Journal Occupational Health Hygiene And Safety
Departement Public Health, UDINUS
E-ISSN: 2987-5625 ; P-ISSN: 2986-8491
http://publikasi.dinus.ac.id/index.php/johhs/index

Vol. x, No. x, July 202x

The Relationship between Individual Internal Factors and Work Fatigue among Employees of the Semarang City Health Office.

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ARTICLE INFORMATION

Article history
Submitted:
Accepted::

Keywords
Keyword 1: Work fatigue
Keyword 2: tenure
Keyword 3: age
Keyword 4: nutritional status

ABSTRACT

Work fatigue is a physical and mental condition that leads to reduced work capacity and endurance and is often influenced by individual and job-related factors. This study aimed to analyze the association between individual internal factors (age, nutritional status, and length of service) and work fatigue among employees of the Public Health Division at the Semarang City Health Office. An analytical quantitative method with a cross-sectional design was employed in December 2025, involving all 31 employees as respondents. The independent variables were age, nutritional status measured by Body Mass Index (BMI), and length of service, while the dependent variable was the level of work fatigue measured using a reaction timer. Data were analyzed using the Spearman rank correlation test with a significance level of $p < 0.05$. The results showed that length of service ($p = 0.020$) and age ($p = 0.030$) had significant positive associations with work fatigue, whereas nutritional status ($p = 0.257$) was not significantly associated. Employees with longer tenure and older age tended to experience higher levels of work fatigue. In conclusion, work fatigue appears to be more strongly influenced by duration of employment and aging processes than by nutritional status. These findings highlight the importance of monitoring workload, providing periodic rest breaks, and managing job rotation to minimize fatigue and maintain employee productivity.

Introduction

Fatigue is a physical and mental condition characterized by decreased work capacity and reduced endurance in carrying out work. This condition can lead to a decrease in work motivation due to the disruption of the psychological aspects of workers. At severe levels of fatigue, individuals may experience an inability to resume work activities. Workers who continue to force themselves to work in a tired condition are at risk of experiencing disruption of work flow and have a bad impact on their physical health (1).

Based on a report *by the International Labour Organization* (ILO) in 2018, every year around 2 million workers die due to work accidents triggered by fatigue while carrying out

their duties. In Indonesia, the number of work accidents has also increased since the pandemic from 2020 to 2022. Data from BPJS Employment records that in 2020 there were 221.740 cases of work accidents, and in 2022 this number increased to 265.334 cases (2).

In Indonesia, more than 65% of workers who visit company polyclinics complain of work fatigue. Work fatigue is an occupational health and safety problem that is influenced by various factors, both from work and individuals. Work factors include workload and work environment conditions, while individual factors include age, gender, health status, nutritional status, diet, and psychological conditions. Work fatigue that is not managed properly has the potential to have negative impacts, such as decreased motivation and work performance, low work quality and productivity, increased errors in the implementation of tasks, work stress, work-related diseases, injuries, and work accidents (3).

Work fatigue is influenced by various factors, both individual and work. One of the individual factors that play a role is age, where increasing age will be followed by the process of degeneration of body organs which causes a decrease in physiological function so that workers become more susceptible to fatigue. In addition, the tenure also has an effect on work fatigue. The tenure can have a positive impact in the form of increasing experience and skills in work, but in the long term it can have a negative impact due to the limitation of the body's immunity to the work process that takes place continuously, thus triggering work fatigue (4).

Another individual factor that plays a role in work fatigue is nutritional status, which reflects the fulfillment of the nutritional needs of the workforce to maintain a healthy degree and optimize capacity and workforce. Imoptimal nutritional status, both undernutrition and overnutrition, has the potential to increase the risk of work fatigue. Workers with overnutrition or obesity status tend to experience fatigue more easily due to limitations in carrying out work activities. Conversely, poor nutritional status that reflects low energy and nutrient intake can lead to faster fatigue as well as increase the risk of anemia, which ultimately results in decreased immunity and increased work fatigue (3).

