low level of MSD complaints, 19 individuals (40.4%) reported a moderate level, and 2 individuals (4.3%) reported a high level of complaints. In terms of posture-based risk assessment using the REBA method, 3 workers were categorized as having a low MSD risk, 4 workers as moderate risk, and 2 workers as high risk.

Conclusion: Dusting and toilet cleaning were identified as tasks with the highest ergonomic risk, primarily due to awkward working postures. These findings indicate the need for immediate corrective interventions and ergonomic improvements to reduce the risk of MSDs among cleaning service workers.

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Keywords: Musculoskeletal Disorders (MSDs); posture; occupational ergonomics; cleaning service workers; Rapid Entire Body Assessment (REBA)

Background

Musculoskeletal complaints (MSDs) are worker complaints that integrate physical, psychological, and work environment factors to understand how these interact to affect worker well-being, and provide new insights into designing more effective and sustainable ergonomic solutions. For every company, the cleanliness of the premises or building facilities is one of the important aspects because a clean and healthy environment is the foundation for the well being and productivity of its employees. Therefore, every company requires specialized workers in an effort to maintain the cleanliness of the environment and work areas. In this regard, ensuring cleanliness in the company's environment and work areas is the main task of cleaning service workers.

The World Health Organization (WHO) states that occupational risks rank as the tenth cause of death and illness (WHO, 2020). Basically, every job and whatever the job is there potential risks and this also applies to cleaning service workers, where there are indeed potential hazards. Despite the appearance of cleaning service work primarily involving cleaning activities, when viewed from the perspective of occupational health and safety (OSH), the job presents several potential dangers, one of which is ergonomic. This is due to the fact that the entire scope of work carried out by cleaning service personnel is done manually. Manual work can cause various complaints, such as back and waist pain, neck strain, wrist, arm, and leg pain, as well as eyestrain, among many others(Tarwaka, 2019).

Ergonomic are dangers caused by the relationship between work activities, the use of tools or facilities, and an unfavorable work environment, resulting in injuries or illnesses to workers. Every job has the potential for ergonomic hazards. In the Republic of Indonesia, according to the Ministry of Manpower Regulation Number 5 of 2018 concerning Occupational Safety and Health in the Workplace, potential ergonomic hazards include work methods, working positions, improper body posture during tasks, as well as workplace design and conditions that do not align with the anthropometry of the workforce, along with lifting loads exceeding the capacity for work. As for several ergonomic issues, they include non-neutral posture, manual handling, workplace layout, and job design (Ministry of Manpower of the Republic of Indonesia, 2018).

Unergonomic postures and manual work methods can cause ergonomic problems. The two are interconnected as manual activities often lead to poor postures, such as bending, stooping and twisting. When postures become unergonomic during work, the risk of musculoskeletal disorders increases (Tarwaka, 2019) Additionally, manual labor naturally requires muscle strength, but if the muscle contraction exceeds 20%, it can lead to reduced blood circulation to the muscles. Consequently, this can impact the supply of oxygen to the muscles and hinder the carbohydrate process, resulting in pain, discomfort, and muscle soreness due to the accumulation of lactic acid (Tarwaka, 2019). The presence of excessive workload will result in negative effects and can persist over an extended period. This leads to a decline in an individual's concentration, causing errors in decision-making, an increased potential for workplace accidents, and impacts on health and work productivity. Workloads obtained by the human body should be in line or balanced with its physical capacity or capability (Khofiyya et al., 2019). In the end, this someone being unable to move and coordinate body movements, resulting in decreased work productivity and efficiency (Khairunnisa, 2023).

One of the Occupational Diseases that arises due to non ergonomic conditions is disorders in the musculoskeletal system (Azzahra, 2021). Musculoskeletal disorders is a type of occupational health disorder caused by repeated release of mechanical energy or prolonged exposure to non ergonomic working positions over an extended period. Musculoskeletal complaints are sensations of pain in the muscle or skeletal parts of an individual. These complaints are commonly referred to as musculoskeletal disorders (MSDs). Individuals typically experience these MSDs at various levels, ranging from very low to very pain. Pain is the most common symptom of MSDs, but in some cases, other symptoms such as joint stiffness, muscle tightness, and swelling may also occur (Saleh, 2018). MSDs can occur due to muscles enduring repetitive static loads over extended periods (Tarwaka, 2019). As for the long-term effects, Musculoskeletal Disorders (MSDs) can lead to disabilities, prolonged pain, medical care, and financial losses (Kattang et al., 2018).Top of Form

Musculoskeletal disorders (MSDs) complaints rank second as the disease contributing to disability worldwide (Saleh, 2018). The World Health Organization (WHO) estimates that complaints of MSDs account for nearly 60% of all occupational diseases (Raraswati at al 2020). Some cases of MSDs, such as those in the Britania Raya during 2018-2019, contributed to 37% of the prevalence of other work related diseases. Consequently, this led to the loss of approximately 6.9 million working days (Health and Safety Executive, 2019).

Complaints of musculoskeletal disorders (MSDs) are an example of occupational diseases. The factors causing MSDs are diverse. According to Tarwaka (2019), the contributing factors to MSDs include awkward working postures, repetitive activities, workload, work period, duration of work, age, length of service, gender, smoking habits, physical fitness, anthropometry, nutritional status, work area, pressure, lighting, vibration, and temperature. Meanwhile, according to World Health Organization (2021), the factors causing MSDs are age, awkward working postures, prolonged working duration, repetitive movements, and unhealthy exercise habits. According to Salamah (2020), the risk factors for Musculoskeletal Disorders are divided into two categories: psychological factors and physical factors, which include occupational risk factors, personal risk factors, and environmental risk factors.

