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ORIGINAL ARTICLE

Determinant Factors of Knowledge about Obesity among Workers in the Chemical Industry in Surabaya City, East Java Province

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ABSTRACT

Introduction: Obesity is a health problem experienced by workers in the manufacturing industry. The incidence of obesity is caused by various factors, including lack of knowledge. This study aims to analyze the factors associated with knowledge about obesity among workers. **Methods:** This study an analytical observational design with a cross-sectional approach conducted at PT XYZ in Surabaya City, East Java Province. The population of this study consisted of 145 workers in the manufacturing sector from various work units. The sample size consisted of 119 people. The independent variables were age, sex, work tenure, work unit, education level, and access to information about obesity. Meanwhile, the dependent variable was knowledge level. The statistical test used was the contingency coefficient test. **Results:** The results showed that most workers were over the age of 35 years (89.9%), males (67.2%), worked in a production work unit (60.5%), had worked for more than 20 years (78.2%), had a high school degree (54.6%), had good knowledge (55.5%), and did not have access to information about obesity (55%). A relationship was found between work tenure ($p = 0.001$), education level ($p = 0.002$) and access to information ($p = 0.004$) with knowledge level of the workers about obesity. Meanwhile, age ($p = 0.437$), sex ($p = 0.643$), and work unit ($p = 0.335$) had no significant relationship with knowledge level of the workers about obesity. **Conclusion:** A relationship was found between work tenure, education level, and access to information with knowledge level about obesity.

Keywords: knowledge level, manufacturing workers, obesity

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INTRODUCTION

The industrial sector is a critical component of economic development as it has made a significant contribution to economic growth for its productivity. The development of the industrial sector is marked not only by an increase in production volume, but also by an increase in the number of goods produced (Arzia, 2019). One of the industrial sectors is the manufacturing industry. The manufacturing sector that produces chemicals poses potential hazards, such as exposure to chemicals and noises, as well as risks of physical harm such as being crushed, scratched, or pinched, which can lead to health problems (Bastuti and Estiningsih, 2021).

Health problems among workers are not only caused by health hazards in the industry. Research in the manufacturing industry sector, namely the textile industry, shows that most workers are obese. Specifically, 77.3% of shift and 59.5% of non-shift workers are obese (Rahmawati, 2021). Another study in China also found that shift workers are at risk of being overweight (Liu *et al*., 2018).

Research in Brazil on male workers showed a relationship between obesity and age, family income, smoking habits, hypertension, and hypertriglyceridemia. Similarly, in female workers, age, alcohol consumption, hypertriglyceridemia,

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hypertension and hyperglycemia were found to be associated with obesity (Araújo *et al*., 2010).

Obesity has negative impacts on four aspects, namely physical, psychological, social, and spiritual aspects. Physically, obesity can cause cancer, diabetes mellitus, hypertension, heart disease, and stroke. Psychologically, it can lead to anxiety, depression, hopelessness, and lack of confidence. Obesity can also have an impact on social aspects, such as exclusion from groups, stigmatization, discrimination, harassment, and ridicule. In addition, it can have an impact on spiritual aspects, including feelings of hopelessness that may increase the risk of self-harm or suicide (Hermawan et.al., 2020).

PT XYZ is a manufacturing company that uses chemicals as raw materials. Workers in the production unit are divided into three work shifts. Preliminary research conducted in 2022 showed that 39% of workers at PT XYZ were obese and 17% of workers were overweight. This indicated that shift workers in the manufacturing industry are at risk for obesity and overweight.

Balanced nutrition refers to the intake of nutrients that are adjusted to the needs of the body. Balanced nutrition consists of four pillars, namely consuming a wide variety of foods, engaging in physical activities and exercising, adopting a clean and healthy lifestyle, and maintaining an ideal body weight (Yuningsih, 2022).

The knowledge level of an individual is influenced by many factors, such as education, occupation, age, environment, and socio-cultural factors. According to a study, good nutritional knowledge can enable an individual to arrange and manage their diet according to the quantity and quality required by the body, leading to healthy behavior and achieving normal nutritional status, thus avoiding obesity. Knowledge of workers related to balanced nutrition plays a critical role in maintaining a healthy balance of incoming and outgoing nutrients to prevent obesity. More than half (75%) of respondents in a study lacked understanding of balanced nutrition (Adibah, Patriasih and Nurhayati, 2020). This study aims to analyze the factors associated with knowledge level about obesity among workers in the manufacturing sector in Surabaya so that PT XYZ can implement appropriate control measures.

