

# Rika

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## Factors Contributing to Work Fatigue Among Construction Workers

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### ABSTRAK

Sektor konstruksi merupakan salah satu sektor pekerjaan dengan tingkat risiko bahaya yang tinggi. Kegiatan yang dilakukan oleh pekerja konstruksi ini dapat menyebabkan terjadinya kesalahan dan kecelakaan kerja yang dipengaruhi oleh kelelahan. Tujuan dari penelitian ini adalah untuk memahami faktor-faktor yang berkaitan dengan kelelahan kerja pada pekerja konstruksi di Proyek Sistem Pengelolaan Air Minum. Metode penelitian yang digunakan adalah explanatory study dengan desain cross-sectional, dengan jumlah sampel sebanyak 30 orang yang diambil menggunakan teknik total sampling. Data primer dikumpulkan melalui penyebaran kuesioner baku yaitu Subjective Self Rating Test dan Depression Anxiety Stress Scales (DASS) 42. Data dianalisis secara univariat menggunakan uji distribusi frekuensi, analisis bivariat dengan uji Chi-Square dan data di visualisasikan menggunakan aplikasi Tableau Public 2022. Dari hasil penelitian didapatkan bahwa usia ( $p=0.104$ ), pendidikan ( $p=0.419$ ), dan lama kerja ( $p=0.063$ ) tidak berhubungan dengan kelelahan kerja, sedangkan status gizi ( $p=0.042$ ) dan stres kerja ( $p=0.028$ ) memiliki hubungan dengan kejadian kelelahan kerja. Kesimpulan penelitian yaitu status gizi dan stres kerja berhubungan dengan kelelahan kerja pada pekerja konstruksi di Proyek Sistem Pengelolaan Air Minum. Saran kepada penyelenggara proyek, perlu dilakukan manajemen dan coping stres yang efektif kepada para pekerja untuk mengurangi kelelahan kerja dan menjaga status gizi pekerja dengan memberikan makanan sesuai kebutuhan kalori pekerja.

**Kata kunci:** Indeks Massa Tubuh, Kelelahan Kerja, Masa Kerja, Pekerja Konstruksi, Tingkat Stres

### ABSTRACT

The construction sector is one of the work sectors with a high level of risk of danger. The activities carried out by construction workers can cause errors and work accidents which are influenced by fatigue. This research aims to understand the factors related to work fatigue in construction workers in the Drinking Water Management System Project. The research method used was an explanatory study with a cross-sectional design, with a total sample of 30 people taken using a total sampling technique. Primary data was collected by distributing standard questionnaires, namely the Subjective Self Rating Test and Depression Anxiety Stress Scales (DASS) 42. Data were analyzed univariately using the frequency distribution test, bivariate analysis using the Chi-Square test, and data were visualized using the Tableau Public 2022 application. From the results, the research found that age ( $p=0.104$ ), education ( $p=0.419$ ), and length of work ( $p=0.063$ ) were not related to work fatigue, while nutritional status ( $p=0.042$ ) and work stress ( $p=0.028$ ) were related to the incidence of work fatigue. The research conclusion is that nutritional status and work stress are related to work fatigue in construction workers in the Drinking Water Management System Project. Suggestions to project organizers, it is necessary to carry out effective stress management and coping for workers to reduce work fatigue and maintain workers' nutritional status by providing food according to workers' calorie needs.