In a research conducted by Prima et al (2021) involving 34 cleaning service workers at General Hospital revealed the presence of MSDs, with 11 workers having a low level, 23 workers having a medium level, and the research showed a correlation between body posture and repetitive movements with MSDs complaints. The risk of MSDs can certainly be minimized. One way to do this is by identifying and assessing the risk of MSDs for each worker beforehand. The results of this identification and assessment can then be used to provide an appropriate form of control. Rapid Entire Body Assessment (REBA) is a systematic method that evaluates a worker's entire posture to identify the risk of musculoskeletal complaints and other work-related risks such angles on the trunk, neck, legs, upper arms, lower arms, and wrists (Tarwaka, 2019). Nordic Body Map (NBM) is one of the subjective measurement methods to measure the muscle pain of workers.

Integrated Facility Services is one of the integrated facility services companies in Indonesia. Integrated Facility Services provides various facility services, and one of them is cleaning service. Based on the preliminary study using the Nordic Body Map (NBM) questionnaire on 10 cleaning service workers at Integrated Facility Services, it was found that all 10 workers (100%) surveyed reported musculoskeletal disorders (MSDs) with varying severity levels. The severity of MSDs complaints was categorized as low in 6 individuals (60%), medium in 3 individuals (30%), and high in 1 individual (10%). Furthermore, observations during the cleaning service workers' activities revealed ergonomic such as repetitive movements. Sometimes, there were instances where their body posture appeared non ergonomic, such as bending and stooping. Therefore, the researcher was motivated to assess the work posture using the Rapid Entire Body Assessment (REBA) method to analyze the level of MSDs risk among Integrated Facility Services cleaning service workers during their work activities where this will potentially affect the work posture such as neck posture, hand posture, foot posture, head posture and other at Cleaning Service Workers in Integrated Facility Services.

Methods

Study Design

This study is an analytical descriptive research utilizing a quantitative approach and a cross-sectional design. A cross-sectional design was chosen because it allows data collection from various individuals or groups at a single point in time to examine specific characteristics within a population. The descriptive component aims to provide a comprehensive overview of the risk levels of musculoskeletal disorders (MSDs) among cleaning service workers during their daily work activities. Data collection was conducted simultaneously across subjects in accordance with the cross-sectional design.

Sample

The focus variables in this study are dusting and toilet cleaning activities, both identified as high-risk based on the Rapid Entire Body Assessment (REBA). The study population comprises 57 cleaning service workers at Integrated Facility Services. However, 10 individuals who participated in the preliminary study were excluded to avoid potential bias due to repeated measurements, ensuring the validity of the findings. Thus, the final sample consisted of 47 participants. Two sampling techniques were applied. Total sampling was used for collecting data on MSDs complaints to capture a complete picture of MSDs among all cleaning service workers. Meanwhile, purposive sampling was employed for assessing work posture. This was based on the assumption that similar job tasks were performed by multiple workers, allowing the selection of representative samples that met specific inclusion criteria related to work posture analysis.

Instruments

This study utilized primary data obtained through the Nordic Body Map (NBM) questionnaire and the Rapid Entire Body Assessment (REBA) sheet.

1. Nordic Body Map (NBM)

   The NBM questionnaire was used to assess the severity of MSDs experienced by cleaning service workers over the past week. This instrument has been validated and shown to have high reliability (Tarwaka, 2019). The questionnaire was self-administered by participants, who were instructed to mark the affected areas among the 28 body regions. The total score was then calculated by summing the checked responses. The interpretation of NBM total scores is as follows:

   a) Score 0–20: Low level
   b) Score 21–40: Moderate level
   c) Score 41–61: High level
   d) Score 62–84: Very high level

2. Rapid Entire Body Assessment (REBA)

   The REBA tool was used to evaluate the risk level of MSDs based on work posture during the execution of work tasks. The REBA sheet has also been validated and is reliable for assessing 144 combinations of body postures and movements in occupational tasks (Tarwaka, 2019). The REBA scores are interpreted as follows:

   a) Score 1: Very low risk
   b) Score 2–3: Low risk
   c) Score 4–7: Moderate risk
   d) Score 8–10: High risk
   e) Score 11–15: Very high risk

   For further analysis, these scores were categorized into two groups:

   a) Non-awkward postures: REBA scores 1–3 (very low to low risk)
   b) Awkward postures: REBA scores 4–15 (moderate to very high risk)

Data Analysis

Univariate analysis was employed to describe the distribution and proportion of each variable. This approach was used to analyze the data obtained from the NBM questionnaire (MSD complaints) and the REBA assessment (work postures). The results were presented in the form of frequency tables and percentage distributions. Additionally, for the work posture analysis, images of workers performing their tasks with identified angles and REBA score tables were provided. Observational data and recommendations for corrective actions were also described.

Ethical Consideration

This study was conducted in accordance with ethical standards and received approval under ethical clearance number 0923-08.093/DPKE-KEP/FINAL-EA/UEU/VIII/2023. Ethical principles including informed consent, confidentiality, participant rights, and research integrity were upheld throughout the research process to ensure scientific accountability and ethical compliance.

Results

The incidence Musculoskeletal Disorders (MSDs) complaints of Integrated Facility Services at cleaning service workers using a Nordic Body Map (NBM) questionnaire, it is observed that there are a total of 26 workers (55.3%) with a low level of musculoskeletal disorders (MSDs) complaints, 19 workers (40.4%) with a medium level of MSDs complaints, and 2 workers (4.3%) with a high level of MSDs complaints. Meanwhile, the assessment work posture of Integrated Facility Services at cleaning service using a Rapid Entire Body Assessment (REBA) sheets. shows that the work activities of cleaning service workers with a low MSDs risk are for 3 workers, a medium risk for 4 workers, and a high risk for 2 workers.

