Relationship Between Stress Levels With the Ankle Brachial Index (ABI) Value as Early Detection of Peripheral Arterial Disease (PAD) and Diabetes Mellitus Type II

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ABSTRACT

As they age, many seniors experience stress. Stress is a person's inability to cope with challenges, which can lead to increased blood sugar. Blood sugar is a source of energy for energy production. One indicator for detecting PAD is the ABI. is a diagnostic examination of the lower extremities to detect the possibility of decreased peripheral perfusion by comparing the systolic pressure of the ankle and arm. Research This aim to analyze the relationship between stress levels and blood sugar with *the Ankle Brachial Index* (ABI) value as an early detection of *Peripheral Arterial Disease* (PAD) in type II diabetes mellitus patients at the Elderly Posyandu, Mlajah Village, Bangkalan. This type of research is analytic correlation with cross-sectional design The population in this study was the entire population of type II DM patients at the Elderly Posyandu, Mlajah Village, Bangkalan with a total of a sample of 42 respondents, using the *probability sampling technique* , namely *simple random sampling* . Variables Independent Stress Level and Variables dependent ABI value with research statistical test use *Spearman rank* obtained the *p value* (0.000) with a significance level of α (0.05), meaning *the p* value <α with the conclusion that there is connection between level stress and sugar blood with ABI value . Based on the interpretation table of stress levels with ABI values, the r value is (0.516), and the interpretation table of blood sugar with ABI values, the r value is (0.636) so that the correlation between the two variables can be said to be strong. Stress levels, blood sugar levels, and ABI values are related. This research is expected to help the public, especially those with diabetes mellitus who participated, improve their health.

Keywords: Stress Level , Diabetes Mellitus, Ankle Brachial Index, Elderly.

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INTRODUCTION

Elderly is someone who has enter 60 years old and above . The elderly will experience various change physical , mental, and social that can cause depression or dissatisfaction (Widyyati, 2020) . Several type diseases in the elderly namely , hypertension , stroke, inflammation joints or rheumatism , acid gout , and diabetes mellitus (Fitriana & Salviana, 2021) .

Diabetes Mellitus is a disease caused by impaired blood sugar absorption by the body, resulting in high blood sugar levels. This high blood sugar level is what causes diabetes

and, in turn, various other health complications. Diabetes Mellitus is a disease that arises from high blood sugar levels (hyperglycemia). Further impacts result in tissue damage and the development of diabetic foot ulcers or gangrene in people with diabetes mellitus. Impaired blood flow in the feet can be detected using an ultrasonic Doppler examination tool. This tool is used to measure *the ankle-brachial index* (ABI), which measures the ratio of systolic pressure in the lower leg to systolic pressure in the arm. (Kuadrat, 2022)

The Ankle-Brachial Index (ABI) is an assessment to determine the presence of disorders in the peripheral arteries that usually occur in complications of diabetes mellitus ulcers, the lower *the Ankle-Brachial Index* (ABI) value indicates a higher level of blood circulation disorders to the periphery, especially in the leg area (Kuadrat., 2022) . *The Ankle-Brachial Index* (ABI) has an important relationship with Diabetes Mellitus (DM), especially in detecting the risk of peripheral artery disease (PAD) in diabetes sufferers.

The World Health Organization (WHO) even estimates that the incidence of diabetes in Indonesia will increase drastically to 21.3 million people by 2030. As many as 90% of total diabetes cases are type 2 diabetes. Type 2 diabetes generally occurs in adults, but in recent years it has also been found in children and adolescents. This is closely related to an unbalanced diet and lack of physical activity that cause children to be overweight or obese. Based on data (Riskesdas, East Java 2023), the prevalence of diabetes mellitus reached 6.8%, placing it among the 10 provinces with the highest prevalence in Indonesia. In Bangkalan district in 2023, as many as 1172 million people suffered from type 2 diabetes mellitus (Bangkalan Health Office 2023).

Based on studies introduction in September 2024 at Posyandu Elderly Ward Explore the get results as many as 50 people with *Diabetes mellitus ,* from 10 samples 7 respondents were obtained own The ABI value (0.67) was included in the moderate PAD category and 3 respondents own ABI value ≤ 0.40 is included in the severe PAD category Because until experience ulcers on the feet.

