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THE RELATIONSHIP BETWEEN INDIVIDUAL CHARACTERISTICS AND WORK FACTORS WITH THE LEVEL OF LOWER BACK PAIN COMPLAINTS AMONG WORKERS IN THE MACARONI INDUSTRY

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ABSTRACT

This study examines the correlation between individual characteristics, work factors, and the severity of lower back pain complaints among workers in the macaroni industry in Malang Regency. The study's background encompasses the notion that individual characteristics and work factors may serve as risk factors for lower back pain complaints. Everyone in the workplace must apply occupational health and safety to achieve the highest level of physical, mental, and social health through preventive and curative measures against work-related health disorders. This study uses a quantitative approach with the cross-sectional method and the chi-square test to determine the relationship between independent variables and dependent variables. The results of the analysis show that individual characteristics such as age, BMI, and education have a significant relationship with lower back pain complaints, while gender is not significant. Work factors such as length of service also show a significant relationship with lower back pain complaints, while length of service does not show a significant relationship.

KEYWORDS *Individual Characteristics; Job Factors; Low Back Pain Complaints; Occupational Health; Occupational Safety*

INTRODUCTION

Within an industry, humans are among the variables that are crucial. A large number of enterprises, particularly small and medium-sized ones, still use direct human labour in their manufacturing processes today. This is because the majority of the instruments are hand tools that need to be operated by people. According to Nadri et al. (2013), a growing number of industrial ailments, including

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cardiovascular illnesses, musculoskeletal problems, and accidents, are brought on by the majority of manual labour.

Risk factors for complaints of low back pain might include personal traits and work-related variables. Low back pain issues may manifest differently depending on one's body mass index (Seyed & Mohamed, 2021). According to Wami et al. (2019), women experience low back discomfort more often than males. This is due to the fact that women's muscular capacity is less than men's, with their ability and muscle endurance being around two-thirds that of males.

According to Raya et al. (2019), there is a greater incidence of low back discomfort among employees who work longer shifts. Long-term employees who do not exercise often report having low back discomfort, and there is a strong correlation between their lack of physical activity and this condition (Wulandari et al., 2017).

Enforcing occupational health and safety is vital for all individuals who operate in the business and labour sectors. The goal of preventative and curative measures against health issues brought on by the workplace is for all employees to achieve the best possible level of physical, mental, and social health. Regretfully, issues related to employee health and safety still often come up in businesses today. It is not unusual for employees to deal with internal business issues.

Workers' productivity will decline as a consequence of pressure from issues including mental and physical difficulties as well as restricted health insurance. The Occupational Safety and Health Management System (SMK3) is a component of the company's overall management system, as per PP No. 50 of 2012, which pertains to its implementation. Its purpose is to limit risks associated with work activities and provide a safe, efficient, and productive workplace.

Pressure from conditions like physical and mental health problems and limited health insurance will cause workers' productivity to decrease. According to PP No. 50 of 2012, which deals with its implementation, SMK3 is a part of the company's overall management system. Its goal is to reduce working hazards and provide a secure, effective, and productive environment.

Employee productivity will decline as a result of factors including insufficient health insurance and issues with physical and mental health. SMK3 is a component of the business's overall management system, as per PP No. 50 of 2012, which addresses its implementation. Its objective is to lessen workplace risks and provide a safe, efficient, and fruitful atmosphere.

A number of variables, such as inadequate health insurance and problems with physical and mental health, may cause employee productivity to fall. As per the implementation guidelines of PP No. 50 of 2012, SMK3 is part of the business's overall management system. Its goal is to reduce workplace hazards while fostering an environment that is productive, safe, and efficient.

Employee productivity may decline for a variety of reasons, including insufficient health insurance and issues with one's physical and emotional well-being. SMK3 is a component of the business's overall management system, in accordance with the PP No. 50 of 2012 implementation requirements. Its objective is to lessen workplace risks while promoting an efficient, safe, and productive atmosphere.