The Incidence Musculoskeletal Disorders (MSDs) Cleaning Service Workers in Integrated Facility Services

Complaints of Musculoskeletal Disorders (MSDs) are sensations of pain in the skeletal muscles experienced by Cleaning Service Workers in Integrated Facility Services, ranging from low to very high. Data on MSDs complaints were obtained from the completion of the Nordic Body Map (NBM) questionnaire by respondents Cleaning Service Workers in Integrated Facility Services. The NBM scores are categorized as follows: 0 – 20 for low, 21 – 41 for medium, 42 – 62 for high, and 63 – 84 for very high. The results from the NBM questionnaire are as follows:

Table 1. Frequency Distribution of MSDs Complaint Levels Cleaning Service Workers in Integrated Facility Services Based on the NBM Questionnaire Results in 2023

Level of MSDs Complaints by Respondents	Frequency (n)	Percentage (%)
Low	26	55.3%
Medium	19	40.4 %
High	2	4.3%
Total	47	100 %

Based on the table 1, it is obtained that there are no respondents among the cleaning service workers of Integrated Facility Services who experience MSDs complaints at a very high level. There are only complaints at low, medium, and high levels. The majority proportion is MSDs complaints at a low level, with 26 respondents (55.3%), followed by 19 respondents (40.4%) who experience MSDs complaints at a medium level, and 2 respondents (4.3%) who experience complaints at a high level. Additionally, the frequency distribution of body parts of respondents from the cleaning service workers of Integrated Facility Services who experience complaints is as follows on the table 2.

Table 2. Frequency Distribution of Body Parts Cleaning Service Workers in Integrated Facility Services Based on Their Complaints in 2023

Body Part	Complain Respondents							
	No Pain		Little Pain		Pain		Very Pain	
	n	%	n	%	n	%	n	%
Upper Neck	15	31.9 %	14	29.8 %	17	36.2 %	1	2.1 %
Left Shoulder	24	51.1 %	14	29.8 %	8	17.0 %	1	2.1 %
Left Upper Arm	19	40.4 %	18	38.3 %	9	19.1 %	1	2.1 %
Right Upper Arm	14	29.8 %	17	36.2 %	12	25.5 %	4	8.5 %
Hip	32	68.1 %	10	21.3 %	2	4.3 %	3	6.4 %
Left Elbow	13	27.7 %	31	66.0 %	3	6.4 %	-	-
Left Lower Arm	10	21.3 %	32	68.1 %	4	8.5 %	1	2.1 %
Left Wrist	10	21.3 %	34	72.3 %	3	6.4 %	-	-
Left Hand	30	63.8 %	13	27.7 %	4	8.5 %	-	-
Left Thigh	42	89.4 %	4	8.5 %	1	2.1 %	-	-
Left Knee	37	78.7 %	10	21.3 %	-	-	-	-
Left Calf	39	83.0 %	7	14.9 %	1	2.1 %	-	-
Left Ankle	42	89.4 %	5	10.6 %	-	-	-	-
Left Sole	42	89.4 %	5	10.6 %	-	-	-	-
Nape	14	29.8%	18	38.3 %	14	29.8 %	1	2.1 %
Right Shoulder	19	40.4 %	16	34.0 %	11	23.4 %	1	2.1 %
Back	12	25.5 %	23	48.9 %	11	23.4 %	1	2.1 %
Waist	15	31.9 %	22	46.8 %	8	17.0 %	2	4.3 %
Butt	42	89.4 %	5	10.6 %	-	-	-	-
Right Elbow	13	27.7 %	33	70.2 %	1	2.1 %	-	-
Right Lower Arm	7	14.9 %	31	66.0 %	1	2.1 %	8	17.0 %
Right Wrist	11	23.4 %	35	74.5 %	-	-	1	2.1 %
Right Hand	27	57.4 %	10	21.3 %	9	19.1 %	3	2.1 %
Right Thigh	42	89.4 %	4	8.5 %	1	2.1 %	-	-

Body Part	Complain Respondents							
	No Pain		Little Pain		Pain		Very Pain	
	n	%	n	%	n	%	n	%
Right Knee	35	74.5 %	11	23.4 %	1	2.1 %	-	-
Right Calf	36	76.6 %	9	19.1 %	2	4.3 %	-	-
Right Ankle	41	87.2 %	4	8.5 %	1	2.1 %	1	2.1 %
Right Sole	41	87.2 %	6	12.8 %	-	-	-	-

Based on the table 2, it is obtained that the body part most frequently reported to have very pain by respondents among the cleaning service employees of Integrated Facility Services is the right lower arm, with a total of 8 respondents (17.0%). Following that, the body part most commonly reported to experience pain is the upper neck, with a total of 17 respondents (36.6%). Subsequently, the body part most frequently reported to have little pain is the right wrist, with a total of 35 respondents (74.5%). On the other hand, the body parts where respondents most commonly reported no pain are the left thigh, left ankle, left sole, butt, and right thigh, with a total of 42 respondents (89.4%).

The Work Posture of Cleaning Service Workers in Integrated Facility Services at Dusting Activities

The dusting activity is the process of cleaning dust from all objects in the working area, such as tables, chairs, shelves, doors, wall accessories, and office equipment. While performing the dusting activity, the cleaning service workers in this section of Integrated Facility Services clean the objects by wiping them with a washcloth and using a sprayer bottle containing cleaning liqui