That matter can happen Because a number of factor . One of the factor risks that can occur influence ABI value in diabetes mellitus patients is one of them is stress and sugar blood (Supriyadi et al., 2024) . Stress and Diabetes Mellitus own attachment if level stress tall can cause level sugar increased in diabetes mellitus sufferers which can cause changes in value *ankle brachial index* (ABI). If somebody experiencing mild stress will impact on normal ABI 0.90 – 1.31, on the other hand if experiencing severe stress can cause changes in low ABI values , so potential occurrence PAD disease (Ingrosso et al., 2023) .

Impact ABI values in diabetes mellitus sufferers . If low ABI value signify PAD conditions , whereas ABI value too high tall signify existence stiffness in the vessels blood peripheral (Bharata et al., 2021) . Decline ABI value if No quick handled can cause appear symptom clinical ischemia and necrosis network and will gangrene occurs so that risky happen amputation of the leg. (Decroli, 2015 in Salsabila, 2023) . For increase mark *Ankle Brachial Index in* diabetes mellitus patients can done in a way pharmacology and non-pharmacology .

METHOD

Study This is done at the Posyandu Elderly Ward Explore use design *analytic correlational* . With a *cross-sectional approach,* the population elderly a total of 50 and statistical tests using the *Spearman rank test* as much as 42 respondents, using *simple random sampling* . Independent variable stress level and dependent variable value *Ankle Brachial Index* . Use questionnaire *DASS,* and Standard Operational Procedure / SOP *Ankle Brachial Index* (ABI).

FINDING AND DISCUSSION
Table 1 : .Data General
Table 1.1 Frequency Distribution of Respondents Based on Age at the Elderly Posyandu in Mlajah Village

Age	Frequency	Percentage %
Age Mid *(Middle Age)* 45-59 years	9	21.4%
Carry on Age *(Elderly)* 60-74 years	31	73.8%
Continued Old Test *(Old)* 75-90 years old	2	4.8%
Total	42	100%

Based on table on age data obtained respondents part big age carry on age (*elderly age*) 60 – 74 years as many as 31 respondents with percentage (73.8%).

Table 1.2 Frequency Distribution of Respondents Based on Type Gender at the Elderly Posyandu in Mlajah Village

Type Sex	Frequency	Percentage %
Man	6	14.3%
Woman	36	85.7%
Total	42	100%

Based on table 1.2 above obtained data type sex respondents almost all of it various sex Woman as many as 36 respondents with percentage (85.7%).

Table 2 : .Data Special
a. Special Data
Table 2.1. Frequency distribution of respondents based on stress levels at the Ceria Lansia Posyandu, Mlajah Village, Bangkalan, December 2024

Stress Level	Frequency	Percentage %
Normal	4	9.5%
Light	8	19%

	Frequency	Percentage %
Currently	15	35.7%
Heavy	13	31%
Very heavy	2	4.8%
Total		100%

Based on table on obtained level data stress almost half of it in category currently as many as 15 respondents with percentage (35.7%).

Table 2.2. Frequency distribution of respondents based on ABI values at the Ceria Lansia Posyandu, Mlajah Village, Bangkalan, December 2024

ABI Value	Frequency	Percentage %
Normal	12	28.6%
Light PAD	16	38.1%
Medium PAD	11	26.2%
Heavy PAD	3	7.1%
Total		100%

Based on table on ABI value data was obtained almost half of it respondents in category light as many as 16 respondents with percentage (38.1%).

Table 2.3. Cross-tabulation between stress levels and ABI values at the Ceria Lansia Posyandu, Mlajah Village, Bangkalan, December 2024

		ABI								Total	
		Normal		Light		Currently		Heavy			
		f	%	f	%	f	%	f	%	f	%
Level stress	Normal	2	4.8	2	4.8	0	0	0	0	4	9.5
	Light	3	7.1	5	11.9	0	0	0	0	8	19
	Currently	4	9.5	9	21.4	2	4.8	0	0	15	35.7
	Heavy	3	7.1	0	0	7	16.6	3	7.1	13	31
	Very heavy	0	0	0	0	2	4.8	0	0	2	4.8
Total		12	28.6	16	38.1	11	26.2	3	7.1	42	100