**Keywords:** Body Mass Index, Work Fatigue, Work Experience, Construction Workers, Stress Level

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## I. PENDAHULUAN

The construction industry is one of the most hazardous employment sectors. This is due to its interdisciplinary nature, the vast number of workers, restricted working duration, high work intensity, and different work equipment.<sup>1</sup> Workplaces must prioritize workplace safety and health. Efforts must be made to decrease and avoid the incidence of workplace accidents and occupational illnesses that harm employees.<sup>1</sup> Fatigue is one of the leading causes of workplace mistakes and accidents.<sup>2,3</sup> The World Health Organization has officially characterized occupational fatigue as a concern.<sup>4</sup> Work-related fatigue is officially classified as a work-related illness.<sup>5,6</sup>

In 2016, 1.9 million individuals died from work-related diseases and injuries worldwide.<sup>7</sup> According to the International Labor Organization, over 340 million work accidents occur yearly, and 160 million people suffer from job-related disorders.<sup>8</sup> There were 225,000 work accidents and 53 job-related disorders in Indonesia alone in 2020. There were 82,000 work accidents and 179 job-related illnesses from January 2021 to September 2021.<sup>9</sup> In D.I Yogyakarta Province in 2020, there were 131 incidents of work accidents and 0 occurrences of occupational sickness.<sup>10</sup>

Burnout is a sub-health state linked with persistent stress, limited resources, low skill, and a chronic lack of energy and enthusiasm for work. This disorder is characterized by emotional fatigue, depersonalization, and a lack of personal fulfillment.<sup>11,12</sup> Burnout causes physical work fatigue, such as feeling weary and having physical tension symptoms (headaches, nausea, loss of sleep, and changes in eating patterns). Burnout may also cause emotional fatigue by causing boredom or indifference, a loss of influence and pessimism, cynicism and hostility, depression-like emotions (sad faces, slumped postures), worry, irritation, and melancholy.<sup>13</sup>

Internal and environmental variables impact work fatigue. Age, gender, dietary status, exercise habits, and health issues are all internal influences. Job environment, work experience, workload, and length of service are examples of

external influences.<sup>14,15</sup> According to prior studies, work fatigue is impacted by various factors, including working hours, work shifts,<sup>16</sup> job stress, degree of education, work experience,<sup>17</sup> age, and nutritional status.<sup>18</sup>

The Yogyakarta Drinking Water Supply System, Management Improvement Agency, oversees the Drinking Water Management System (DWMS) project. This development activity has only been ongoing for a few months in the construction industry, so workers are still adjusting to the work environment, equipment utilized, and other factors. Hot working conditions and strenuous physical exercise are examples of activities that might create worker work fatigue and contribute to workplace accidents. As a result, this study aims to identify the elements that contribute to work fatigue in construction workers.

## II. METODOLOGI

This study employed explanatory research with a cross-sectional design to evaluate the factors associated with work fatigue in construction workers.<sup>19</sup> In April 2023, the research was conducted at the Drinking Water Management System (DWMS) Project in Yogyakarta Province. Thirty employees worked on the Water Treatment Installation project. The study included 30 participants as samples, employing total sampling as the sampling strategy.

Researchers collected primary data by distributing questionnaires. The independent factors are age, education, length of employment, nutritional status, and stress levels. In research, the dependent variable is work fatigue.

This study used a standard questionnaire, the Subjective Self Rating Test for work fatigue with 30 questions,<sup>20</sup> and Depression Anxiety Stress Scales (DASS) 42 for stress levels with 14 questions and an answer range of 0-3,<sup>21</sup> no validity or reliability tests were performed.

The age questionnaire includes questions on workers' ages, divided into three categories: 15-24 years, 25-54 years, and 55-64 years<sup>22</sup>, then simplified into 2 categories, namely productive and less productive. The education questionnaire

asks employees about their most recent level of education, which is divided into four categories: less than basic (not attending school), basic (elementary school and junior high school), intermediate (high school), and advanced (further education)<sup>23</sup>, then simplified into 2 categories, namely low (no school-junior high school) and high (high school-university). The work experience questionnaire includes questions on the work experience or years of service of a construction worker, classified as one year, 1-5 years, 6-10 years, and > ten years<sup>24</sup>, then simplified into 2 categories, namely  $\geq 10$  years and >10 years.