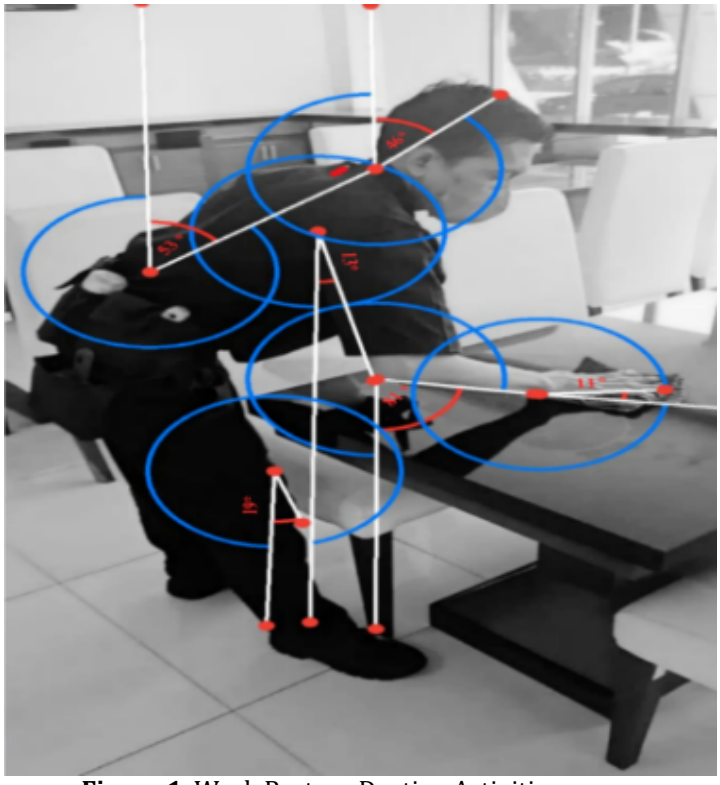

Figure 1. Work Posture Dusting Activitie

Table 3. The Assessment Work Posture Dusting Activities Using a Rapid Entire Body Assessment (REBA) Sheets

Body Posture A		
Position of Body Parts	**Score**	**Detail**
Neck	3	The position of the neck is bent at 46o (+2) and the neck is rotated so that +1 is added
Trunk	4	The position of the trunk is bent by 53o (+3) and the condition of the trunk is rotated so that it is +1
Leg	1	The position of both leg is normal (+1) and the knee angle is 19o so there is no additional score
Posture Score A	6	The results of drawing the neck, trunk and leg score lines from table A on the REBA sheet
Load	0	No load (+0)
core A	6	The result of adding the A posture score with the load score
Body Posture B		
Position of Body Parts	**Score**	**Detail**
Upper arm	1	The position of the upper arm is slightly forward by 13o (+1)
Lower arm	1	Lower arm position at 81o (+1)
Wrist	1	Wrist position at 11o (+1)
Posture Score B	1	The results of drawing the upper arm, lower arm and wrist score lines from table B on the REBA sheet
Coupling	0	How to hold a washcloth well (+0)
Score B	1	The result of adding the A posture score with the coupling score
Table C Score		
Score C	6	The results of drawing a line for score A and score B in table C on the REBA sheet
Activity	2	The trunk bends statically for >1 minute (+1) and there is movement repeats on hand >4x in 1 minute (+1)
REBA Final Results (score c + activity score)		
Final Results of REBA Assessment		8
MSDs Risk Level		High
Work Posture Category		Awkward Work Posture
Action Requirement		Action Required Immediate Fixes/Changes

Based on the table 3 shows the REBA analysis table above, it is obtained that the highest score is associated with body posture A, specifically in the trunk section, resulting in a score of 4. This is because the cleaning service employee in Integrated Facility Services, while performing dusting, bends the trunk at an angle of 53 degrees and also rotates it, earning a score of 4. The overall assessment score for body posture A, including the neck, trunk, and legs, is 6. This score is obtained by summing the scores for each body part from Posture A in the REBA sheet. In contrast, the assessment score for body posture B, including the upper arm, lower arm, and wrist, is 1. This score is obtained by combining the scores for each body part from Posture B in the REBA sheet.

The assessment results show that posture A has a score of 6, while posture B has a score of 1. As a result, the combined score (C) is 6. This overall score is obtained by combining scores A and B on the REBA sheet. The final REBA assessment result for the cleaning service employee at Integrated Facility Services, specifically for the dusting activity, is the sum of score C and the activity score, resulting in a final REBA score of 8. This indicates a high level of risk for

Musculoskeletal Disorders (MSDs), categorizing it as an awkward work posture. Immediate corrective actions or changes are required.

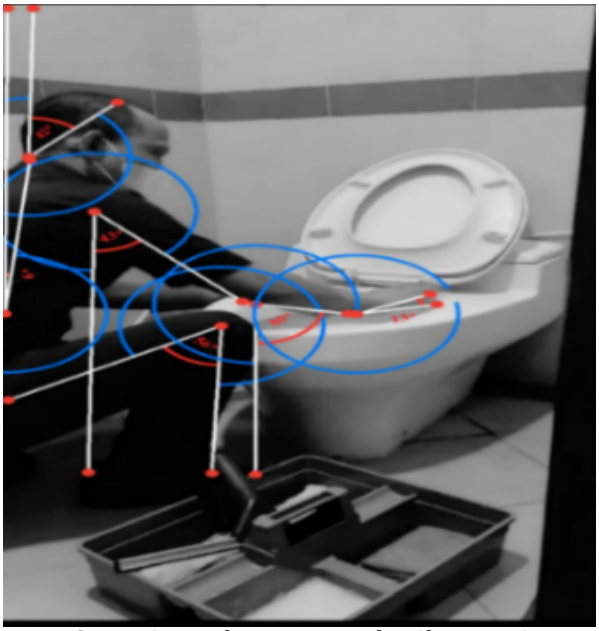

Figure 2. Work Posture Toilet Cleaning Activities

The Work Posture of Cleaning Service Workers in Integrated Facility Services at Toilet Cleaning Activities

Toilet cleaning activity is the process of cleaning all toilets in the work area. During the toilet cleaning activity, the cleaning service employee at Integrated Facility Services in this department cleans the toilets using tools such as a sponge, a dry cloth, and soapy water.

Based on the data presented in Table 4, which summarizes the REBA (Rapid Entire Body Assessment) analysis, it can be observed that the highest risk score is associated with body posture A, particularly in the neck and leg sections, resulting in a score of 2. For the neck, this elevated score is attributed to the posture adopted by the cleaning service employee at Integrated Facility Services during toilet cleaning activities. The employee is frequently seen tilting the neck downward at an angle of approximately 42 degrees while also performing slight rotational movements. According to the REBA scoring criteria, this position earns a score of 3, reflecting a significant ergonomic strain on the cervical area. Similarly, the legs also exhibit a high-risk posture during the task. Both knees are observed to be bent at an angle of approximately 56 degrees, a position that maintains pressure and strain on the lower limbs. This posture is assessed with a score of 3 based on the REBA guidelines. When the individual scores for the neck, trunk, and legs are combined for body posture A, the cumulative score reaches 6. This score reflects a substantial ergonomic risk that requires attention and possible intervention.