Hypothesis

Hypo means temporary or weak truth and thesis means statement or theory. Thus, a hypothesis means a provisional statement that needs to be tested for truth.(Notoatmodjo, 2012b).

H_o: There is no relationship between individual characteristics and occupational factors on low back pain in Malang Regency macaroni industry workers

H1: There is a relationship between individual characteristics and work factors on low back pain in macaroni industry workers in Malang Regency.

RESEARCH METHOD

This research examined the association between independent and dependent variables using a quantitative design, the Cross-Sectional technique, and the *Chi-Square* test. The purpose of this research is to determine the association between personal traits and workplace conditions and the frequency of low back pain complaints among workers in the Malang Regency's macaroni sector. Using a complete sampling approach, 40 manufacturing workers who worked in seated positions made up the study sample (Notoatmodjo, 2012a).

This study used a cross-sectional approach, a quantitative methodology, and the *Chi-Square* test to investigate the relationship between independent and dependent variables. The aim of this study is to ascertain the relationship between occupational characteristics and low back pain complaints among employees in the macaroni industry in Malang Regency. The research sample consisted of 40 industrial workers who were seated throughout work, selected using a comprehensive sampling technique.

The purpose of this research is to determine the association between low back pain complaints and occupational characteristics among workers in Malang Regency's macaroni industry. Using a thorough sampling approach, 40 industrial workers who were seated throughout their workdays made up the study sample.

RESULT AND DISCUSSION

Company Profile

The Malang macaroni business produces unique delicacies and delivers them to places outside of Java, including Bali, Nusa Tenggara, Makassar, and Kalimantan. 2011 saw the founding of the macaroni market.

Univariate Results

The characteristics of the respondents, such as age, gender, BMI, education, tenure, duration of employment, and low back pain, represent the univarial outcomes of this research.

Worker age and gender groups in the macaroni sector participated in this research. The age groupings of the respondents were <30 years (47.5%) and >30 years (52.5%). Gender-wise, female respondents made up 97.5 percent of the total, while male respondents made up 2.5 percent.

Additionally, respondents were categorised according to their body mass index, falling into the underweight (7.5%), normal (55.0%), and obese (37.5%) groups. With a ratio of 57.5%, the majority of respondents only had a primary education (SD), followed by junior high school (15.0%) and senior high school (27.5%). In terms of duration, the majority of respondents (65.0%) had worked for more than five years, while the remaining respondents (35.0%) had worked for shorter time.

Just 2.5% of respondents worked more than eight hours a day, while the majority (97.5%) worked eight hours or less. Respondents with low back pain fell into four groups according to the severity of their complaints: low (35.0%), moderate (42.5%), high (15.0%), and extremely high (7.5%). This information shows the range of low back discomfort that employees in this sector encounter.

Bivarial Results

Finding the outcomes of the connection between independent and dependent variables is the goal of bivariate analysis. This study's analysis used the *Chi-Square* test with a significance level of less than 0.05. There is a significant association between the independent and dependent variables if the Sig value is less than 0.05.

Relationship between individual characteristics and the level of low back pain complaints

The investigation used the *Chi-Square* test to ascertain the association between individual characteristics and the degree of complaints related to low back pain. Table 1 displays the *Chi-Square* test findings together with the severity of complaints for low back pain:

Table 1. Age of Respondents

Age of respondent	Lower back pain			Total	Sig
	Ringa	Medium	Weight		
<30 years	14 (73,7%)	5 (26,3%)	0 (0,0%)	19 (100%)	0,001
>30 years	3 (14.3%)	17 (81,0%)	1 (4,8%)	21 (100%)	

Source: (Research data, 2024)

The study's findings showed that the Chi Square test produced a Sig value of 0.001, meaning that the Sig value was less than 0.05. Statistical studies reveal a substantial correlation between the degree of low back pain and several age-related factors.

