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The relationship between diabetes mellitus (DM) risk factors and random blood sugar levels (RBSL) in managerial and non-managerial positions in the local government of Bener Meriah Regency

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ABSTRACT

Fasting Blood Sugar Level (FBSL) as one of the efforts to detect DM. The study aims to determine the risk factors of DM on FBSL in managerial and non-managerial positions (civil servants) in Bener Meriah Regency. The study used a cross-sectional design. The research sample consisted of 81 managerial and 102 non-managerial respondents. Purposive sampling was used. The study period was from February 20 to June 7, 2024. Data collection involved measurements (height, weight to calculate BMI), blood pressure checks, and KGDS. A questionnaire (IPAQ) was used for interviews on physical activity, and a questionnaire (Riskesdas) from 2018 was used for interviews on risk factors for low fiber consumption and high sugar, salt, and fat consumption. Analysis of Mann Whitney Test and Multiple Logistic Regression data. The results showed that there was a relationship between KGDS and BMI (OR= 2.48; 95%CI=2.48; p-value=0.007). There was no relationship between KGDS and blood pressure (OR= 1.66; 95%CI=0.82-3.35; p-value=0.1520). There is no relationship between KGDS and physical inactivity (OR=1.80; 95% CI=0.82-3.93 p-value=0.1307). There is no relationship between KGDS and low fiber consumption (OR=1.15; 95% CI=0.50-2.61 p-value=0.74). There was no association between KGDS and high sugar, salt, and fat intake (OR=0.90; 95% CI=0.41-1.94; p-value=0.7828). There was no association between group and KGDS occurrence (OR=1.39; 95% CI=0.76-2.53 p-value=0.272). There was no association between random blood glucose levels (KGDS) and blood pressure, physical activity, and dietary patterns. Regular KGDS testing and the implementation of physical activity and balanced nutrition are still recommended.

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INTRODUCTION

Diabetes Mellitus (DM) is one of the global health problems with a prevalence that continues to increase every year. According to (WHO, 2023), More than 422 million people worldwide live with diabetes, and the death rate from this disease reaches around 1.5 million per year. This condition illustrates that diabetes is not only an individual disease, but also a major challenge for public health systems globally, especially because its complications can interfere with the productivity and quality of life of sufferers (Cho et al., 2018).

Nationally, the prevalence of diabetes mellitus in Indonesia continues to increase. Data from the 2018 Riskesdas shows that the prevalence of diabetes mellitus based on blood tests increased from 6.9% in 2013 to 10.9% in 2018 (Riskesdas, 2018). isk factors such as obesity, lack of physical activity, hypertension, low fiber intake, and a diet high in sugar, salt, and fat play a major role in increasing blood glucose levels and worsening diabetes mellitus (Yunir et al., 2023). Changes in modern lifestyles, especially among workers with high workloads, also increase the potential for such risks (Sholeh et al., 2024).

At the local level, differences in job characteristics between managerial and nonmanagerial positions can also affect individuals' lifestyles and health status. Managerial workers tend to have low physical activity due to the dominance of administrative work, while nonmanagerial workers may experience high physical exertion but face the risk of unhealthy food consumption due to irregular eating patterns (Lubis et al., 2024). These factors are thought to influence fasting blood glucose levels (FBG), which can be an early indicator of metabolic disorders and the risk of diabetes mellitus (Kurniasari et al., 2020).

Another study by (Parera et al., 2023) shows that low physical activity is significantly associated with increased fasting blood glucose levels ($p < 0.05$). Meanwhile, Dewa et al. (2022) found that workers with a BMI (Body Mass Index) > 25 had higher blood glucose levels than workers with a normal BMI (Dewa et al., 2022). Hypertension is also often associated with impaired glucose tolerance due to increased insulin resistance. These factors interact with each other to worsen the body's metabolic balance (Vania et al., 2023).

With the increasing prevalence of diabetes mellitus and variations in risk factors based on job type, it is important to examine the relationship between diabetes mellitus risk factors and fasting blood glucose levels (FBG) in groups of workers with different occupations. This study is expected to provide empirical evidence on the effects of obesity, physical inactivity, hypertension, low fiber intake, and high intake of sugar, salt, and fat on BGLC, thereby providing a basis for the development of strategies for the prevention and control of diabetes mellitus in the workplace.