METHODS

This study used an analytical observational study with a cross-sectional design. This study was conducted from May to July 2023. The population consisted of 145 workers at PT XYZ, a chemical manufacturing company located in Surabaya City, East Java Province. Simple random sampling was used as the sampling method. The sample size was calculated using the Sample Size Calculator with a minimum sample size of 105 workers. A total of 119 workers were included in this study.

A questionnaire was used as an instrument. The questionnaire was tested for validity and reliability. The results showed that the questionnaire was valid and reliable with correlation values (Pearson correlation) for knowledge and attitude question items showing a calculated r value of between 0.5 and 0.8 compared to r table of 0.361 and a Cronbach's alpha value 0.690 (>0.60).

The questionnaire consisted of questions regarding worker characteristics, knowledge level, and access to information. The independent variables in this study were worker characteristics, including age, gender, work unit, work tenure, and education level. Meanwhile, the dependent variable in this study was knowledge level of workers.

In this study, age was categorized into two, namely less than or equal to 35 years and more than 35 years. Sex was categorized into male and female. Work unit consisted of production, quality control, maintenance, and others (managerial, warehouse, housekeeping, and so on). Work tenure was categorized into less than or equal to 20 years and more than 20 years. Education level was divided into four categories, namely elementary school or equivalent, junior high school or equivalent, senior high school or equivalent, and tertiary education (bachelor’s/associate’s degree).

Knowledge level was divided into three categories, namely poor (score of less than 42), moderate (score between 42 and 75), and good (more than 75). The questionnaire assessing knowledge level consisted of 12 questions covering balanced nutrition, the impact of obesity, and the causes of obesity. In addition, workers were also asked about their access to information sources about obesity. Access to information was divided into two, namely "Yes", indicating access to information and "No", indicating no access to information about obesity. The sources of information were divided into four categories, namely from companies, brochures, social media and other sources. The results were analyzed using the contingency coefficient correlation test. This study received ethical approval from the Research Ethics Committee of the Faculty

of Nursing, Universitas Airlangga with a certificate number 2804-KEPK/2023.

RESULTS

Characteristics of Workers at PT XYZ

Table 1 shows the frequency distribution of worker characteristics, knowledge level, and access to information about obesity among workers at PT XYZ in Surabaya. Table 1 shows that 89.9% of the workers were over or equal to 35 years old. The youngest worker was 19 years old, while the oldest was 55 years old. The majority of the workers were males (67.2%), worked in the production unit (60.5%), and had worked for less than or equal to 20 years. The shortest work tenure was one year, while the longest was 24 years. Most workers (54.6%) also had a high school degree.

Knowledge Level about Obesity among Workers at PT XYZ

Table 2 shows that 55.5% of the workers had a moderate level of knowledge. The average score obtained was 52.86 ± 17.16, with a minimum score of 8 and a maximum score of 92.

Table 3 shows that 55% of workers reported never having access to information about obesity, while 45% reported having access to information. Table 3 shows that 88% of the 54 workers who answered "Yes" reported having access to information about obesity from the company, with the remainder obtaining information from brochures, social media, and others.

Table 1. Frequency Distribution of Employee Characteristics, Knowledge Level, and Access to Information among Workers at PT XYZ in 2023

Variable	Frequency (n)	Percentage (%)	Minimum	Maximum	Mean ± SD
Age (Years)					
≤35	12	10.1	19	55	42.38 ± 6.69
>35	107	89.9			
Sex					
Male	80	67.2	-	-	-
Female	39	32.8			
Work Unit					
Production	72	60.5			
Quality Control	10	8.4	-	-	-
Maintenance	1	0.8			
Others	36	30.3			
Work Tenure (Years)					
≤20	93	78.2	1	24	17.78 ± 6.51
>20	26	21.8			
Education Level					
Elementary School	3	2.5			
Junior high school	30	25.2	-	-	-
Senior high school	65	54.6			
Bachelor's/associate's degree	21	17.6			

Table 2. Knowledge level about obesity among workers at PT XYZ in 2023

Knowledge Level	n	%	Minimum Score	Minimum Score	Mean ± SD
Poor	43	36.1			
Moderate	66	55.5	8	92	52.86 ± 17.16
Good	10	8.4			
Total	119	100.0			

Factors Associated with Knowledge Level about Obesity among Workers at PT XYZ

The factors analyzed in this study included age, sex, work tenure, work unit, and education level.