Table 2. Gender

Gender of respondent	Lower back pain			Total	Sig
	Lightweight	Medium	Weight		
women	17	21	1	39	

	(43,6%)	(53,8%)	(2,6%)	(100%)	0,657
Male	0 (0,0%)	1 (100%)	0 (0,0%)	1 (100%)	

Source: (Research data, 2024)

The study's findings indicate that the Chi Square test produced a Sig value of 0.657, more than 0.05. Numerous gender factors do not significantly correlate with the severity of low back pain, according to statistical testing.

Table 3. Body mass index

Body mass index of respondents	**Lower back pain**			**Total**	**Sig**
	Lightweight	**Medium**	**Weight**		
Skinny	1 33,3%)	2 (66,7%)	0 (0,0%)	3 (100%)	
Normal	14 63,6%)	8 (36,4%)	0 (0,0%)	22 (100%)	0,037
Fat	2 13,3%)	12 (88,0%)	1 (6,7%)	15 (100%)	

Source: (Research data, 2024)

The study's findings showed that the Chi Square test produced a Sig score of 0.037, meaning that the Sig value was less than 0.05. The results of statistical testing indicate a substantial correlation between the degree of low back pain and the various components of body mass index.

Table 4. Education

Education of respondents	**Lower back pain**			**Total**	**Sig**
	Lightweight	**Medium**	**Weight**		
SD	7 (31,3%)	14 (63,6%)	1 (4,5%)	22 (100%)	
SMP	3 (50,0%)	3 (50,0%)	0 (0,0%)	6 (100%)	0,043
HIGH SCHOOL	7 (0,0%)	5 (100%)	0 (0,0%)	12 (100%)	

Source: (Research data, 2024)

The study's findings showed that the Chi Square test produced a Sig value of 0.043, meaning that the Sig value was less than 0.05. The results of statistical testing indicate a substantial correlation between the degree of low back pain and certain gender traits.

The Relationship of Occupational Factors with the Level of Complaints of Low Back Pain

Table 5. Length of service

Respondent's length of employment	Lower back pain			Total	Sig
	Lightweight	Medium	Weight		
8 hours	17 (43,6%)	21 (53,8%)	1 (2,6%)	39 (100%)	0,657
>8 hours	0 (0,0%)	1 (100%)	0 (0,0%)	1 (100%)	

Source: (Research data, 2024)

The study's findings showed that the Chi Square test produced a Sig value of 0.657, meaning that the Sig value was less than 0.05. The results of statistical testing indicate that there is no meaningful correlation between the specific gender traits and the severity of low back pain.

Table 6. Tenure

Respondent's tenure	Lower back pain			Total	Sig
	Lightweight	Medium	Weight		
<5 years	10 (71,4%)	4 (28,6%)	0 (0,0%)	14 (100%)	0,023
>5 years	17 (42,5%)	22 (55,0%)	1 (2,5%)	26 (100%)	

Source: (Research data, 2024)

The study's findings showed that the Chi Square test produced a Sig score of 0.023, meaning that the Sig value was less than 0.05. The results of statistical testing indicate a substantial correlation between the degree of low back pain and certain gender traits.

Discussion

The Relationship between Individual Characteristics and the Level of Complaints of Lower Back Pain in Makaroni Industry Workers in Malang Regency

Age

One of the things that affects complaints of back pain is an individual's age. Although muscular strength decreases with age, older workers tend to have more emotional stability than younger workers, which may improve performance. Age-related changes in the body's physiological function include changes in the organs and tissues; as a result, human activity levels will start to decline while engaging in physically demanding activities or demanding high energy levels. These alterations include a reduction in bone density and muscular strength, both of which may have an impact on an individual's capacity to engage in strenuous or energy-demanding physical activity. Low back pain complaints are uncommon in younger age groups. As people age, they often start to experience low back discomfort around the age of thirty.

According to the Chi Square test findings, the sig value is less than 0.05, with a 0.001 sig value. A statistical analysis reveals a substantial correlation between age and the severity of low back pain. This finding supports a study by Umami (2014), which found that bone deterioration occurs with advancing age and that this condition begins at age thirty. The body starts to degenerate at this stage, resulting in decreasing fluid levels, scar tissue replacing normal tissue, and tissue damage. Each of them causes the flexibility of the muscles and bones to decline. As people age due to the ageing process, there is a corresponding rise in the incidence of low back pain (LBP), according to Orchita et al. (2020). Bone deterioration manifested as tissue turnover into scar tissue, fluid decrease, and tissue injury starts to happen around the age of thirty. As a result, muscles and bones become less stable.

