



Musculoskeletal Disorders and Body Mass Index (BMI) Among Trans Rapid Bus (BRT) Drivers in Semarang

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ABSTRACT

Background : Bus drivers are among the professions with a high risk of health disorders. One of the common health disorders experienced is Musculoskeletal Disorders (MSDs), which encompass a wide range of complaints, from mild to severe, in skeletal muscles. MSDs can occur due to various factors, including working posture. Body Mass Index (BMI) also serves as an individual determinant of working posture. This research aims to determine whether there is a relationship between musculoskeletal disorders and Body Mass Index. **Methods:** It employs an observational method with a cross-sectional approach. The objective of this research is to explore the relationship between the independent variable, which is BMI, and the dependent variable, which is musculoskeletal disorders. The research sample consists of 35 drivers from three corridors of the Bus Rapid Transit (BRT) system in Trans Semarang. **Results :** The research findings reveal that there is no significant relationship between musculoskeletal disorders and BMI, with an r-value of 0.16 and a p-value of 0.339. In conclusion, musculoskeletal disorders among bus drivers are categorized as low.

Keywords: Bus Rapid Transit, Body Mass Index, Musculoskeletal Disorders, Drivers



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Background:

Musculoskeletal Disorders (MSDs) encompass a range of complaints in skeletal muscles, varying from mild to severe. When muscles experience static load over prolonged periods, it can lead to issues such as ligament, tendon, and joint damage. As stated by Tarwaka and Bakri (2004), there are many causes of musculoskeletal complaints, including excessive muscle stretching, repetitive activities, and unnatural working postures. Working posture refers to the body position of a worker while performing their tasks. Postures such as raised hands, bent backs, or lifted heads are considered unnatural working postures. Musculoskeletal complaints often arise when the body is positioned far from the center of gravity. According to Tarwaka and Bakri (2004), the working postures of workers in Indonesia are unnatural due to the mismatch between tools, workplaces, and the workers' body sizes.

Body parts such as wrists, hands, shoulders, necks, waists, and legs are frequently affected by musculoskeletal disorders. Pain is one of the most common complaints associated with musculoskeletal disorders. Pain can manifest in various forms, including heat, dullness, and sharp stabbing sensations. Discomfort during activities, muscle stiffness, numbness, and tingling sensations are some of the complaints related to musculoskeletal disorders. MSDs often have an episodic nature, where the pain may subside or disappear but then reoccur. Persistence can occur when an individual experiences traumatic musculoskeletal injuries (TMSI)

(Rosenbloom, Khan, McCartney, & Katz, 2013).

Among the health issues experienced by bus drivers are musculoskeletal disorders, psychological problems such as fatigue and stress, gastrointestinal issues, and sleep problems. These issues impact how bus drivers operate. The seated position of bus drivers poses musculoskeletal problems influenced by their physical and mental conditions since they must sit for extended periods while driving.

This seated position can lead to discomfort and illnesses, which can result in significant losses in job performance and reduce work productivity and efficiency. There are three categories of musculoskeletal disorder risk factors: job-related factors, organizational factors, social (psychosocial) factors, and individual factors (Patandung & Widowati, 2018). Individual factors such as Body Mass Index (BMI) are one of the causes of musculoskeletal disorders. BMI includes height, weight, and blood pressure, all of which can affect an individual driver's resilience while working.

Workers can suffer losses due to MSDs. Workers become unproductive, rendering them unable to work and meet their livelihood needs if their health is compromised. In Indonesia, research by the Ministry of Health shows that approximately 40.5% of diseases suffered by workers are related to their workplaces. According to research conducted on 9,482 workers in 12 regencies/cities in Indonesia, MSDs account for 16% of diseases, cardiovascular diseases 8%, nerve disorders 5%, respiratory disorders 3%, and Ear, Nose, and Throat



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(ENT) disorders 1.5%, making them the most common disorders experienced by workers (Livandy & Setiadi, 2018).

In society's way of life, transportation is one of the essential components. One of the means to serve the public's needs is public transportation. Many people prefer using public services because they are affordable, efficient, and easily accessible. Buses, taxis, minibusses or city transportation are examples of public services that are easily found (Hadyan, 2015). Bus Rapid Transit (BRT) is one of the public transportation services in Trans Semarang-

Therefore, based on the background above, I am interested in conducting research on the relationship between musculoskeletal disorders and Body Mass Index (BMI) among Trans Semarang BRT bus drivers.

