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RE-ECHO: METABOLIC SYNDROMA SCREENING PROGRAM AND LOW-INFLAMMATION DIET EDUCATION

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ABSTRACT

Background: Metabolic syndrome is a cluster of risks for cardiovascular disease, diabetes mellitus, and stroke. Metabolic syndrome can occur in adolescents, adults, and the elderly. Metabolic syndrome in pregnant women can lead to fetal disorders and even childhood obesity. Therefore, metabolic syndrome can occur at any age. **Methods:** Quantitative research, pre-experimental, with *one group pretest and post-test design* . Population: parents of PAB 8 Saentis High School students. Sample: The sampling technique was accidental sampling. 45 parents of students who came to the research location who wanted to be research respondents. Research instruments: observation sheets of metabolic screening results: BP, blood glucose levels, uric acid levels (blood purine). Questionnaire sheets to measure respondents' knowledge of anti-inflammatory diets. Data were analyzed using the Wilcoxon test for mean differences with a P value of P <0.05, so there was a difference in knowledge before and after low-inflammatory diet education. **Results:** Screening results: The majority of respondents are at risk of reproduction, namely age > 35 years as many as 39 people (86.7%). Blood glucose levels are mostly normal as many as 43 people (95.6%), purine levels in respondents are mostly normal as many as 24 people (53.3%). bring the knowledge score before education min -max 30-80, mean 52.78 and knowledge score after education min-max 40-90 mean 73.33. Mean difference test The Wilcoxon test value found P value 0.000 (P <0.05) shows that there is a difference in respondents' knowledge before and after being given education on metabolic syndrome and a low-inflammatory diet . **Conclusions:** Education about metabolic syndrome for respondents is effective in increasing respondents' knowledge .

Keywords: Screening, Metabolic Syndrome, Low-Inflammatory Diet

INTRODUCTION

Metabolic syndrome is a metabolic disorder that can lead to cardiovascular disease, diabetes mellitus, and stroke. This metabolic disorder can occur in adolescents, adults, and the elderly (Asupan et al. 2024) .

In 2021 , 18 million were found from a 70- year- old person died due to disease No infectious one of them diabetes mellitus presenter (Sustainable and Goals 2025) . This is in accordance with Indonesia Gold mission then according to the 2045 RPJM it is stated in astacita that is transformation social For productive . Forming man productive (Subianto, Strategi, and Bangsa 2025)) . Healthy teenagers so will influence on offspring even until until old age (Kemenkes 2023). Yulianto et al. stated that there is a link between metabolic syndrome and stroke because <55 years (73.9%), women (62.2%), with the proportion of stroke sufferers and the proportion of metabolic syndrome being 1.2%, and 24.4%, respectively (Yulianto, Wahyono, and Helda 2023). In pregnant women, 23.9 kg/m² or more can result in infertility due to anovulation (Ergashbekovna, Alimhanovna, and Shamilevna 2026). Causative factors include unhealthy lifestyles and an unbalanced diet (Anggraini 2024). According to Girma et al. in Ethiopia There is influence incidence of diabetes with age , family history , control , place stay (Girma, Shiferaw, and Aklilu 2024). Smoking , sleep disorders, stress, genetics, obesity. Another journal in Nigeria stated that There is connection significant knowledge and attitudes towards diabetes (South et al. 2024) . In this study Fithri in Malaysia stated screening test reflexes in DM sufferers to detect function neurology (Fithri et al. 2025) . Naif in Ira in 2026 stated There is connection hypothyroidism with incidence of diabetes mellitus (Function 2026), In research other chronic DM and related diseases with level control to the hospital (Diabetes and Multicenter 2023). Research other state There is mental health with diabetes mellitus (Klin et al. 2026) . In the study other No There is connection antibody response in someone who is insulin resistant compared to someone who is not (Yan-sen et al. 2026) .

An unhealthy lifestyle results in increased fat in the middle of the body due to decreased levels of HDL cholesterol (the cholesterol that functions to absorb more cholesterol in the blood) and increased triglycerides (fat in the blood that is stored as leftover calories, sugar, and fat from food) and glucose, namely a lack of exercise to burn fat. Elasticity skin change For Diabetes (Poonja and Kiss 2024) . Unbalanced diet. Consuming too much salt and carbonated foods. Pro-inflammatory foods tend to stimulate the body's cytokines interleukin 6, TNF alpha, and others. Therefore, the recommendation cannot exceed 5 grams per day or 1 teaspoon. Table salt contains sodium chloride, while MSG contains sodium. Sodium has the property of absorbing fluids in the body. The sodium level in the blood is 135-145 mEq/L. Too low (hyponatremia due to diarrhea, vomiting, lack of fluids resulting in cramps, confusion), while excess sodium is called hypernatremia due to lack of fluids, feeling thirsty. Smoking triggers inflammation of the blood vessels. Nicotine content can increase the hormone dopamine, making smokers feel happy but making it difficult to quit smoking. The pathogenesis of metabolic syndrome is insulin resistance, activation of neurohormones and adipose tissue, and chronic inflammation. Insulin resistance can result in inhibition of glucogenesis and lipolysis or the formation of new glucose and fat breakdown so that neuro hormonal activation such as the renin-angiotensinogen system (RAS) causes adipose tissue to produce angiotensin II peptide (Ang II) activation of nicotinamide adenine dinucleotide phosphate (NADPH) oxidase, which increases the production of reactive oxygen species (ROS) which can cause injury to blood vessel endothelial cells resulting in endothelial dysfunction, inflammation and ultimately

cardiovascular disease. Chronic inflammation produces proinflammatory cytokines such as IL-6, C-reactive protein (CRP), and TNF-α in individuals.