The nutritional status questionnaire, which contains questions about the last worker's weight and height, is measured and confirmed by direct measurement with digital scales and measuring tape or meter, which is then calculated by the worker's Body Mass Index (BMI), with the BMI category following WHO standards, namely Underweight (18.5), Normal (18.5-24.9), Overweight (25-29.9), Obes Class I (30-34.9), Obes Class II (35-39)<sup>6</sup>, then simplified into 2 categories, namely normal and abnormal. The Frequency Distribution test determines the distribution per variable, whereas the Chi-Square test is used in bivariate analysis so that the study variables are separated into two groups. The Tableau Public 2022 program is used for data visualization.

### III. HASIL DAN PEMBAHASAN

Table 1 shows that the majority of respondents were aged 25-54 years, with an average age of 41 years, with a Basic education level (1.37) namely SD-SMP, normal nutritional status at an average BMI of 22.07, work experience with an average of 14 years old, normal stress level with an average score of 11.13, and mild work fatigue with an average score of 52.10.

According to Figures 1 and 2, the average construction worker had a light level of job stress at a productive age, more than ten years of work experience, normal nutritional status or BMI, and a mild work fatigue level of 8 persons, or 26.67%.

Table 1. Characteristics of Workers

Characteristics of Respondents	n (%)	Mean	Std. Deviasi
<b>Age (Year)</b>			
15-24	3 (10)		
25-54	22 (73.3)	40.80	13.527
55-64	5 (16.7)		
<b>Education Level</b>			
Less than Basic	1 (3.3)		
Basic	20 (66.7)	1.37	0.718
Intermedediate	6 (20)		
Advance	3 (10)		
<b>Body Mass Index</b>			
Underweight	4 (13.3)		
Normal	20 (66.7)		
Overweight	6 (20)	22.07	3.45
Obes Class 1	0 (0)		
Obes Class 2	0 (0)		
Obes Class 3	0 (0)		
<b>Work Experience</b>			
<1 year	3 (10)		
1-5 year	3 (10)	14.37	11.15
6-10 year	7 (23.3)		
>10 year	17 (56.7)		
<b>Level of Stress</b>			
Normal	20 (66.7)		
Mild	2 (6.7)	11.13	9.265
Moderate	5 (16.7)		
Severe	2 (6.7)		
Very Severe	1 (3.3)		
<b>Work Fatigue</b>			
No Fatigue	1 (3.3)		
Mild	18 (60)	52.10	13.265
Moderate	11 (36.7)		
Severe	0 (0)		

Table 2. Characteristics Respondents in Two Categories

Characteristics of Respondents	n (%)	Min	Max	Varians
<b>Age (Year)</b>				
Productive (25-54)	22 (73.3)	19	69	182.9
Less Productive (15-24 and 55-64)	8 (26.7)			
<b>Education Level</b>				
Low	21 (70)	0	3	0.516
High	9 (30)			
<b>Work Experience</b>				
$\leq 10$ year	11 (36.7)	0.1	40	124.5
>10 year	19 (63.3)			
<b>Body Mass Index</b>				
Normal	21 (70)	15.2	29.4	11.9
Abnormal	9 (30)			
<b>Level of Stress</b>				
Mild	22 (73.3)	0	36	85.8
Severe	8 (26.7)			
<b>Work Fatigue</b>				
Mild	19 (63.3)	30	73	175.9
Severe	11 (36.7)			

Table 3 shows the findings of the bivariate analysis. BMI (nutritional status) and stress levels were shown to be associated with work fatigue in construction workers.