Research Methodology

This study is an observational research with a cross-sectional approach. The objective of this research is to explore the relationship between the independent variable, which is Body Mass Index (BMI), and the dependent variable, which is musculoskeletal disorders. The research was conducted on four corridors: Corridor III, Corridor IV, Corridor VII, and Corridor VIII, with the respondents being Trans Semarang BRT bus drivers.

Population selection was based on inclusion criteria, while research samples were selected using exclusion criteria, taking into consideration the distance and time from each corridor. The total number of research samples consisted of 35 respondents. The sample was selected by recommendation from BLU Trans Semarang. The research instrument included a questionnaire and measurements of height, weight, and blood pressure for the bus drivers. Data analysis was conducted using the Spearman Rank correlation test (Octaviani, 2017).

Results and Discussion

Table 1. Characteristic Respondents

Variable	Total Respondents	
	f	%
Age		
< 40 year	14	40
≥ 40 year	21	60
BMI		
Normal	14	40
Abnormal	21	60
Length of Service of Trans Semarang Bus Rapid Transit Drivers		
≤ 3 year	26	74,3
> 3 year	9	25,7

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Variable	Total Respondents	
	f	%
Duration of Work		
≥ 12 hours	27	77,1
< 12 hours	8	22,9
Break Times		
≥ 20 minutes	19	54,3

< 20 minutes	16	45,7
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Based on Table 1, it is observed that the age of the bus drivers is categorized into two groups: those older than 40 years (≥ 40 years) and those younger than 40 years (< 40 years). This categorization is due to the respondents' ages ranging from 24 years to the oldest age of 69 years. There are 14 respondents aged younger than 40 years and 21 respondents aged older than 40 years.

One way to assess nutritional status is by measuring the Body Mass Index (BMI), which requires data such as weight and height. Below are the results of BMI measurements for Trans Semarang BRT bus drivers. BMI for males falls into the following categories based on the classification of the Body Mass Index by the Indonesian Ministry of Health (Depkes RI) in 2003 for males.

In the calculation table above, it can be observed that 14 respondents (40%) have a normal Body Mass Index (BMI), while 21 respondents (60%) have an abnormal

BMI, as the calculation result yielded $> 23 \text{ kg/m}^2$ (Umyati, 2015).

Based on the calculations in Table 1, it is found that respondents with less than 3 years of work experience constitute 26 respondents (74.3%). These drivers have work experience ranging from 3 months to 1 year, which corresponds to the probation period set by BLU Trans Semarang for Trans Semarang BRT drivers. On the other hand, drivers with more than 3 years of work experience, the longest being 4 to 9 years, are in the category of longer-term drivers.

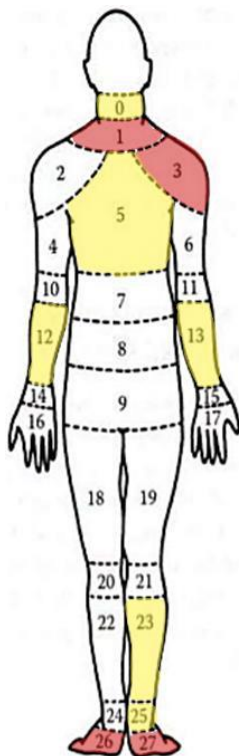
The Nordic Body Map (NBM) is commonly used in research. It is a questionnaire that can be employed to analyze any activities occurring around us and in our workplace. After its use, NBM can elucidate pain point results from areas of the body experiencing musculoskeletal discomfort. Its utilization can assist in improving working posture. The objective of completing this questionnaire is to identify which parts of the body frequently experience pain or discomfort among Trans Semarang BRT drivers, whether during or after work



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Table 2. Distribution of Nordic Body Map