The impacts of metabolic syndrome include cardiovascular disease, diabetes mellitus, and stroke, as well as sexual dysfunction (Imantika, Angraini, and Destriyanti 2022) . Metabolic syndrome can occur in children, adolescents, adults, and the elderly, as well as in mothers. pregnant (Astuti and Simarmata 2021) and will become complications . (Pondaang et al. 2025) . The majority of causes of unhealthy lifestyles such as lack of activity at all ages, children are dominantly fond of playing with mobile phones just sitting, teenagers like fast food containing sodium and excess sodium and smoking, including the same thing that occurs in adults, while in the elderly it is worsened by the regeneration period so that the consequences of unhealthy lifestyle and diet in adolescents and adults are worsened by cell degeneration (Chung and Rhie 2022) . Problem solving that can be done is improving lifestyle and improving dietary patterns so that weight decreases by increasing physical activity and a low-inflammatory diet and consuming drugs to neutralize blood glucose, purine and blood pressure levels back to normal levels (Peterseim, Jabbour, and Mulki 2024) . The problem-solving approach for metabolic syndrome sufferers can be done by improving clinical symptoms, namely pharmacological and non-pharmacological clinical examinations (Henggar et al. 2025) . According to Soetoko and Fatmawati (2022), improving the quality of life of people with metabolic syndrome can be achieved through dietary training. In this study, problem-solving was carried out by conducting metabolic screening and dietary education, namely a low-inflammatory diet (Soetoko and Fatmawati 2022) . In previous studies, problem-solving carried out by healthcare workers was by improving clinical symptoms, providing pharmacological and non-pharmacological therapy, and providing education about physical activity for children, adolescents, adults, pregnant women, and the elderly (Rina et al. 2022). In this study, respondents will undergo metabolic screening so that they know their metabolic condition. For respondents with normal metabolic status, respondents will continue with a low-inflammatory diet to reduce the risk of metabolic syndrome. This study also provided education on a diet that supports the prevention or improvement of metabolic syndrome, namely a low-inflammatory diet, namely foods that are low in inflammation. Inflammatory foods are foods that contain lots of glucose and fat, while foods that contain low inflammation .

METHODS

Univariate uses frequency distribution to determine the characteristics of respondents.
Bivariate: data were analyzed using the T-test. Dependent test with a P value of $P<0.05$, there was a difference in knowledge before and after low-inflammatory diet education.
O_1: *Pre-test value* (measurement beginning knowledge respondents at low inflammation).
X: Giving Education low inflammation
O_2: *Post-test value* (measurement end knowledge respondents at low inflammation) .

Population: parents of students of PAB 8 Saentis High School.
Sample: The sampling technique was accidental sampling. Forty-five parents of students who came to the research site and were willing to participate were selected as respondents. Research instruments: observation sheets containing metabolic screening results: blood pressure, blood glucose levels, and uric acid (blood purine) levels. A questionnaire was used to measure respondents' knowledge of anti-inflammatory diets.

Data analysis:

Univariate uses frequency distribution to determine the characteristics of respondents. Bivariate: Data is analyzed using the Wilcoxon mean difference test. With a P value of P < 0.05, there is a difference in knowledge before and after low-inflammatory diet education x

RESULTS AND DISCUSSIONS

Univariate Analysis: From the results of the study, it can be seen in Table 4.1. The majority of respondents are at risk of reproduction, namely 39 people (86.7%) aged > 35 years and a minority of non-risk ages are 6 people (13.3%). The majority of respondents have normal blood pressure, 39 people (86.7%) and a minority of high blood pressure, 6 people (13.3%). Blood glucose levels are mostly normal, 43 people (95.6%) and a minority of abnormal, 2 people (4.4%). Uric acid or purine levels in respondents are mostly normal, 24 people (53.3%) and a minority of abnormal, 21 people (46.7%).

. that knowledge before education was mostly lacking as many as 20 people (44.4%) and a minority of good as many as 10 people (22.2%), while knowledge after education was obtained that the respondents' knowledge about metabolic syndrome and low-inflammatory diet was mostly good as many as 26 people (58.8%) and a minority of poor (6.7%) .

Bivariate Test

The bivariate test in this study was to measure the mean difference test on the respondents' knowledge scores before and after being given education about metabolic syndrome and a low-inflammatory diet . From table 4.. 3 it can be seen that the knowledge score before education was min-max 30-80, mean 52.78 and the knowledge score after education was min-max 40-90 mean 73.33. The mean difference test The Wilcoxon test value obtained a P value of 0.000 (P <0.05) indicating that there was a difference in respondents' knowledge before and after being given education about metabolic syndrome and a low-inflammatory diet .