Employees in the Public Health Division of the Semarang City Health Office have an important role in planning, implementing, and evaluating public health programs. Job demands that include administrative, technical, and field activities require optimal physical and mental conditions. In this context, internal individual factors such as age, nutritional status, and tenure have the potential to affect employees' ability to adapt to workload and increase the risk of work fatigue (5).

In addition to physical demands, employees in public health offices frequently face substantial mental workload arising from continuous reporting, data verification, administrative coordination, and tight deadlines. In the Public Health Division, routine tasks often include compiling program indicators, validating community health data, preparing periodic report, and coordinating with multiple stakeholders across units and levels of government. These responsibilities commonly require multitasking, sustained attention, and a high level of accuracy, particularly when employees must work with large volumes of data and meet strict submission schedules.

Futhermore, the nature of public health work is not always predictable. Employees may need to respond to urgent requests, sudden program adjustments, or time sensitive coordination related to field activities and community services. Such conditions can increase cognitive demands and create prolonged periods of concentration, especially when administrative tasks are performed alongside monitoring and evaluation activities. When recovery opportunities are limited, fatigue may accumulate gradually and reduce work capacity, even if the tasks appear “non physical”

In practice, fatigue may manifest as reduced concentration, slower response to tasks, decreased consistency in completing reoutine work, and diminished motivation. These consequences are important beauce public health services depend on timely and accurate outputs, including reporting, planning, and coordination that support program implementation. Even modest declines in alertness and accuracy may increase the likelihood of errors, delays, and reduced service quality.

Therefore, identifying internal factors related to fatigue is important not only for occupational health protection but also for maintaining the quality and timeliness of public health program delivery. However, until now, empirical studies that specifically analyze the relationship between individual internal factors and the level of work fatigue in employees of the Public Health Division of the Semarang City Health Office are still limited. Therefore, this study is important to identify the relationship between individual internal factors and work fatigue as the basis for planning efforts to prevent and manage work fatigue within the Semarang City Health Office.

Method

This research is an analytical quantitative study with a cross-sectional design, conducted in December 2025 at the Public Health Division of the Semarang City Health Office.

The study population comprised all 31 employees in the division, and total sampling was applied. The independent variables were age, nutritional status, and tenure, while the dependent variable was the level of work fatigue. Age and tenure data were obtained from respondents' records, nutritional status was assessed using Body Mass Index (BMI) based on anthropometric measurements, and work fatigue was measured using a reaction timer. Data were processed and analyzed using statistical analysis and tested with the Spearman Rank correlation because the data were not normally distributed with statistical significance set at $p<0.05$.

Results and Discussion

In this section, the results of research are presented on the relationship between individual internal factors and the level of work fatigue in employees of the Public Health Division of the Semarang City Health Office. The results presented are an analysis of primary data obtained through age measurement, nutritional status based on Body Mass Index (BMI), tenure, and work fatigue levels. The presentation of results was carried out in the form of frequency distribution tables and bivariate analysis, which were further described descriptively and associated with relevant theories and findings of previous research.

Result

Based on Table 1, most respondents were in the early productive age category (74.2%), followed by the late productive age category (25.8%). The majority of respondents' nutritional status fell into the Obesity Class I category (35.5%), followed by overweight (25.8%) and normal BMI (19.4%). Most respondents had a short length of service (77.4%), while those with a long length of service accounted for 22.6%. Work fatigue levels were predominantly classified as severe fatigue (38.7%), followed by mild fatigue (32.3%) and moderate fatigue (29.0%).

Table 1. Variable Frequency Distribution

Features	Frequency	Percentage (%)
Age		
Early productive age (25-45 years)	11	35.5
Late productive age (49-60 years)	20	64.5
BMI		
Underweight (< 18,5)	2	6.5
Normal (18,5 – 22,9)	6	19.4
Overweight (23 – 24,9)	8	25.8
Obesity 1 (25-29.9)	11	35.5
Obesity 2 (≥30)	4	12.9

Features	Frequency	Percentage (%)
Tenure		
New (< 7 years)	24	77,4
Long (> 7 years)	7	22,6
Work Fatigue		
Lightweight (>240 - <410)	10	32.3
Medium (>410 - <580)	9	29.0
Weight (≥580)	12	38.7

Based on the analysis presented in Table 2, age (p = 0.030) and length of service (p = 0.020) were significantly associated with the level of work fatigue, whereas nutritional status (BMI) (p = 0.257) showed no significant association. These findings indicate that increasing age and longer length of service tend to be accompanied by higher levels of work fatigue among employees.