The study's findings suggest that workers in the Malang Regency's macaroni business have a correlation between their age and the frequency of low back pain complaints. This is consistent with a study by Wicaksono (2012) that found a link between respondents' age range of 32 to 42 years old with the start of low back pain.

Gender

There were both men and women working in the manufacturing part of the macaroni business in this research. According to Rasyidah's (2019) study, there is a connection between gender and low back discomfort. Because of differences in hormones between men and women, women in this research reported having low back pain at a higher rate than males.

At a significance level of sig = <0.05, the Chi Square test findings indicate a probability value of 0.567. The study's findings suggest that there is no correlation between a worker's gender and the frequency of low back pain complaints in the Malang Regency macaroni sector. According to this survey, female employees report lower back pain problems at a higher rate than male employees. Out of the total number of participants who reported experiencing low back discomfort, 21

people (53.8%) were female and 1 person (100%) was male. This is also due to the fact that, generally speaking, there are more female employees in the manufacturing sector than male employees.

Men's bone density is losing less quickly than women's. The reason why males have a lesser chance of fractures than women is because men have a lower rate of bone production, which results in thinning of the trabeculae but not extensive or discontinuous perforation. Men's cortical bone mass starts to decline beyond the age of 75, but women's starts to decline in middle life. In order to acquire maximal bone mass in adulthood and preserve bone mass, males need testosterone for maturation at the conclusion of adolescence (Laswati Putra, 2016).

The hormone oestrogen, which is present in women, affects bone density. Oestrogen contributes to bone maturation and growth stoppage near the end of puberty, but it also plays a function in the development of bone length during the early stages of puberty. Men and women have the same chance of developing low back pain or low back pain until the age of 60, despite some professional opinions differing. However, women really have complaints more often than males. For instance, during the menstrual cycle, women's muscular capacity is decreased due to physiological variables (Winata, 2014).

Body mass index

Obesity or excess body weight will weaken the abdominal muscles, pushing the centre of gravity forward and increasing the risk of low back discomfort (Harwanti et al, 2018). Based on the *Chi-Square* test findings, the Sig value is 0.037 at a significance level of sig <0.05, suggesting a correlation between the degree of low back pain complaints and body mass index. The findings of this investigation conflict with those of Amirza's (2018) study, which found no connection between body mass index and complaints of low back discomfort. The majority of respondents had a normal body mass index (BMI), according to the findings of the BMI measurement, however those who are overweight are more likely to have low back discomfort. Carrying too much weight might direct the ensuing body weight towards the abdomen, adding to the strain on the lower back. According to Fitriyani et al. (2015), being overweight puts undue strain on the spine and may cause harm to the surrounding tissue.

One of the several reasons why people gain excess weight is when they consume too much energy from food and beverages compared to what they need for activities. Devianty claims that being overweight or obese has a nutritional association with the development of low back pain. Compared to non-obese persons, a higher percentage of obese people have low back discomfort. This is due to the fact that gaining weight and having a high BMI will increase body weight and put more strain on the spine, making it unstable. Overweight brought on by an abundance of body fat may limit the range of motion in the lumbar joints and make mobility more difficult (Nifu et al, 2020).

Education

An individual's degree of education might reveal how much they know about working with proper posture. A person will get more information the more educated

he is (Umami et al, 2014). Since the *Chi-Square* test resulted in a Sig value of less than 0.043, it is possible to draw the conclusion that there is a substantial correlation between low back pain complaints and education. According to study findings, most workers who only finished elementary school report having more severe low back discomfort than those who completed secondary education (Anggraika et al., 2019).