Table 1 Distribution of Respondents' Metabolic Frequency

Variables	Frequency	Percentage (%)
Age		
(At risk) <35 years	39	86.7
(No Risk) 20-35 years	6	13.3
Total	**45**	**100**
Blood pressure		
Abnormal	6	13.3
Normal	39	86.7
Total	**45**	**100**
Blood Glucose Levels		
Abnormal	2	4.4
Normal	43	95.6

Total	**45**	**100**
Uric Acid Levels		
Abnormal	21	46.7
Normal	24	53.3
Total	**45**	**100**

Table 4.2 Respondents' Knowledge about Metabolic Syndrome and Low-Inflammatory Foods

Variables	Frequency	Percentage (%)
Before Education		
Not enough	20	44.4
Enough	15	33.3
Good	10	22.2
Total	**45**	**100**
After Education		
Not enough	3	6.7
Enough	16	35.6
Good	26	58.8
Total	**45**	**100**

Table 4.3. Knowledge before and after education on metabolic syndrome and low-inflammatory diet

Variables	Mean	Standard Deviation	Score		P. Value
			Min	Max	
Knowledge Before Education	52.78	20,214	30	80	0.000
Knowledge after Education	73.33	15,076	40	90	

The age characteristics of the respondents are mostly at risk in reproduction, namely age > 35 years as many as 39 people (86.7%). This states that the majority of respondents are at risk if they reproduce again because the majority of women over 35 years of age have experienced degeneration of the woman's body cells so that it can cause complications in pregnancy and have an adverse impact on fetal growth. Women with obesity can also be at risk of giving birth to large children (Wallentowitz et al. 2026). Ages over 15 years and above can experience metabolic syndrome (Yulianto et al. 2023). The majority of respondents have normal blood pressure as many as 39 people (86.7%). Blood glucose levels are 43 people (95.6%). Uric acid or purine levels in respondents are mostly normal as many as 24 people (53.3%). This states that the majority of respondents' cardiovascular systems are still functioning well. However, some people have already experienced metabolic syndrome, including high blood pressure (6 people (13.3%), high blood pressure (2 people (4.4%), and elevated blood purine levels (21 people (46.7%). Patients experience purine crystallization in the blood, which causes joint inflammation. Treatment can be done with warm compresses (Aminah, Saputri, and Wowor 2022).

Researchers assumed a high-risk age because all respondents were parents of students at the private high school PAB 8 Saentis. Therefore, the respondents were women who had children aged around 15-20 years if their first child, so it is reasonable that the majority of respondents were over 35 years old. From the results of the metabolic syndrome screening, the majority were still normal and a minority of respondents already experienced metabolic syndrome disorders .

The results of the bivariate test showed that the knowledge score before education was min-max 30-80, mean 52.78 and the knowledge score after education was min-max 40-90 mean 73.33. The mean difference test The Wilcoxon test value obtained a P value of 0.000 (P < 0.05) indicating that there was a difference in respondents' knowledge before and after being given education on metabolic syndrome and a low-inflammatory diet.

Betol and Darmo (2023) found that there was an impact of providing education to the public about metabolic syndrome education (Betol and Darmo 2023). Sim et al.'s research in 2025 found that the majority of participants studied underwent early detection of triglyceride levels in women (Sim et al. 2025). According to Mulyani et al., a physical examination followed by nutritional counseling can increase respondents' knowledge about the respondent's syndrome (Mulyani, Fitriyaningsih, and Wagustina 2023). Metabolic syndrome can be prevented and improved from adolescence through sufficient activity and a healthy diet (Mulyani et al. 2023). The same thing was also conveyed by Rina et al. in 2022 that preventing metabolic syndrome can be done from adolescence, namely a healthy lifestyle (Rina et al. 2022). Education is needed for adolescents and the elderly in understanding body nutrition (Manurung et al. 2022). This provides information to adolescents and the elderly to get calorie needs according to their age (Manurung et al. 2022).
Efforts are made for healthy reproduction. Food content such as leptin levels. Blood sugar levels to assess insulin resistance (Chung and Rhie 2022). Metabolic syndrome can be prevented by improving lifestyle. In addition to lifestyle changes, it is necessary to take medication regularly as recommended by a doctor (Peterseim et al. 2024). Elderly women also really need early detection to improve the quality of life (Henggar et al. 2025). It is very necessary effective communication give information (Manurung et al. 2022) give improvement knowledge about diabetes through nutrition Good since in the womb (Simarmata et al. 2026). Excellent diabetes care needed for the elderly (Hutabarat et al. 2024).

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CONCLUSIONS

There is a difference in knowledge before and after education on metabolic syndrome and a low-inflammatory diet in parents of female students at PAB 8 Saentis Private High School.

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CONFLICT OF INTEREST AND FUNDING DISCLOSURE

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