Statistical Test *Spearman Rank*

$\alpha = 0.05$

$p = 0.00$

$r = 0.516$

Based on the table, it can be explained that respondents who have a stress level in the moderate category are in the mild ABI category, amounting to 9 respondents with a percentage of (21.4). From the results of the *Spearman Rank statistical test, the p value* (0.00) <α (0.05) was obtained . With mark coefficient correlation of 0.516 so that H1 is

accepted and H0 is rejected . This means that there is connection level stress with ABI Value as detection Early PAD in Elderly with Diabetes Mellitus Type II with level correlation strong

DISCUSSION

Overview of Stress Levels in Type II Diabetes Mellitus Patients

Based on distribution frequency education stress levels in diabetes mellitus patients type II at integrated health posts elderly Ward Explore . DM patient education is partly big from respondents educated low (<SMA). Based on study on obtained patient outcomes DM sufferers have moderate stress level due to part big own work as a housewife.

According to analysis researchers level stress is inability somebody in face something problems that can be cause disorders of the body and mind . Stress levels can experienced from self individuals , families , and public matter This happen every moment during life ongoing . So that in patients with diabetes mellitus type II can experience problems that are not can resolved . Stress level divided in normal, light , moderate , heavy and very severe categories weight . In the study This results questionnaire level stress show that almost from half of it own level stress moderate . This is happen Because almost from half of it diabetes mellitus patients type II educated low (< SMA), thing This Because level stress in diabetes mellitus patients type II can influenced by the level education they . Patients with education more tall tend own greater understanding Good about disease , management stress , and patterns life healthy , so that can manage stress with more effective . On the other hand , patients with education more low Possible experience stress more tall consequence lack of understanding about care , limitations access information , or inability overcome complications .

Part respondents own work as a housewife, this This due to housewives with diabetes mellitus type 2 who experience level stress currently generally face pressure from various not quite enough answer , such as look after family , work House stairs , and limitations time For nurse self . Stress level currently Can appear consequence demands everyday that still can controlled but , still give burden psychological , such as limitations economy , lack of support family , or difficulty arrange pattern eating and activities physical . If stress This No managed with good , can influence control sugar blood and health term long patient .

This matter in line with study Supriyadi (2024), which shows that respondents who have level stress mild in patients with diabetes mellitus type II partial big respondents always Be patient in face disturbance to things to do . Some big respondents also did not feel difficult For calm after make annoyed and not feel has use up Lots energy Because worried matter This show that factor education own impact on diabetes mellitus patients type II. Increasingly tall education as well as can manage work with good stress can overcome (Supriyadi et al., 2024). This is also reinforced with study Husna & Darliana (2022), explains that people who do not Work will more prone to caught stress compared to with those who work . As a result No own work DMT2 patients will more often think about cost For his life and burden thought This can cause DMT2 patients who do not Work

easy experience stress . Uncontrolled stress controlled can increase level hormone cortisol , which contributes to increased level glucose blood , worsening diabetes conditions , and improve risk complications (Husna & Darliana, 2022) .

Overview of ABI Values in Type II Diabetes Mellitus Patients

Based on distribution frequency ABI values in diabetes mellitus patients type II at integrated health posts elderly Ward Traveling , almost from half respondents own ABI category value light . Based on type sex Type II DM patients were found almost from all of it respondents various sex women . This is proven with light ABI value due to diabetes mellitus sufferers type II at integrated health posts elderly Ward Explore seldom do activity physique .

According to analysis researchers ABI value is inspection For detect existence decline perfusion peripheral with method compare pressure blood systolic highest from second ankles and arms . The ABI principle is the same with pressure blood which is results distribution between pressure blood peripheral with rainfall heart . If pressure blood peripheral with rainfall heart increase so will happen improvement blood . This is what can occurs in people with diabetes mellitus type II experiences ineffectiveness perfusion network peripheral . The ABI value is divided in normal category , mild PAD, moderate PAD , and severe PAD . In the study This results ABI value almost from half respondents own category light matter This happen Because diabetes mellitus patients type II almost from all of it various sex women . Elderly people who have experiencing menopause, the risk of PAD increases drastic consequence decline estrogen levels , which play a role in guard elasticity vessels blood . As a result , women with mild ABI more prone to experience difficult diabetic foot ulcers healed , even though symptom painful due to PAD not always appear . Condition This be one of complications serious about diabetes because potential cause painful leg , wound difficult healed , until amputation . Elderly women are also more prone to experience disturbance mobility and activity low physical , so that can happen decline perfusion blood to extremities lower .