In contrast, the assessment for body posture B, which includes the upper arm, lower arm, and wrist, yields a score of 1. This indicates that, relative to posture A, the risk associated with these body parts is minimal. The score for posture B is derived by summing the individual scores of the upper limb segments from the REBA worksheet. When the scores for posture A and posture B are combined to obtain the overall score (C), the total is 6. This intermediate calculation sets the foundation for determining the final REBA score. By adding the activity score which accounts for factors such as task repetition, duration, and static postures to score C, the final REBA score for this activity is calculated as 8.

A REBA score of 8 falls within the high-risk category for developing Musculoskeletal Disorders (MSDs). This score indicates that the employee is performing the toilet cleaning activity with an awkward and ergonomically unsafe posture, particularly due to the excessive neck flexion and significant knee bending. According to REBA guidelines, such a score signals the need for immediate corrective measures. These may include redesigning the cleaning tools to minimize bending, adjusting work procedures, providing ergonomic training, or rotating tasks to reduce the duration of high-risk postures. Implementing these improvements is crucial to prevent potential injuries and to enhance workplace safety and productivity.

Table 4. The Assessment Work Posture Toilet Cleaning Activities Using a RapidEntire BodyAssessment (REBA) Sheet

Body Posture A		
Position of Body Parts	**Score**	**Detail**
Neck	3	The position of the neck is bent at 42o (+2) and the neck is rotated so that +1 is added
Trunk	2	Trunk position at 6o (+2)
Leg	3	The position of both legs is bent (+2) and the knee angle is 56o so it is added + 1
Posture Score A	6	The results of drawing the neck, trunk and leg score lines from table A on the REBA sheet
Load	0	No load (+0)
Score A	6	The result of adding the A posture score with the load score
Body Posture B		
Position of Body Parts	Score	Detail
Upper arm	2	The position of the upper arm is forward by 43o (+2)
Lower arm	1	Lower arm position at 80o (+1)
Wrist	1	Wrist position at 13o (+1)
Posture Score B	1	The results of drawing the upper arm, lower arm and wrist score lines from table B on the REBA sheet
Coupling	0	How to hold a sponge well (+0)
Score B	1	The result of adding the A posture score with the coupling score
Table C Score		
Score C	6	The results of drawing a line for score A and score B in table C on the REBA sheet
Activity	2	Static in both legs which are bent due to squatting posture >1 minute (+1) and there are repetitive movements in the hands >4x in 1 minute (+1)
REBA Final Results (score c + activity score)		
Final Results of REBA Assessment	8	
MSDs Risk Level		High
Work Posture Category		Awkward Work Posture
Action Requirement		Action Required Immediate Fixes/Changes

Discussion

The Incidence Musculoskeletal Disorders (MSDs) Complaints of Cleaning Service Workers in Integrated Facility Services

These results are in line with research conducted by Azwar (2023) on 45 cleaning service UIN North Sumatra IV University. The research indicates that the majority of cleaning service workers experience complaints related to MSDS at a low level, specifically 40 worker (88.9%) and the remaining is 5 worker corresponds to those experiencing high level MSDS complaints. The research results also align with the research conducted by Auliya and Lantika (2021) on 40 cleaning service workers at Bandung Islamic University. The research indicates that the majority of cleaning service workers experience complaints related to MSDS at a low level, specifically 75%. The remaining is 17% of the workersmedium level MSDS complaints and 8% are facing high level MSDS complaints. Then, as for this research, there were no individuals experiencing MSDs complaints at a very high level. This is in line with Rachman et al. (2019) research on 60 cleaning service workers at Prof. Dr. R.D. Kandou Manado General Hospital, none of them reported any very high level MSDs complaints.

Based on the findings of this research, utilizing the NBM questionnaire for categorizing musculoskeletal disorder (MSDs) complaints among Cleaning Service Workers in Integrated Facility Services, the perceived discomfort levels in different body parts ranged from very pain, pain, little pain and not pain. The top three most body parts experiencing very pain include the lower arm (18%), upper arm (8.5%), and hip (6.8%). As for most body parts with complaints of pain, these are observed in the neck (36.2%), nape (29.8%), and upper arm (25.5%). Furthermore, most body parts with complaints of little pain include the right wrist (74.5%), left wrist (72.3%), and right elbow (70.2%). Additionally, most

body parts without any complaints of pain include the left thigh, left ankle, left sole, butt, and right thigh, totaling 42 respondents (89.4%). From these results, it can be inferred that the majority of complaints regarding body parts among Cleaning Service Workers in Integrated Facility Services are the neck, nape, lower arm, upper arm, left wrist, right wrist, and right elbow. This is in accordance with the findings of the European Survey on Working Conditions (ESWC), where Musculoskeletal Disorders (MSDs) experienced by the majority of workers are felt in the neck, lower back, and upper skeletal muscles. Then also, these results are in line with the research conducted by Laksono and Asyfiradayati (2022) on 60 cleaning service workers at Dr. Moewardi Solo Regional General Hospital. In his research, a majority of them also experienced MSDs complaints, particularly in the lower back and right wrist. In this research, the presence of complaints in these body parts is likely due to the fact that every aspect of the work activities, such as dusting, sweeping, damp mopping, glass cleaning, toilet cleaning, high rise cleaning, waste disposal, and event support, is still manually performed by human labor. Consequently, workers are prone to experiencing muscle stress or excessive muscle strain during their daily work routine. The body part that workers often complain about is the back, which is 88.6%, the right arm is 84.1%, and the upper left arm is 79.5% (Mallapiang et al., 2021).