Fatigue	Age	Education	Experience	IBM	Stress	Count of Fatigue
Mild	Less	Basic	>10	Normal	Mild	1
			>10	Abnormal	Severe	1
		Advanced	>10	Abnormal	Mild	1
			>10	Normal	Mild	1
		Basic	>10	Normal	Mild	3
			>10	Normal	Mild	1
	Productive	Intermediate	>10	Abnormal	Mild	2
			>10	Normal	Mild	1
		Basic	>10	Abnormal	Severe	1
			>10	Normal	Mild	1
		Advanced	>10	Abnormal	Severe	1
			>10	Normal	Mild	1
Severe	Less	Advanced	>10	Abnormal	Severe	1
			>10	Normal	Mild	1
		Basic	>10	Abnormal	Mild	1
			>10	Normal	Mild	1
		Intermediate	>10	Abnormal	Severe	1
			>10	Normal	Severe	1
	Productive	Less than basic	>10	Normal	Severe	1
			>10	Normal	Mild	1
		Basic	>10	Normal	Mild	1
			>10	Abnormal	Mild	1
		Advanced	>10	Abnormal	Severe	2
			>10	Normal	Mild	1

Figure 1. Count of Work Fatigue broken down by Variable

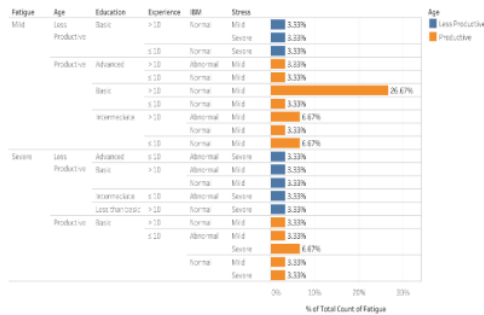


Figure 2. % of Total Count of Fatigue for each Variable

Table 3. Bivariate Analysis of Factors Contributing to Work Fatigue

Variable	Work Fatigue			P value
	n (%)	n (%)	n (%)	
<b>Age (Year)</b>				
Productive	6 (20)	16 (53.3)	22 (73.3)	0.104
Less	5 (16.7)	3 (10)	8 (26.7)	
<b>Education Level</b>				
Low	9 (30)	12 (40)	21 (70)	0.419
High	2 (6.7)	7 (23.3)	9 (30)	
<b>Work Experience</b>				
≤10 year	7 (23.3)	5 (16.7)	12 (40)	0.063
>10 year	4 (13.3)	14 (46.7)	18 (60)	
<b>Body Mass Index</b>				
Abnormal	6 (20)	3 (10)	9 (30)	0.042*
Normal	5 (16.7)	16 (53.3)	21 (70)	
<b>Level of Stress</b>				
Mild	6 (20)	2 (6.7)	8 (26.7)	0.028*
Savere	5 (16.7)	17 (20)	22 (73.3)	

Younger workers report higher job stress and work-family conflict levels than older workers.<sup>25</sup> As employees age, new work-family conflict occurs, such as caring for elderly relatives, related to fatigue. Fatigue symptoms varied greatly depending on the life phases of

working men and women, with younger men and women aged 20-35 and 55 years and older being more sensitive.<sup>26</sup> This study is comparable to that of Hiestand et al., who found no link between age and the occurrence of work fatigue.<sup>27</sup> The findings of Triana et al. vary in that there is a link between age and work fatigue with a p-value of 0.009.<sup>28</sup> This finding differs from the findings of Dall'Ora et al., who discovered that workers who are young and have significant work-life issues had a greater prevalence of burnout.<sup>29</sup>

The results of this study have no association between education level and fatigue in construction workers. The amount of education influences construction workers' perceptions of occupational health hazards and directly affects coping behavior.<sup>30</sup> The amount of education is associated with the prevalence of work-related stress, and stress can produce fatigue, one of which is caused by role overload.<sup>31,32</sup> Higher levels of education may result in increased employment expectations and responsibilities, increasing the risk of burnout.<sup>33</sup> Workers with a greater degree of education may have higher job expectations and may invest more in their employment, which can contribute to increased stress and burnout.<sup>34</sup> Other study indicates that workers with a higher education degree may have better abilities and resources to deal with workplace stress, lowering the likelihood of job burnout.<sup>34,35</sup> According to Obeid et al., education level was not connected to emotional and physical work fatigue with a p-value greater than 0.05.<sup>36</sup> Sun et al.'s study yielded different results, which found a link between education level and work fatigue.<sup>37</sup>