RESEARCH METHOD

This study aims to determine the relationship between diabetes mellitus risk factors and FBSL in managerial and non-managerial positions of the Civil Service (ASN) of the Bener Meriah Regency Government. This study uses a *cross-sectional study* design (Notoatmodjo, 2018). The population in this study consisted of all civil servants in the Bener Meriah Regency Local Government, totaling 4,352 people, comprising 349 managerial positions and 4,003 non-managerial positions. The sample for this study consisted of 81 managerial positions and 102 non-managerial positions. Respondents were selected using the Slovin formula. The sampling technique used was *purposive sampling* (Akbar, 2022). Research period: February 20 - June 7, 2024.

Data was collected through secondary data collection, while primary data was obtained through measurements, examinations, and structured interviews using questionnaires. Data collection using purposive sampling was assisted by seven enumerators working at the Health Office. Data collection steps: Obtaining permission to conduct the research, explaining the purpose of the research to the head of the agency or representative, conducting measurements and

interviews. Data collected through several stages, namely: Editing, Coding, Transferring, Data Entry, and Tabulating (Sugiyono, 2018). Data analysis was conducted in stages as follows: a) Univariate analysis is used to describe the frequency distribution of each variable, including measures of central tendency and dispersion, and can be presented in tabular or graphical form; b) Bivariate analysis was conducted to determine whether there was a relationship between the independent variables and the dependent variables, using mean values. The Mann-Whitney test was used because the data was not normally distributed; c) Multivariate analysis was performed using multiple logistic regression tests with a 95% confidence level, as well as examining the simultaneous effect of independent variables on dependent variables by controlling for confounding variables (Sutadji et al., 2022).

RESULTS AND DISCUSSIONS

The characteristics of the respondents in this study will provide an overview of the frequency distribution of KGD, age, gender, highest level of education, age, educational background, BMI, blood pressure, physical activity, consumption of fruits and vegetables, and high consumption of sugar, salt, and fat. The data on the distribution of respondent characteristics is presented in Table 1.

Table 1. Distribution of respondent characteristics based on non-managerial and managerial groups

Variable Name	Grup					
	Non-managerial			Managerial		
	Mean±SD	F	%	Mean±SD	F	%
FBSL	119±41,61			140±59,75		
Normal		46	45.10		3037.04	
Abnormal		56	54.90		5162.96	
Age	42.09±7.62			47.1±6.30		
Gender						
Male		22	21.57		5061.73	
Women		80	78.43		3138.27	
Education						
SMA		2	1.96		1	1.23
D3		23	22.55		5	6.17
S1		69	67.65		5365.43	
S2		8	7.84		2227.16	
Latar Belakang Pendidikan						
Kesehatan		45	44.12		1720.99	
Non Kesehatan		57	55.88		6479.01	
body mass index (BMI)	27.18±4.15			35.11±52.39		
Normal		31	30.39		2024.69	
Thin		2	1.96		0	0
Fat		69	67.65		6175.31	
Blood Pressure						
Systolic	117.5±16.05			126.7±17.74		
Diastolic	78.28±5.76			81.17±7.33		
Normal		84	82.35		5365.43	
Abnormal		18	17.65		2834.57	
Physical Activity	5939±2969			6292±3787		
Weight		83	81.37		6479.01	
Currently		19	18.63		1720.99	
Fiber Intake from Vegetables and Fruits	3.23±1.36			3.22±1.43		
Enough		16	15.69		1113.58	
Less		86	84.31		7086.42	
High Consumption of Sugar, Salt, and Fat	2.63±2.63			2.37±1.74		
<1 time/day		23	22.55		1012.35	
≥1 time/day		79	77.45		7187.65	

Based on Table 1 above, it shows that in non-managerial positions, the average FBSL is 119, with 45.1% normal FBSL and 54.9% abnormal FBSL, while in managerial positions, the average FBSL is 140, with 37.04% normal FBSL and 62.96% abnormal FBSL. Based on age, the average FBSL for non-managerial positions is 42.09 and for managerial positions is 47.1. Based on gender, 21.57% of non-managerial positions are held by men and 78.43% by women, while 61.73% of managerial positions are held by men and 38.27% by women. Based on education, in non-managerial positions, 1.96% had a high school diploma, 22.55% had a DIII diploma, 67.65% had a bachelor's degree, and 7.84% had a master's degree, while in managerial positions, 1.23% had a high school diploma, 6.17% had a DIII diploma, 65.43% had a bachelor's degree, and 27.16% had a master's degree.