Then, based on the results of field observations, Cleaning Service Workers in Integrated Facility Services extensively use their hands in performing their tasks, such as when cleaning and lifting objects. Consequently, this can potentially induce stress in the hand muscles or result in muscle fatigue, especially since these activities are repeated quite frequently throughout the day. Therefore, there is a potential for musculoskeletal complaints in the workers' hand areas. According to Kurniawidjaja and Ramdhan (2019), musculoskeletal complaints arise from repeated exposure to loading on various parts of the body. If muscle contractions exceed 20%, blood circulation to the muscles decreases based on the contraction level influenced by the required force. When the supply of oxygen to the muscles decreases, the carbohydrate metabolism process is hindered, leading to the accumulation of lactic acid and causing the onset of muscle pain (Tarwaka, 2019). Low back pain is a relevant problem worldwide, causing chronic pain and high health care costs (Dagenais, Caro, & Haldeman, 2008; Geurts, Willems, Kallewaard, Van Kleef, & Dirksen, 2018; Olafsson, Jonsson, Fritzell, Hägg, & Borgström, 2018).

The Work Posture of Cleaning Service Workers in Integrated Facility Services at Dusting Activities

Based on the final assessment results of the Rapid Entire Body Assessment (REBA) for cleaning service workers during the dusting activity, the score was 8, indicating a high level of risk for Musculoskeletal Disorders (MSDs) and categorizing it as an awkward working posture. The results of this research are in line with the research conducted by Rayyani et al (2018) on cleaning service workers at the Islamic University of Bandung, it was found that in the dusting activity, there is one cleaning service worker with a high risk of Musculoskeletal Disorders (MSDs).Top of Form

The analysis of body posture A, starting from the worker's trunk, reveals that the worker's trunk is bent at an angle of 53 degrees and rotated to reach each side of the table during dusting. Based on this condition, the worker's trunk is considered awkward as it exceeds the >20 degress and involves rotation, posing a potential risk of MSDs if this condition persists continuously. Considering that, according to the NBM, 35 workers (74.4%) experienced MSDs complaints in the trunk, this could be a potential contributing factor. An awkward trunk position occurs when bending at an angle >20 degrees and increases the risk when there is rotation or lateral bending (McAtamney and Hignett, 2000). During field observations, it was noted that the worker's bending posture depends on the object being dusted. If the table is small, the worker does not bend at all, only bending when the table is low, wide, or long. When dusting a low, wide, or long table, the worker maintains a bent position for more than 1 minute, which is potentially dangerous. If this condition is left unchecked and continues continuously, the worker is at risk of developing MSDs. These results are in line with the research conducted by Rayyani et al (2018) the results of the research explain that the working posture of cleaning service personnel involves a bent back when performing the activity of wiping tables. Furthermore, from the observations during the work, it is evident that the habit of bending while dusting objects of low height, width, or length is prevalent among workers. They aim to reach the center and all sides of the table surface without changing positions, even though it is possible to achieve this more efficiently by moving and approaching the desired areas without bending. The inclination to perform tasks while bending according with Irwan (2018) explanation, where this posture commonly occurs when objects are positioned far in front or below the body's horizontal line, leading workers to bend in order to reach.

The inclination of the worker's neck is also considered awkward as it is inclined at 46 degrees and rotated to see all sides of the table during dusting. Like the trunk, the neck is at risk of MSDs complaints if this condition persists continuously. Considering that, according to the NBM, 32 workers (68.1%) experienced MSDs complaints in the neck, this could be one of the potential causes. An awkward neck position occurs when the inclination is >20 degrees, and the risk increases if there is rotation or lateral bending (McAtamney and Hignett, 2000). Observations indicated that the worker's neck bending is due to the object being dusted being lower than the worker's height, affecting the worker's line of sight and causing the neck to bend downward to see the table's surface during dusting.

In contrast, the worker's leg position is considered good, as observed during work, the worker stands normally with both leg firmly planted on the floor, and the knee condition is also safe, with the measured angle still at 19 degrees. A posture of standing with body weight supported on both straight legs can be used to exert strength, reduce muscle activity, and the strength of the back muscles in a standing position is twice that of a semi standing or sitting position (Tarwaka, 2019).

In conclusion, for body posture A, the worker's legs are not at risk, making the likelihood of MSDs complaints in the worker's legs small. However, the trunk and neck postures are at risk, and MSDs complaints are highly likely if these conditions persist continuously. This is supported by Tarwaka (2019), who states that the further away body parts are from the center of gravity, the higher the risk of skeletal muscle complaints. Then, Korhan and Memon (2019) also states when body parts move away from their natural positions, such as excessive bending of the back or rotating or bending of the shoulders, wrists, hips, and knees, it will result in excessive pressure on the joints.

Then the analysis results of body posture B, starting with the upper arm position, indicate that the upper arm is considered good, as it is observed to be only slightly forward. From field observations, this condition may be attributed to the worker's bent position, bringing the upper arm close to the object being dusted. This eliminates the need for the worker's upper arm to be excessively forward. The measurement of the angle of the upper arm results in an angle of 13 degrees. Obtaining a 13 degrees angle indicates that the movement of the upper arm is still very safe, avoiding risks as it remains slightly away from the body's center of gravity. Awkward positions for the upper arm occur when forming an angle >45 degrees and the risk increases if the shoulder is lifted or the arm moves toward the center (McAtamney and Hignett, 2000).

The position of the lower arm in the cleaning service worker's job activity is also considered good, as it is observed that the lower arm does not extend too far forward when cleaning objects, aligning with the upper arm position. This is influenced by the worker's proximity to the dusting object, eliminating the need for excessive forward movement. The measurement of the angle of the lower arm results in an 81 degrees angle, indicating that the movement of the lower arm is still safe and does not pose a risk, as it has not strayed far from the body's center of gravity. Awkward positions for the lower arm occur when forming an angle >100 degrees (McAtamney & Hignett, 2000).

For the wrist position of the cleaning service worker in this job activity, it is also considered good, as it is observed to be only slightly downward. This is because the cleaned surface is horizontal, allowing the worker's wrist to remain in a neutral position. The measurement of the angle of the wrist results in an 11 degrees angle, indicating that the wrist movement is still safe and does not pose a risk, as risks arise when the angle exceeds 15 degrees, or there is bending or twisting (McAtamney & Hignett, 2000).