Table 3. Access to information about obesity among workers at PT XYZ in 2023

Access to Information about Obesity	n	%
Yes	54	45.0
No	65	55.0
Total	119	100.0

Table 4. Source of information about obesity among workers at PT XYZ in 2023

Information Access	n	%
Company	48	40.3
Brochure	1	1.0
Social Media	2	1.7
Others	3	2.5
No Access	65	54.5
Total	119	100.0

Table 5 shows a relationship between knowledge level and work tenure with a p-value of 0.001 ($\alpha < 0.05$), education level with a p-value of 0.002, and access to information with a p-value of 0.004. However, age, sex, and work unit were not found to have relationship with knowledge level.

The contingency coefficients of work tenure and access to information were 0.593 and 0.513, respectively, indicating a very strong relationship. Meanwhile, education level has a strong relationship with a contingency coefficient of 0.415.

DISCUSSION

Characteristics of Workers at PT XYZ

The results of this study suggested that most workers were over 35 years old. In addition, there were more male workers than female workers who participated in this study. Most participants of this study also came from the production work unit with a work tenure of less than or equal to 20 years. Finally, the highest education level of the majority

Table 5. Factors associated with knowledge level about obesity at PT XYZ in 2023

Variable	Knowledge Level						Total		Sig.	Contingency Coefficient Value
	Poor		Moderate		Good					
	n	%	n	%	n	%	N	%		
Age (Years)										
≤35	5	42.62	5	41.62	2	16.76	12	100	0.437	0.117
>35	38	35.51	61	57.01	8	7.48	107	100		
Sex										
Male	31	38.75	42	52.50	7	8.75	80	100	0.643	0.086
Female	12	30.77	24	61.54	3	7.69	39	100		
Work Tenure (Years)										
<20	34	36.56	49	52.69	10	10.75	93	100	0.001*	0.593
≥20	9	34.62	17	65.38	0	0.00	26	100		
Work Unit										
Production	28	38.89	40	55.56	4	5.56	72	100		
Quality Control	1	10.00	7	70.00	2	20.00	10	100	0.335	0.233
Maintenance	1	100.00	0	0.00	0	0.00	1	100		
Others	13	36.11	19	52.78	4	11.11	36	100		
Education Level										
Elementary School	2	66.67	1	33.33	0	0.00	3	100		
Junior high school	18	60.00	12	40.00	0	0.00	30	100	0.002*	0.415
Senior high school	19	29.23	42	64.62	4	6.15	65	100		
Bachelor's/associate's degree	4	19.05	11	52.38	6	28.57	21	100		
Information Access										
Yes	22	40.74	28	51.85	4	7.41	54	100	0.004*	0.513
No	21	32.31	38	58.46	6	9.23	65	100		

* Significance (α) < 0.05

of workers was senior high school degree. Similarly, a study found that the majority of manufacturing workers had long work tenure, namely more than 10 years or even more than 21 years (Sali, 2020).

The results of this study are consistent with the results of a survey conducted by the Central Bureau of Statistics and the Ministry of Manpower. According to the Central Bureau of Statistics (2023), the working age population refers to individuals over 15 years old who are employed. The Organization for Economic Cooperation and Development (OECD) also defines the working age population as individuals between 15 and 64 years old. Meanwhile, the processing unit had a bigger proportion of male workers than female workers. The majority of the population who were employed were junior high school graduates (Indonesian Ministry of Manpower, 2021; OECD, 2024).