In non-managerial positions based on educational background, 44.12% are in health-related fields and 55.88% are in non-health-related fields, while in managerial positions, 20.99% are in health-related fields and 79.01% are in non-health-related fields. In non-managerial positions, the average obesity rate is 27.18%, normal weight 30.39%, underweight 1.96%, and overweight 67.65%, while in managerial positions, the average obesity rate is 35.11%, normal weight 24.69%, and overweight 75.31%. For non-managerial positions, normal blood pressure was 82.35%, abnormal blood pressure was 17.65%, while for managerial positions, normal blood pressure was 65.43% and abnormal blood pressure was 34.57%.

Meanwhile, in non-managerial positions, the average physical activity level was 5939, with 81.37% heavy physical activity and 18.63% moderate physical activity, while in managerial positions, the average was 6292, with 79.01% heavy physical activity and 20.99% moderate physical activity. Regarding vegetable and fruit fiber consumption, non-managerial positions had an average of 3.23, with 16% consuming enough and 86% consuming less, while managerial positions had an average of 3.22, with only 13.58% consuming enough and 86.42% consuming less. Regarding high sugar, salt, and fat consumption in non-managerial positions, the average was 2.63, with <1 time/day at 22.55% and ≥1 time/day at 77.45%. while in managerial positions, the average is 2.37, where high sugar, salt, and fat consumption is <1 time/day at only 12.35%, and ≥1 time/day reaches 87.65%.

Table 2. Table of normality test distribution for non-managerial and managerial positions

Variable	*P-value*	Data distribution (Non-Managerial)	Variabee	*P-value*	Data distribution (Managerial)
FBSL	0,000	Abnormal	FBSL	0,000	Abnormal
body mass index (BMI)	0,46	Normal	BMI	0,000	Abnormal
Systolic	0,015	Abnormal	Systolic	0,079	Normal
Diastolic	0,001	Abnormal	Diastolic	0,18	Normal
Physical Activity	0,000	Abnormal	Physical Activity	0,0005	Abnormal
Fiber Intake Vegetables and Fruits	0,156	Normal	Fiber Intake Vegetables and Fruits	0,006	Abnormal
High Consumption	0,000	Abnormal	High Consumption	0,000	Abnormal

Based on Table 2 above, it shows that in non-managerial positions, the data that is normally distributed is that which has a P-Value >0.005, namely in the variables of BMI and Vegetable and Fruit Fiber Consumption. Meanwhile, in managerial positions, the data that is normally distributed is Systolic and Diastolic.

Bivariate analysis in this study was conducted to determine the relationship between independent variables and dependent variables and to examine the relationship and differences between the non-managerial group and the managerial group. The statistical test used was the Mann-Whitney test because the variables were not normally distributed. The results of the analysis are as follows:

Bivariate Analysis
Relationship Between Variables Based on Non-Managerial and Managerial Groups

Table 3. Relationship between variables based on non-managerial and managerial groups

Variable	Grup		p-value
	Non-managerial	Managerial	
FBSL			
Mean ± SD	119±41,61	140±59,75	0.0027
body mass index (BMI)			
Mean ± SD	27.18±4.15	35.11±52.39	0.5915
Systolic Blood Pressure Diastolic Blood Pressure			
Mean ± SD	117.5±16.05	126.7±17.74	0.0002
	78.28±5.76	81.17±7.33	0.0044
Physical Activity			
Mean ± SD	5939±2969	6292±3787	0.8584
Fiber Intake from Vegetables and Fruits			
Mean ± SD	3.23±1.36	3.22±1.43	0.8109
High Consumption of Sugar, Salt, and Fat			
Mean ± SD	2.63+2.63	2.37+1.74	0.6278