The workforce's degree of performance or knowledge increases with an individual's educational background. Higher levels of formal and informal education often translate into wider perspectives. A high level of productivity awareness will motivate the affected personnel to operate in a productive manner (Nugraha, 2016). This suggests that a workforce's educational attainment positively influences its attitudes towards work as more educated individuals are better equipped to function at a higher level. One aspect that might really boost the productivity of the company's work is the degree of education. Education, in all of its forms, is crucial to the process of developing and enhancing each person's unique set of professional skills. A person gains the tools necessary to handle difficulties they may encounter in the future by learning how to identify, understand, and use systematic thinking techniques.

Relationship between Occupational Factors and the Level of Complaints of Lower Back Pain in Makaroni Industry Workers in Malang Regency

Length of service

One work-related factor that influences the frequency of complaints of low back pain is the length of one's employment. With a significance threshold of sig <0.05, the Chi-Square test results show a Sig value of 0.023. The study's findings suggest that workers in the Malang Regency's macaroni business have a correlation between their degree of low back pain complaints and tenure. The amount of time a person spends working at a location is known as the working period. Accordingly, low back pain is considered a chronic illness that takes a long time to manifest and cause symptoms for a person (Andini, 2015).

The findings of this research indicate that the work duration of > 5 years is greater than the work period of < 5 years, which is one of the reasons the work term is associated with complaints of low back discomfort. Because prolonged working hours and constant static loads, together with the repeated tasks that each employee does, may also contribute to muscle problems, the longer an individual works. The work period is the culmination of an individual's extended duration of work activity. Muscle performance declines under physical strain after a given amount of time. Over time, daily pressures will build up and lead to a decline in health.

One of the elements that contribute to the development of low back pain is the length of one's working day. When one works with an unergonomic attitude for extended periods of time, pressure on the spine builds up and causes discomfort. According to Andini's (2015) study, employees who have worked for less than five years tend to report low back discomfort. According to study by Rasyidah (2019), there is a correlation (Sig = 0.031) between tenure and low back discomfort, which is consistent with this notion. The majority of research participants had more than five years of job experience.

Length of employment

The duration of work is calculated based on the respondent's work hours. Tarwaka (2015) states that an average worker puts in eight hours a day or forty hours a week at work. Working in a seated posture for extended periods of time adds to the workload. There is no correlation between the duration of work and the number of complaints of low back discomfort, according to the findings of the Chi-Squere statistical test. The Sig value of 0.657 (Sig <0.05) indicates this.

The duration of work refers to how long someone spends working on a task. An average individual works six to eight hours a day at their job. An individual's job skills improve with length of employment (Sangaji et al., 2020). An increase in working hours beyond this point will result in lower production due to burnout, accidents at work, and illnesses connected to the workplace. This study supports studies (Wahab, 2019) showing no correlation between the number of working hours per day and the prevalence of low back pain among employees.

An extended workday raises the possibility of low back discomfort. The physical state of the employee's body affects how long they labour. Excessive physical exertion may impact the functioning of the respiratory, circulatory, and muscular systems, among others. A prolonged period of labour without a break will weaken the body and may result in limb discomfort. A worker's risk of developing back discomfort increases when they work 41–48 hours per week, or an average of 7-8 hours per day, since this results in less downtime and more muscular activity. According to the study's findings, respondents' tenure of employment has an impact on how often they have back discomfort. The number of hours or duration of labour a person puts in each day is known as their length of work.

CONCLUSION

The study's findings indicate that individual variables, including age, gender, body mass index (BMI), and education, might influence the complaints of low back pain. While mild pain was more prevalent in BMI categories, moderate low back pain was more common in certain age, gender, and educational groups. While duration of service revealed no significant connection, occupational characteristics such as length of service showed a significant correlation with complaints of low back discomfort. According to the Nordic Body Map (NBM) questionnaire, most employees reported having moderate to severe discomfort. Improved ergonomics and working conditions in the macaroni business are among the suggestions, along with providing employees with health education. While further study is anticipated to examine additional variables that impact low back pain complaints, workers are urged to stretch on a regular basis.

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