The correlation coefficients for age and length of service were positive, suggesting that higher age and longer tenure are generally followed by increased fatigue levels. Although the magnitude of the correlations ranged from weak to moderate, this pattern remains meaningful in an occupational context because fatigue—even at moderate levels—may reduce alertness, accuracy, and consistency in completing routine tasks. In contrast, BMI demonstrated a negative direction of correlation with fatigue but was not statistically significant, implying that BMI alone may be insufficient to reflect physiological condition or functional capacity contributing to fatigue in this group. Overall, the results suggest that work fatigue is not determined by a single factor but rather arises from the interaction of multiple individual and work-related factors; therefore, fatigue control interventions should be comprehensive and should not focus solely on individual characteristics.

Table 2. The Relatinship between Age, Nutritional Status, and Working Time with Work Fatigue Levels

Variable	Correlation Coefficients	*p-value*
Age	0.390	0.030
BMI	-0.210	0.257
Tenure	0.417	0.020

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Discussion

The Relationship between Age and Work Fatigue Levels

Fatigue is the body's protective response to prevent further damage due to activities or work carried out, so a recovery process through rest is needed. The body generates fatigue signals as a defense mechanism so that individuals can rest and recover the energy that has been used. The Fatigue control process takes place centrally by the brain through the system at the central nervous system. If the rest process is not met, temporary fatigue can develop into chronic fatigue that has the potential to reduce productivity and increase the risk of work accidents. In addition, changes in the body's physiological functions as they age can affect the body's immunity as well as an individual's ability and work capacity (6).

In theory, according to Suma'mur (2009), age is one of the individual factors that can affect the level of work fatigue. Workers with older ages tend to experience a faster decrease in completing tasks, so it can have an impact on decreased performance and less than optimal work results (7). The results of this study are not entirely in line with this theory, because it was found that there was a significant relationship between age and the level of work fatigue in employees of the Public Health Division of the Semarang City Health Office based on the *Spearman Rank* correlation test ($p = 0.030$). This shows that the older a person gets, the higher the level of work fatigue experienced.

Increased fatigue in older age can be caused by degenerative processes that cause decreased organ function, muscle strength, reaction speed, and endurance to workloads. This condition makes adult workers fatigue faster than young adult workers. This finding is in line with research conducted by Budi Santosa (2024) which states that older workers have a higher chance of experiencing fatigue than younger workers (8).

The Relationship between Nutritional Status and Work Fatigue Levels

Nutritional status is an individual factor that contributes to workers' physical condition, functional capacity, and overall endurance in performing daily tasks. Therefore, it is theoretically related to work fatigue. In office based settings, nutritional status is also closely linked to lifestyle patterns, physical activity levels, and dietary habits, which may indirectly affect fitness and perceived energy during work. Imbalanced nutritional status can disrupt the body's energy metabolism (9). Workers with poor or non ideal nutritional status are more susceptible to work fatigue. Obesity may make it more difficult for workers to carry out their work activities. Meanwhile, undernourished workers typically characterized by low body

No.ISSN online: xxxx- http://publikasi.dinus.ac.id/index.php/johhs/index
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eighth tend to have inadequate caloric intake. This caloric deficiency can cause the bocy to become fatigued more quickly and increase the risk of low blood pressure or anemia, making workers more likely to feel tired (10).

However, the results of this study show that nutritional status measured through the Body Mass Index (BMI) does not have a relationship with the level of work fatigue, as shown by the results of bivariate analysis using the *Spearman Rank correlation test* with a value of $p = 0.257$ ($p > 0.05$). This finding suggests that, within the study population, differences in fatigue levels could not be directly explained by BMI categories. It also highlights the multifactorial nature of work fatigue, whereby the potential contribution of nutritional status may be outweighed by other more dominant determinants, such as job characteristics, daily workload, rest patterns, and program coordination demans.