This matter selajan with study Widyanata (2023), low ABI value affected by irregularity consume antihyperglycemic drugs , irregularity do activity physical , irregularity do foot care and irregularities implementing a DM diet (Widyanata et al., 2023). This strengthened with study Yuliantini (2023), before done exercise activity physique like exercise movement joints , there are respondents in research that has ABI value weight so that it requires handling so as not to happen ischemia in patients . After the activities physical condition in diabetes mellitus sufferers type II partial big on type sex Woman own normal ABI values This due to existence improvement strength muscle after done activity physique (Yuliantini et al., 2023) . This is also reinforced with study Kartikadewi et al., (2022), Decline estrogen levels after menopause in women carry on age also contributes to improvement risk atherosclerosis , which can cause decline ABI value .

Combination between factor age , control sugar suboptimal blood , and these hormonal changes increase risk the occurrence of PAD in women carry on age with diabetes mellitus type 2. Therefore that 's important for Woman carry on age with diabetes mellitus

type 2 for do ABI examination routine use detect early existence disturbance circulation blood . Besides that , management level sugar good blood and increase activity physique in accordance ability can help prevent decline ABI values and complications related other (Kartikadewi et al., 2022) .

Relationship Between Stress Level and *Ankle Brachial Index Value*

Based on statistical test results use *Spearman Rank* obtained mark *p value* (0.000) with level significance α (0.05), means mark *p value* < α. With thus from results analysis can concluded that H0 is rejected and Ha is accepted , which means There is connection between stress levels with ABI values at integrated health posts elderly Ward Explore . Based on table interpretation results r value shows that big mark *Correlation Coefficient* (0.516), so correlation between second variables can it is said correlation his strong .

According to analysis researcher is one of those who can done For normal ABI value is with guard pattern think positively , that problems that occur can searched for the solution . Response body someone who experiences stress will impact on the increase sugar blood so that experience changes in the ABI value . When somebody experience stress , body release hormone cortisol and adrenaline, which in term long can cause improvement pressure blood and insulin resistance . Conditions This speed up damage vessels blood , increase risk atherosclerosis , and inhibits flow blood to the feet. In patients with diabetes mellitus type II with control sugar bad blood , effects stress become more critical Because can cause thickening wall arteries , worsening narrowing vessels blood , and finally happen changes in the ABI value , meaning the more heavy somebody experience problem , then will impact on the ABI value so that can experience change .

This matter in line with study Supriyadi (2023), Tabulation results cross show that level mild stress will impact on the normal *Ankle Brachial Index* relationship significant between level stress with ABI value . Patient with level stress more tall tend own higher ABI values low . This is emphasize importance management stress For prevent decline ABI values in diabetes mellitus patients type 2 (Supriyadi et al., 2023). This strengthened with research by Fatimah & Purwanti (2024), the relationship between level stress with ABI values in diabetes mellitus patients type 2. The result show that management good self relate with higher ABI values good , which can influenced by the level stress patient.

If somebody No can finish problem with good , and not done precise control can experience decline ABI value so that can increase occurrence complications and can endanger soul if No quick handled (Fatimah & Purwanti, 2024) . This is also reinforced with research by Lase & Laoli (2024), that diabetes sufferers in term long time 5 years or more can caused by the level of glucose that is not controlled so that result in hyperglycemia and stress resulting in decline health in a way overall consequence various disease excessive hyperglycemia cause wall vessels blood become weak and fragile so that happen blockage in the blood vessels blood small and resulting in changes in ABI values (Lase & Laoli, 2024) .

CONCLUSION

1. Almost from half of it respondents own moderate stress levels at Posyandu Elderly Ward Explore
2. Part big respondents own mild ABI values at Posyandu Elderly Ward Explore
3. There is a relationship between level stress with ABI values at Posyandu Elderly Ward Explore

Suggestion
    1. Respondents
        Through results study This expected elderly can manage stress with Good so that can prevent occurrence changes in ABI values .
    2. Researchers Furthermore
        It is expected researchers furthermore can develop other factors that are capable of influence ABI value

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