Based on Table 3 above, it can be seen that the average FBSL for non-managerial positions is 119, while for managerial positions it is 140. The average Obesity variable in the Non-managerial position group is 27.18 and in the Managerial position group is 35.11, while the average Systolic Blood Pressure variable in the Non-managerial position is 117 and in the Managerial position is 126.6, and the average Diastolic Blood Pressure variable in the Non-managerial position is 78.28 and in the Managerial position is 81.17. For the Physical Activity variable, the average for non-managerial positions was 5939 and for managerial positions was 6292. For Vegetable and Fruit Fiber Consumption, non-managerial positions scored 3.23 and managerial positions scored 3.22, which can be considered the same between the two. For the High Sugar, Salt, and Fat Consumption variable, non-managerial positions scored 2.63 and managerial positions scored 2.37.

Relationship Between Variables Based on FBSL Events in Non-Managerial and Managerial Groups

Table 4. Relationship between variables based on FBSL occurrence in non-managerial and managerial groups

Variabel	Blood Sugar Level				*OR*	*95%CI*	p-value
	Normal		Abnormal				
	N	%	N	%			
Civil Service (ASN)							
Non-managerial	46	45.10	51	54.90	1.39	0.76–2.53	0.272
Managerial	30	37.04	56	62.96			
body mass index (BMI)							
Normal	29	56.86	22	43.14	1.12	1.03-1.23	0.0015
Thin	2	10	0	0	1	*Empty*	*empty*
Fat	45	34.62	85	65.38	2.48	2.49	0.007
Blood Pressure							
Normal	61	44.53	76	55.47	1.66	0.82-3.35	0.1520
Abnormal	15	32.61	31	67.39			
Physical Activity							
Weight	65	44.22	82	55.78	1.80	0.82-3.93	0.1307
Currently	11	31.43	25	69.44			
Fiber Intake from Vegetables and Fruits							
Enough	12	44.44	15	55.56	1.15	0.50-2.61	0.74
Less	64	41.03	92	58.97			
High Consumption of Sugar, Salt, and Fat							
<1 time/day	13	39.39	20	60.61	0.90	0.41-1.94	0.7828
≥1 time/day	63	42.00	87	58.00			

Based on Table 4, normal FBSL is higher in the non-managerial group at 45.10%, compared to the managerial group at only 37.04%. Meanwhile, abnormal FBSL is higher in the managerial group at 62.96%, compared to the non-managerial group at only 54.96% with an Odds Ratio (OR) of 1.39, which means that the managerial group is 1.39 times more at risk of experiencing abnormal FBSL than the non-managerial group, with a p-value of 0.272, meaning that there is no relationship between the group and the occurrence of FBSL.

In BMI, the highest normal FBSL in normal BMI was 56.86% compared to 34.62% in obese BMI, while the highest abnormal FBSL in obese BMI was 65.38% compared to 43.14% in normal BMI, with an OR of 2.48, meaning that obese BMI has a 2.48 times higher risk of abnormal FBSL than normal BMI, with a p-value of 0.007, indicating a significant relationship between FBSL and BMI. Meanwhile, the highest normal FBSL was found in normal blood pressure at 44.53% compared to abnormal blood pressure at 32.61%. Meanwhile, the highest abnormal FBSL was found in abnormal blood pressure at 67.39%, compared to normal blood pressure at 55.47%, with an OR of 1.66, meaning that abnormal blood pressure carries a 1.66 times higher risk of abnormal FBSL compared to normal blood pressure, with a p-value of 0.1520, indicating that this relationship is not significant.