In this study, the work experience had no significant link with work fatigue among construction workers. However, experience may shield older workers against the risk of accidents associated with the job's high work speed and physical demands.<sup>38</sup> Furthermore, work experience might influence a construction practitioner's career, resulting in varied work content and duties.<sup>39</sup> Burnout is connected with increased job demands regarding psychological well-being and work effort.<sup>40</sup> Professionalization can help construction workers avoid job burnout

by providing them with identity, autonomy, and competence. Construction worker with more excellent experience may be more inclined to accept more job demands and duties, which can raise their workload and stress levels and contribute to burnout.<sup>41</sup> Work experience can increase workload, leading to increased stress and burnout. Work experience can also contribute to a reduced workload, affecting employee job satisfaction.<sup>42</sup> This study contradicts Zhang et al.'s claim that job experience is connected to work fatigue.<sup>43</sup> However, according to the research of Ruiz-Fernández et al., there is a link between work experience and job burnout.<sup>44</sup>

In this study, nutritional status was not related to work fatigue among construction workers. One of the causes of fatigue has been identified as inadequate nutrition. Food consumption and body composition changes appear to alter work fatigue perception, presumably through inflammation and mitochondrial dysfunction processes.<sup>45</sup> BMI is one variable that impacts work fatigue, with a greater BMI associated with more fatigue.<sup>46</sup> Workers with an aberrant nutritional state, such as underweight, may feel job fatigue. A study of construction workers discovered that workers who are tired at work are more likely to have irregular nutritional conditions.<sup>47</sup> Obesity and a high physical workload are linked to poor job performance and have a synergistic, negative effect.<sup>47</sup> It was discovered in Yamin et al.'s study that dietary status or body mass index did not influence the occurrence of work fatigue.<sup>48</sup> This study contradicted the findings of Załuski and Makara-Studzńska, who discovered a link between BMI and work fatigue.<sup>49</sup>

According to this study, stress levels have a meaningful association with work burnout. Construction workers suffer from high levels of job burnout because they labor in physically and intellectually demanding conditions.<sup>50</sup> Construction workers are under continual and intense job pressure, which can lead to burnout. Job burnout frequently results in unpleasant feelings such as despair, discouragement, and low job satisfaction.<sup>51</sup> Emotional tension can cause construction

workers to lose focus and disregard proper practice.<sup>52</sup> In this study, the amount of stress has a substantial link with work fatigue in construction workers. Workplace stress has long been associated with work burnout. According to the stress challenge-barrier model (challenge-hindrance stress model), participation in a stress challenge, such as job obligations, frequently results in beneficial organizational outcomes. While the stress barrier, specifically a role overload, hurts organizational outcomes.<sup>53</sup> Long-term role overload causes employees to devote more time and energy to work while saving less time and energy to home life, leading to family disputes, impaired rest quality, and worse work fatigue.<sup>32</sup> Employees who are burned out have reduced job satisfaction, psychological health, physical health, and organizational commitment, as well as increased turnover intentions and trouble relaxing after work.<sup>54</sup> Job stress directly influences burnout, and all manifestations of anger indirectly affect the link between job stress and burnout, according to Lee et al.'s study.<sup>55</sup>

#### IV. SIMPULAN DAN SARAN

The bivariate analysis test findings show that BMI and stress levels have a strong link with work fatigue in construction workers. Labor fatigue is unrelated to age, education, work experience, or nutritional health. Work fatigue is impacted by various elements and situations, including sleep time, work shifts, the time spent working in a day, the physical work environment (noise, illumination, and vibration), and interpersonal connections between employees and others. Future research can look into the abovementioned components, making the results of the elements that cause work fatigue more complicated. Project organizers must use appropriate stress management and coping strategies for workers to prevent job fatigue and preserve workers' nutritional condition by supplying meals based on their caloric demands. Increasing the number of study participants is strongly advised because the results will be significantly more varied and significant.

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