No	Complaint Location	TTS	SDS	S	SS
0	Upper neck	25	9	1	0
1	Lower neck	27	6	2	0
2	Left shoulder	29	6	0	0
3	Right shoulder	25	8	2	0
4	Left upper arm	32	3	0	0
5	Back	23	11	1	0
6	Right upper arm	33	2	0	0
7	Waist	23	12	0	0
8	buttock	28	7	0	0
9	bottom	32	3	0	0
10	Left elbow	34	1	0	0
11	Right elbow	35	0	0	0
12	Left lower arm	32	2	1	0
13	Right lower arm	33	1	1	0
14	Left wrist	30	5	0	0
15	Right wrist	34	1	0	0
16	Left hand	30	5	0	0
17	Right hand	33	2	0	0
18	Left thigh	31	4	0	0
19	Right thigh	34	1	0	0
20	Left knee	31	4	0	0
21	Right knee	32	3	0	0
22	Left calf	22	13	0	0
23	Right calf	27	7	1	0
24	Left ankle	28	7	0	0
25	Right ankle	32	2	1	0
26	Left foot	25	8	2	0
27	Right foot	29	4	2	0

Source: (Tubuh, 2018)

Based on Table 2, the distribution of the Nordic Body Map (NBM) results indicates that none of the Trans Semarang BRT drivers complained of experiencing

severe pain in any body region, as evidenced by the table showing zeros (0) in every body region indicating severe pain. However, it is observed that 12

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respondents reported experiencing discomfort in specific body regions. Specifically, 1 respondent complained of pain in the upper neck, 2 respondents in the lower neck, 2 respondents in the upper left shoulder, 1 respondent in the back, 1 respondent in the lower left and right arms, 1 respondent in the right calf and right ankle, and 2 respondents in the left and right legs (Octaviani, 2017).

Furthermore, in the table denoting "SDS" or Slightly Painful, many drivers reported feeling pain in the upper neck, back, waist, and left calf. During interviews, it was found that these areas sometimes experience discomfort only while working. For instance, the upper neck feels stiff when driving due to insufficient rest

breaks. Pain in the back and waist results from prolonged sitting while driving and uncomfortable postures caused by turning the steering wheel. The left calf experiences discomfort due to frequent use of the clutch pedal during traffic congestion.

These findings from the Nordic Body Map (NBM) provide valuable insights into the musculoskeletal discomfort experienced by bus drivers and can serve as a basis for understanding the relationship between body discomfort, work conditions, and other factors such as BMI. Further analysis and discussion can help identify potential interventions or changes in work conditions to improve driver health and well-being.

Tabel 3. Rank Spearman Test

BM Categor y	N	Length		Work		Break		Body Mass	
	of Work	-value	s	-value	s	-value	s	-value	p
		0,165	,345	0,296	,084	,047	,789	,167	339
	N	35		35		35		35	

Based on the results of the Spearman Rank test presented in Table 3, it is evident that there is no significant relationship between musculoskeletal disorders and Body Mass Index (BMI) among Trans Semarang BRT bus drivers. The correlation coefficient (r_s) is 0.167, and the p-value is 0.789. These results indicate that there is no statistically significant association between musculoskeletal disorders and BMI in these drivers.

The research findings demonstrate that there is no relationship between Elvan Fadilah Hidayanti, et al : Musculoskeletal Disorders and Body Mass Index (BMI) Among Trans Rapid Bus (BRT) Drivers in Semarang

musculoskeletal disorders and BMI among Trans Semarang BRT bus drivers, as the rs value falls within the range of 0.00 – 0.25. However, there is a somewhat meaningful association between musculoskeletal disorders and work duration, with an rs value of -0.296. Nevertheless, this relationship lacks correlation significance, as the p-value is 0.084, which is greater than 0.05.

Nevertheless, the research results indicate that the musculoskeletal complaints of respondents do not increase



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with their duration of work. This could be attributed to the non-ergonomic work postures adopted by bus drivers, leading to ongoing muscle and skeletal issues even with longer working hours. Respondents with limited break times may also contribute to the absence of a correlation between BMI and musculoskeletal disorders, as the eating habits of drivers with less break time may become less healthy (Anggraini & Wulandari, 2018).

These findings suggest that addressing ergonomic work postures and providing adequate break times for bus drivers could be essential considerations to mitigate musculoskeletal issues, even though BMI does not appear to be a significant factor in this context. Further research and interventions aimed at improving driver health and well-being may be warranted based on these results.

Conclusion

The results of this study indicate that there is no correlation or significant relationship between musculoskeletal disorders and Body Mass Index (BMI) among Bus Rapid Transit (BRT) Trans Semarang drivers. Out of the 35 respondents, musculoskeletal disorders were observed in the low category, with an average score of 32.74. The body regions most frequently experiencing pain or discomfort included the upper neck, back, waist, and left calf.

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