Normal FBSL was highest during heavy physical activity at 44.22% compared to moderate physical activity at 31.43%. Meanwhile, abnormal FBSL was higher in moderate physical activity at 69.44% compared to heavy physical activity at 55.78%, with an OR of 1.80, meaning that moderate physical activity carries a 1.80 times higher risk of abnormal FBSL compared to heavy physical activity, with a p-value of 0.1307, meaning that there is no significant relationship between the level of physical activity and the incidence of FBSL. For vegetable and fruit fiber consumption (Rais et al., 2025), normal FBSL was highest at adequate consumption, which was 44.44% compared to insufficient consumption, which was 41.03%, while abnormal FBSL was higher at insufficient vegetable and fruit fiber consumption, which was 58.97% compared to adequate consumption, which was 55.56%. with an OR of 1.15, meaning that insufficient vegetable and fruit fiber consumption carries a 1.15 times higher risk of abnormal FBSL compared to adequate vegetable and fruit fiber consumption, with a p-value of 0.74 indicating that there is no significant relationship between fiber consumption and FBSL. High consumption of sugar, salt, and fat FBSL is normal in those who consume ≥1 time/day, namely 42%, compared to those who consume <1 time/day, namely 39.39%. Meanwhile, abnormal FBSL is highest in those who consume <1 time/day, namely 60.61%, compared to those who consume ≥1 time/day, namely 58%. with an OR of 0.9, meaning that high consumption of sugar, salt, and fat ≥1 time/day carries a 0.9 times higher risk of abnormal FBSL compared to those who consume <1 time/day with a p-value of 0.7828, meaning that no significant relationship was found between high consumption of sugar, salt, and fat and FBSL.

The Relationship between Non-Managerial and Managerial Positions and FBSL Incidents

Table 5. Relationship between non-managerial and managerial positions and FBSL incidents

Variable	Group				*OR*	*95%CI*	p-value
	Non-managerial		Managerial				
	N	%	N	%			
FBSL							
Normal	46	60.53	30	39.47	1.39	0.77-2.53	0.2709
Abnormal	56	52.34	51	47.66			

Based on Table 5.5 above, the highest non-managerial position experienced 60.53% normal FBSL and 52.34% abnormal FBSL, while in the highest managerial group, 47.66% experienced abnormal FBSL and 39.47% experienced normal FBSL with an odds ratio of 1.39, which means that the managerial group is at risk of experiencing an increase in abnormal FBSL by 1.39 times

compared to the non-managerial group, with a p-value of 0.2709, meaning that there is no relationship between job group and the occurrence of FBSL.

Multivariate Analysis

The Most Dominant Factors Related to Blood Sugar Levels in Non-Managerial and Managerial Groups

Multivariate analysis was conducted to determine the most dominant factors associated with fasting blood sugar levels in managerial and non-managerial positions. Variables suitable for inclusion in multivariate analysis using multiple logistic regression tests were those with a p-value < 0.25 in bivariate analysis. These variables included the following:

Table 6. Most dominant factors related to blood sugar levels in non-managerial and managerial groups

Variable	p-value	AOR 95%CI
body mass index (BMI)		
Normal	0.557	1.04
Thin	Empty	1
Fat	0.255	1.786
Blood Pressure		
Normal	0.320	1.450
Abnormal		
Physical Activity		
Weight	0.152	2.030
Currently		

Based on Table 6 above, in non-managerial and managerial positions, the most dominant factor associated with FBSL was BMI (p-value = 0.557 and AOR 95% CI = 1.04), with respondents who were obese 0.557 times more likely to experience an increase in FBSL compared to those with normal weight. Blood pressure (p-value = 0.320 and AOR 95% CI = 1.450), respondents with abnormal blood pressure are 0.320 times more likely to experience an increase in FBSL compared to those with normal blood pressure. Physical activity (p-value = 0.152 and AOR 95%CI = 2.30), respondents with moderate physical activity were 0.152 times more likely to experience an increase in FBSL compared to those with heavy physical activity.

Relationship Between Groups and Blood Sugar Levels

Theoretically, differences in blood sugar levels can be influenced by group characteristics such as age, gender, occupation, or socioeconomic status. According to metabolic physiology theory, increasing age and decreasing insulin sensitivity are important factors that affect glucose homeostasis (Hall & Hall, 2020). Research by (Rahayuwati et al., 2020) found that people over the age of 45 had higher blood glucose levels than younger people. This study shows that biological aging plays a role in increasing insulin resistance and the risk of type 2 diabetes mellitus. As a person ages, the body's ability to maintain normal glucose levels decreases due to a decline in insulin secretion by the pancreas (Arifah, 2021).