Based on the above description, it can be concluded that the entire body posture B of the worker, including the upper arm, lower arm, and wrist, is considered low risk. Therefore, the likelihood of MSDs occurring in these three parts of the worker's body is low. Next, the cleaning service worker in this job activity does not bear any load, making it safe. Additionally, based on field observations, the grip when holding the washcloth is good, ensuring safety. However, for the activity, there are repetitive movements >4x within 1 minute, specifically involving the hands. Work activities that are repetitive and involve non-ergonomic can lead to the emergence of Musculoskeletal Disorders (MSDs) that can be felt both during work and when not working (Gowi, 2018). Field observations indicate that while cleaning one table, there are many hand movements towards the right and left during wiping. This has the potential to cause complaints in various parts of the hand, including the shoulder, wrist, lower arm, and upper arm. This is supported by the research conducted by Samsudin (2019) on PMI Bogor 47 cleaning service workers. In his study, many cleaning service workers there complained about their right shoulder due to excessive use of the hand. This is also supported by a theory from Tarwaka (2019) which states that repeated tasks can lead to health problems, as static muscle contractions become stronger than dynamic contraction. Furthermore, there is one static part of the body, namely the trunk, where the worker maintains a bent position for more than 1 minute. Sustaining this position for an extended period is highly risky, prolonged static muscle contractions can lead to the blockage of blood flow, resulting in a lack of oxygen and glucose supply to that body part. Moreover, the body will produce metabolic by products such as lactic acid that cannot be efficiently transported away due to impaired blood circulation. This accumulation may cause discomfort and strain on muscles and tendons, leading to faster fatigue and a higher likelihood of musculoskeletal complaints (Tarwaka, 2019).

Based on the overall description above, it can be concluded that the cleaning service worker in the dusting activity has a risky posture in the trunk and neck, which makes it highly likely for MSDs complaints to occur in those body parts if the conditions are continuously maintained. Conversely, the positions of the legs, upper arms, lower arms, and wrists of the worker are not considered risky, resulting in a low likelihood of MSDs complaints in those body parts. This is supported by research To at al (2020), who states that incorrect body positions during work can lead to the emergence of Musculoskeletal Disorders (MSDs). Individuals in non ergonomic work positions are at a higher risk of experiencing MSDs related complaints. The final REBA assessment score this research is 8, indicating a need for immediate corrective actions or changes. If not addressed promptly, it could impact the worker's productivity. Therefore, the researcher recommends

providing education to the cleaning service workers in the dusting activity at Integrated Facility Services on proper work postures when dusting each object. This aims to change the workers' working habits so that they can position themselves effectively by adapting to the objects being dusted, thus preventing awkward postures, especially in the trunk and neck. Additionally, it is advisable to stretch the hands before and after performing work activities. Given the frequent hand movements and exertion, coupled with repetitive hand motions during activities, advising the cleaning service workers in this job activity to stretch their muscles for approximately 2 minutes before and after completing work activities can help reduce stress and fatigue caused by excessive muscle strain.Top of Form

The Work Posture of Cleaning Service Workers in Integrated Facility Services at Toilet Cleaning Activities

The final REBA assessment score for the toilet cleaning activity of the cleaning service worker is 8, indicating a high level of risk for Musculoskeletal Disorders (MSDs) and is considered an awkward working posture. The results of this research are in line with the research conducted by Rayyani et al (2018) on cleaning service workers at the Islamic University of Bandung, it was found that in the toilet cleaning activity, there is one cleaning service worker with a high risk of Musculoskeletal Disorders (MSDs).

The analysis of Posture A, starting from the neck, reveals that the worker's neck is bent at an angle of 42 degrees. The awkward neck posture is defined as bending with an angle greater than 20 degrees, with increased risk if there is rotation or lateral bending (McAtamney & Hignett, 2000). Therefore, based on this condition, the worker's neck is considered awkward, as the neck angle exceeds 20 degrees, potentially leading to MSDs complaints if this condition persists over time. Considering that 32 workers (68.1%) experienced MSDs complaints in the neck, according to the NBM results, this could be a possible contributing factor. Field observations indicate that the reason for the worker bending the neck is the low or below level objects being cleaned. This affects the worker's line of sight, forcing them to look downward to clean the toilet, resulting in a bent neck position.

The posture of the worker's trunk appears to be good, as despite working in a squatting position with low cleaning objects, the worker maintains a proper trunk position during the cleaning process. This is evident from the measurement of the trunk angle, which is obtained at 6 degrees. A 6 degrees angle indicates that the worker's trunk is still very safe, avoiding risks as it is slightly away from the body's center of gravity. An awkward trunk position is defined as bending with an angle greater than 20 degrees, with increased risk if there is rotation or lateral bending (McAtamney & Hignett, 2000). This is in line with Rayyani et al (2018) research which states that even in a squatting position when cleaning the toilet, the working posture does not stray too far from the body, as observed from the formed angle, and it is not excessively large.

The position of the worker's legs appears to be bent due to working in a squatting position, as seen from the measurement of the knee angle at 56 degrees. Based on this condition, the worker's legs are considered awkward, as a squatting posture is considered an awkward posture for the legs. The second cause observed for the worker's bent legs is the requirement to squat while cleaning the toilet, as the toilet is positioned below or lower than the worker's body. Working in a squatting position, according Permatasari et al (2022), involves objects being worked on below the horizontal plane of the body.

Furthermore, this squatting position is also supported by Zahra (2023) research, which indicates that workers adopt a squatting position due to their adjustment to work activities and work layout. Squatting is a body position where the abdomen is close to the thighs, resulting in maximum flexion in the knee, hip, and lumbar spine areas (Tarwaka, 2019). Therefore, workers who perform their tasks in a squatting position are at some risk, as prolonged work in this position can lead to leg fatigue, as the legs must exert extra effort or require more energy to support the body's weight.