The results of this study are in line with research by Nurhidayat et al. (2023) which stated that Body Mass Index (BMI) did not have a significant relationship with fatigue symptoms in operators (11). The similarity of these results shows that work fatigue is not solely influenced by nutritional status as measured through the Body Mass Index (BMI), but may be more influenced by other factors such as work arrangements, workload, environmental conditions, and the individual's ability to adapt to job demands. In addition, the Body Mass Index (BMI) only describes the condition of the body in general and does not necessarily reflect the level of fitness, physical endurance, or the ability of individuals to adjust to work demands, so its effect on work fatigue is not directly visible (12). In other words, BMI captures weight to height proportion but does not account for body composition, cardiorespiratory fitness, or habitual physical activity, which may be more proximal to fatigue experienced at work.

Descriptive findings showed that most respondents were classified as overweight or obese, which may reflect sedentary work patterns and lifestyle factors commonly observed in office environments. Although BMI was not significantly associated with fatigue in the bivariate analysis, this distribution remains relevant for occupational health considerations, as excess body weight may influence general fitness and perceived exertion during work activities. In addition, the substantial proportion of severe fatigue suggests that fatigue management strategies should be considered to prevent potential declines in performance and service quality.

No.ISSN online: xxxx- http://publikasi.dinus.ac.id/index.php/johhs/index
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The Relationship between Tenure and Work Fatigue Levels

Tenure is one of the factors that can influence the occurrence of work fatigue among employees. The results of bivariate analysis using the *Spearman Rank correlation test* showed a value of $p = 0.020$ ($p < 0.05$). This shows that there is a significant relationship between the tenure and the level of work fatigue in employees of the Public Health Division of the Semarang City Health Office. This condition is suspected to be related to the accumulation of exposure to workloads and responsibilities experienced on an ongoing basis during the tenure, which can affect the physical and mental capacity of workers. In addition, work routines carried out over a long period of time have the potential to cause work burnout, thus contributing to increased work fatigue (13).

Individuals with long tenure generally have different physical and mental conditions compared to workers who have just joined, so this affects their performance and endurance while working. Workers with longer work experience tend to experience higher levels of work fatigue than new workers. This condition is influenced by the effects of the tenure which can be positive or negative. Positive effects arise when work experience increases over time to help workers in carrying out their duties. On the other hand, negative effects occur if the work done is monotonous, so that the same activities every day cause a sense of saturation and fatigue in the worker (14).

The results of this study are in line with the research of Darimi et. al (2024) regarding the relationship between working time and work fatigue in factory employees, which shows a significant relationship between working time and work fatigue (15). The study reported that workers with long tenure tended to experience higher levels of work fatigue than workers with shorter working hours, suggesting that the longer a person worked in a work environment, the greater the risk of burnout due to continuous workload accumulation.

Conclusion

This study aims to analyze the relationship between individual internal factors and the level of work fatigue in employees in the Public Health Division of the Semarang City Health Office. The findings of this study enderscore that efforts to control work fatigue should prioritize employees at higher risk, particularly those of older age and longer tenure. Based on the results of the analysis, it was found that age ($p = 0.037$) and working period ($p = 0.022$) had a significant relationship with the level of work fatigue while nutritional status based on Body Mass Index (BMI) did not show a significant relationship with the value of $p = 0.257$. These

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No. ISSN cetak: xxxx-

findings indicate that employees with older age and longer working hours tend to experience higher levels of work burnout, which may be influenced by decreased physical and mental capacity as they age as well as accumulated workload and burnout due to long-term work routines. Therefore, efforts to control fatigue are needed throught workload management, adequate rest time, and task rotation to minimize work fatigue and maintain employee productivity.

Acknowledgments

The authors would like to express their sincere gratitude to the Semarang City Health Office, particularly the Public Health Division, for granting permission and support for this study. Appreciation is also extended to all respondents for their participation, and to the Bachelor of Public Health Program, Dian Nuswantoro University, especially the supervisors, for their guidance and constructive input throughout the research and manuscript preparation.

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