The Relationship Between Obesity and Blood Sugar Levels

Obesity increases insulin resistance through the accumulation of visceral fat, which causes low-grade chronic inflammation and impaired glucose metabolism. According to the Energy Homeostasis Theory, excess calorie intake beyond requirements will be stored as fat, triggering oxidative stress and insulin resistance (WHO, 2023). (Nurhidayati et al., 2022) found a significant relationship between obesity and high blood glucose levels in adolescents in Indonesia. Adolescents with a BMI ≥25 had fasting blood glucose levels 15–25 mg/dL higher than those of normal weight. These results were reinforced by (Evi et al., 2022) which reported that being overweight directly increases blood sugar levels due to an increase in abdominal fat that interferes with insulin regulation. However, Sri (2019) reported that not all obese individuals experience high

blood sugar levels. These results are associated with high levels of physical activity and low-carbohydrate eating habits in some of the research subjects (Sri Sudewi & Bahtera Purba, 2019).

Level of Physical Activity with Blood Sugar Levels

Physical activity plays a role in increasing insulin sensitivity and accelerating glucose uptake by muscles. Physiologically, muscle contraction during exercise increases GLUT4 transporter expression independently of insulin (Bayushi, 2023). According to the results of the study (Mega et al., 2024) states that physical activity of ≥150 minutes per week significantly reduces the risk of hyperglycemia in pregnant women with a predisposition to diabetes. In addition, (Niken, 2024) reported that patients with type 2 diabetes mellitus who had moderate to high levels of activity had lower blood glucose levels than those with low activity levels.

Relationship between Hypertension Risk Factors and Blood Sugar Levels

Hypertension and hyperglycemia often occur together because they share the same pathophysiological basis, namely insulin resistance. Excess insulin can increase sodium reabsorption in the kidneys and renin-angiotensin system activity, which causes blood pressure to rise (Syaharani & Mayasari, 2024). According to research from (Alfian et al., 2023) The results of the chi-square analysis show that there is no significant relationship between blood sugar levels and the occurrence of stroke, with a p-value of 0.769.

Relationship between Risk Factors of an Unbalanced Diet (high sugar, salt, and fat) and Blood Sugar Levels

A diet high in sugar, salt, and saturated fat causes carbohydrate metabolism disorders and increased blood glucose levels. According to the Glycemic Load theory, eating foods with a high glycemic index increases excessive insulin response and ultimately reduces insulin sensitivity (Tantri et al., 2024). Research results (Syuryadi et al., 2025) shows a significant relationship between junk food consumption habits and an increase in waist circumference and high blood sugar levels. This is in line with (Mariana et al., 2025) which emphasizes the importance of a diet low in sugar, salt, and fat in maintaining stable blood glucose levels.

Relationship between Low Fiber Risk Factors (Vegetable and Fruit Fiber Consumption) and Blood Sugar Levels

Fiber slows down glucose absorption in the intestines, increases satiety, and lowers the glycemic index of foods. Soluble fiber (such as pectin and beta-glucan) inhibits glucose absorption, thereby helping to control blood sugar levels (Maulina et al., 2025). Research (Amanda, 2024) shows that low fiber consumption (<25 grams/day) is associated with an increase in blood sugar levels. Negative control blood sugar levels decreased by 13%. Blood sugar levels of 16% mg decreased by 11%. Blood sugar levels of 30% mg decreased by 17%. Blood sugar levels of 64% mg decreased by 25%. Positive control blood sugar levels (glibenclamide) decreased by 25%. The distribution was normal, $p>0.05$.

CONCLUSION

This study concluded that Body Mass Index (BMI) is a factor significantly associated with fasting blood sugar levels (FBSL) among civil servants in Bener Meriah Regency, where respondents with obese BMI had a higher risk of increased FBSL, while blood pressure, physical activity, and consumption patterns of fiber and foods high in sugar, salt, and fat showed no significant association. Practically, these findings recommend the implementation of early detection and regular FBG testing, especially among civil servants with excessive BMI, as well as strengthening workplace health programs focused on weight control, increasing physical activity, and adopting a balanced diet. Academically, further research is recommended using longitudinal or cohort designs and adding other variables such as family history and lifestyle factors to strengthen causal

evidence, while considering that cross-sectional designs, the use of self-reported data, and research location limitations restrict the interpretation and generalization of results to a wider population.

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