Frequency Distribution of Knowledge about Obesity among Workers in the Manufacturing Sector

Knowledge level was divided into three categories, namely poor, moderate, and good. This study found that most workers had a poor level of knowledge. This finding is consistent with previous research in the tofu manufacturing sector indicating a lack of knowledge about nutrition among the majority of workers. Among workers with poor knowledge, those with a high activity level had the highest percentage. More than half of the workers had a poor consumption pattern, and most had an underweight nutritional status (Rini, 2022).

The findings in this study suggested that workers who lacked access to information about obesity had a poor level of knowledge about nutrition. Most of the workers who had access to information reported that the company had conducted disseminations. However, a small number of workers reported that they had access to information from brochures, social media, and so on.

Government Regulation Number 88 of 2019 concerning Occupational Health states that the implementation of occupational health includes efforts to prevent disease, improve health, improve health, and restore health. Occupational health standards to improve health can be done through increasing health knowledge, including the application of good nutrition practices in the workplace. Efforts to improve health are carried out to achieve the highest level of health in healthy, fit, and productive conditions. This regulation emphasizes that all levels of governments, including workplaces, have an obligation to participate in organizing health at work, one of which is to provide health-related information to their workers (Government of the Republic of Indonesia, 2019).

Research has shown that workplace interventions, including nutrition and health education, can have a positive impact by increasing knowledge of health and nutrition and promoting behavioral changes. The duration of interventions related to nutrition and health can significantly increase knowledge of health and nutrition, especially if the workplace emphasizes the need for better approaches and methods for assessing the most relevant intervention for the best outcomes (Peñalvo *et al*., 2021; Rachmah *et al*., 2022).

Relationship between Age and Knowledge Level about Obesity among Workers in the Manufacturing Sector

This study found no relationship between age and knowledge level of workers about obesity, indicating a lack of knowledge across all age groups. This is consistent with research conducted in Bali in 2017 which found no correlation between age and dental and oral health knowledge among workers (Dharmawati and Wirata, 2016). This is also consistent with research conducted in Bekasi which found a relationship between age and knowledge level (Nursa'iidah and Rokhaidah, 2022).

However, this finding is not consistent with research which found that knowledge level increases with age. This is because with age comes wisdom and more information is obtained. In other words, age influences comprehension and mindset of an individual (Sulistyowati, Putra and Umami, 2017).

Relationship between Sex and Knowledge Level about Obesity among Workers in the Manufacturing Sector

Women who are older and currently studying or working in the health sector are significant predictors of knowledge about nutrition (Svendsen *et al*., 2021).

This study found no relationship between sex and knowledge level of workers about obesity. Although the majority of participants in this study were males, sex was not found to be a factor related to knowledge level about obesity. However, research has shown that females are more likely to seek health information. Health information seeking behavior could provide a lot of benefits, such as acquiring knowledge related to health (Manierre, 2015).

However, this finding is not consistent with research which found a correlation between sex and knowledge level among students (Nito, Tjomiadi and Manto, 2021; Rahmawati, 2021).

Relationship between Work Tenure and Knowledge Level about Obesity among Workers in the Manufacturing Sector

This study found a very strong and significant positive relationship between work tenure and knowledge level, indicating that the longer the working tenure, the higher the knowledge level of workers related to obesity.

Workers who have been employed for a longer period are more likely to have had access to nutrition and health education interventions than new workers. This finding is consistent with research conducted on dental and oral therapists in Yogyakarta which found a strong relationship between work tenure and knowledge level about nutrition. Therefore, a longer working period is associated with an increase in nutritional knowledge (Febriyani, Sandy and Mardhiyah, 2022). In addition, a study in Tanzania among health workers showed a strong relationship between work tenure and nutritional knowledge. Moreover, workplaces are ideal locations to implement health information and intervention programs because individuals in the productive age group tend to spend the majority of their waking hours at work (Munuo *et al*., 2016; Grimani, Aboagye and Kwak, 2019).

Relationship between Work Unit and Knowledge Level about Obesity among Workers in the Manufacturing Sector

The work unit in the manufacturing sector in this study included workers from production, quality control, maintenance, and other units. The socio-cultural environment in the workplace can affect health-related knowledge and behavior of workers. Colleagues can mutually influence the decision to start a healthy lifestyle, including their knowledge level. A work culture that promotes good health knowledge will undoubtedly support workers in acquiring knowledge about healthy living. In contrast, workplaces that do not provide health promotion or education to workers will have workers with relatively low levels of knowledge related to health because effective health promotion requires support from the management and organizational levels.