In conclusion, the body posture A of the worker's trunk are not at risk, making the likelihood of MSDs complaints in the worker's trunk small. However, the neck and leg postures are at risk, and MSDs complaints are highly likely if these conditions persist continuously. This is supported by Tarwaka (2019), who states that the further away body parts are from the center of gravity, the higher the risk of skeletal muscle complaints. Then, Korhan and Memon (2019) also states when body parts move away from their natural positions, such as excessive bending of the back or rotating or bending of the shoulders, wrists, hips, and knees, it will result in excessive pressure on the joints.

Then the analysis of body posture B, starting from the upper arms and lower arms, where the positions of the worker's upper and lower arms are considered not risky. For the position of the worker's upper arms, even though they appear to be forward, they are still not risky. This can be seen from the measurement of the upper arm, which obtained an angle of 43 degrees, indicating that the movement of the worker's upper arms is close to the risk limit of the body's center of gravity. An awkward position for the upper arms is when forming an angle greater than 45 degrees, with increased risk if the shoulders lift or the arms move closer to the center (McAtamney & Hignett, 2000). As for the worker's lower arms, the angle is 80 degrees. Obtaining an angle of 80 degrees indicates that the movement of the lower arms is still safe and not risky, as it has not moved away from the risky center of gravity. An awkward position for the lower arms is when forming an angle greater than 100 degrees (McAtamney and Hignett, 2000). This aligns with the research

conducted by Rayyani et al (2018), which states that during toilet cleaning, the right arm position is too far from the body, creating a significant angle. Therefore, when maintaining this working posture for an extended and repetitive period, it can lead to musculoskeletal complaints.

The position of the worker's wrist can also be considered good, as it is seen to be slightly elevated. From field observations, this can be attributed to the position of the lower arm of the worker's hand being parallel horizontally to the surface of the object. This helps influence the position of the worker's wrist, which is slightly elevated. This can be seen from the measurement of the angle at the worker's wrist, which obtained an angle of 6 degrees. Obtaining an angle of 6 degrees indicates that the movement of the worker's wrist is still very safe, avoiding risks as it has not exceeded 15 degrees and there is no bending or twisting (McAtamney and Hignett, 2000).

Based on the above description, it can be concluded that the entire body posture B of the worker, including upper arms, lower arms, and wrists are considered not risky. Therefore, the likelihood of MSDs occurring in these three parts of the worker's body is low.

Then, the cleaning service worker in this job activity has no load, making it safe. Furthermore, based on field observations, the grip when holding the sponge is good, ensuring safety. However, for the activity, there is repetitive movement >4 times in 1 minute, specifically involving the hands. Work activities that are repetitive and involve non-ergonomic can lead to the emergence of Musculoskeletal Disorders (MSDs) that can be felt both during work and when not working (Gowi, 2018). From the observation during toilet cleaning, there are numerous hand movements, both to the right and left, while moving the sponge. This has the potential to cause complaints in the surrounding areas of the hands, including the shoulders, wrists, lower arms, and upper arms. This is supported by the research conducted by Samsudin (2019) on PMI Bogor 47 cleaning service workers. In his study, many cleaning service workers there complained about their right shoulder due to excessive use of the hand. This is also supported by a theory from Tarwaka (2019) which states that repeated tasks can lead to health problems, as static muscle contractions become stronger than dynamic contraction. Additionally, there is one static body part, the legs, due to a squatting posture lasting >1 minute. In the field observation, when cleaning one toilet, the worker adopts a squatting posture for 2-3 minutes. During this squatting posture, both legs of the worker are required to remain static by bending until the toilet is cleaned.

Based on the overall description above, it can be concluded that for the cleaning service worker in the toilet cleaning activity, the neck and legs are considered risky postures. This increases the likelihood of Musculoskeletal Disorders (MSDs) in those body parts if the conditions persist over time. On Conversely, the posture of the trunk, upper arms, lower arms, and wrists is considered non risky, reducing the likelihood of MSDs in those body parts for the worker. This is supported by research To at al (2020), who states that incorrect body positions during work can lead to the emergence of Musculoskeletal Disorders (MSDs). Individuals in non ergonomic work positions are at a higher risk of experiencing MSDs related complaints. The final REBA assessment score this research is 8, indicating a high level of risk. Therefore, immediate corrective actions or changes are necessary. Failure to do so may impact the worker's productivity. The researcher suggests providing a small chair for the cleaning service workers in Integrated Facility Services during toilet cleaning activities. This would eliminate the need for the worker to maintain a squatting posture, which is considered a risky working position. By providing a small chair, the worker's legs would no longer have to support their body weight, reducing the potential risk of complaints in the worker's legs. It's important to note that the choice of the chair should be adjusted to the worker, ensuring it's not too small to avoid excessive bending of the worker's legs. Additionally, it is advisable to stretch the hands before and after performing work activities. Given the frequent hand movements and exertion, coupled with repetitive hand motions during activities, advising the cleaning service workers in this job activity to stretch their muscles for approximately 2 minutes before and after completing work activities can help reduce stress and fatigue caused by excessive muscle strain.

Conclusion

The incidence of MSDs complaints in Cleaning Service Workers in Integrated Facility Services based on the results of the NBM questionnaire shows that workers experience more low-level MSDs complaints compared to workers who experience moderate and high MSDs. Then, the body parts most frequently complained of by workers in each category are as follows: severe pain in the forearm, pain in the upper neck, and slight pain in the wrist. Analysis of the level of risk of MSDs in Cleaning Service Workers in Integrated Facility Services in dusting work activities shows a high level of risk, which indicates an awkward work posture. Immediate corrective action or change is required. Analysis of the level of risk of MSDs in Cleaning Service Workers in Integrated Facility Services in the work activity of cleaning toilets also shows a high level of risk, which indicates an awkward posture. Immediate corrective action or change is required.

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The authors declare no potential conflict of interest.

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