High workloads can hinder healthy lifestyle and participation in health behaviors. However, research shows that with support from organizations, positive outcomes for the health of workers can be achieved. Studies conducted in various workplace settings have found that leadership support has a more consistent impact on promoting a healthy lifestyle. This can be further reinforced by the support of organizational policies. The workplace can promote health in accordance with the needs and goals of the organization, targeting multiple dimensions of health and well-being of workers. Leaders should ensure that health promotion programs can be accessed or obtained by all workers, and evaluate them based on the needs of workers (Hyun and Kim, 2018; Payne *et al*., 2018; Mazzola, Jackson and Thiele, 2019)

Relationship between Education Level and Knowledge Level about Obesity among Workers in the Manufacturing Sector

This study found a very strong and significant positive relationship between education level and knowledge level about obesity, indicating that workers with higher levels of education had better knowledge about obesity. The majority of workers participating in this study had a high school degree.

This finding is consistent with previous research on COVID-19 which found a relationship between education level and knowledge level. Specifically, individuals with higher levels of education tend to have higher levels of knowledge, and vice versa (Damayanti and Sofyan, 2022). This finding is also consistent with a study which found a relationship between education level and knowledge level about health, especially traditional medicine (Febrianty, Andriane and Fitriyana, 2018).

Health knowledge may be influenced by education level. Higher levels of education may lead to greater capacity to learn about health and its various risks, including nutritional information. Individuals with higher levels of education are more likely to understand their health needs, follow instructions, and communicate effectively. This also includes having good health literacy, which enable them to better receive information on health campaigns (Braveman and Gottlieb, 2014; Gellert, 2015; Febrianty, Andriane and Fitriyana, 2018; Sponselee *et al*., 2021; Wu *et al*., 2022).

Relationship between Access to Information and Knowledge Level about Obesity among Workers in the Manufacturing Sector

Health knowledge is the ability to obtain, understand, and apply existing health information. In this study, access to information is primarily obtained from companies or workplaces. The age of workers in this study affected their access to health information from the workplace, particularly because the majority were over 35 years old.

However, obtaining health information requires certain skills and a good understanding. Younger people tend to use digital media to access health information. The internet and health applications have made health information more accessible. The advantage of easy access to health information from companies is that it is reliable and trustworthy due to the involvement of professionals to provide the information. Health information from social media or the internet is easier to obtain, but there is a higher risk of inaccurate, misleading information, including the possibility of commercial motives (Gellert, 2015; Nutbeam and Lloyd, 2020).

Similar research on reproductive health in university students has shown that access to information is significantly related to the knowledge level of the students. The majority of respondents reported obtaining reproductive health information from the internet (Fitria, Safitri and Nisa, 2023).

According to systematic research, one of the obstacles to healthy living, especially in terms of obesity prevention, is a lack of knowledge related to nutrition and physical activity necessary to maintain an ideal body weight. When individuals lack knowledge related to healthy living, their chances of changing their lifestyle to be healthier are reduced. In addition, health-related programs should be designed to allow individuals with existing knowledge to apply it to their daily behaviors (Mazzola, Jackson and Thiele, 2019).

Therefore, it is recommended that companies provide health information to workers regularly to ensure accurate health information. This is particularly important for workers with lower secondary education and upper middle age. The limitation of this study is that it only examined six factors. Therefore, further research that includes additional factors such as training and nutritional status is needed. In addition, research should be conducted on all units in PT XYZ.

CONCLUSION

This study concluded that the majority of workers were over 35 years old, males, came from the production unit, had worked for less than or equal to 20 years, had a high school degree, and had a moderate level of knowledge about obesity. This study found a relationship between work tenure, education level, and access to information with knowledge level about obesity among workers at PT XYZ. Meanwhile, no significant relationship was found with age, sex, and work unit.

Nutrition promotion should be carried out frequently. This is particularly important for workers with less than 20 years of experience and who have only completed elementary or junior high school.

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