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Original Article

Health Status of Women in Tondo Permanent Residence: Metabolic Syndrome and Quality of Life

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ABSTRACT

Natural disasters result in increased risk of metabolic syndrome (MetS) and reduced quality of life (QoL), especially in vulnerable groups such as women. Objective: To determine the relationship between the incidence of metabolic syndrome and the quality of life of women in Tondo Permanent Residence, Palu City. The study used a cross-sectional design with a total sample of 80 women aged 18-65 years selected by purposive sampling. Data were collected through measurement of blood pressure, lipid profile, blood glucose, abdominal circumference, and quality of life questionnaire, then analyzed using the chi-square test and odds ratio (OR) with STATA software. 53.75% of respondents had metabolic syndrome, with significant risk factors including age, high blood pressure, total cholesterol >200 mg/dL, triglycerides >200 mg/dL, blood glucose >100 mg/dL, and abdominal circumference >80 cm. Abdominal circumference >80 cm was the strongest predictor with an OR of 77.5. Women with a better metabolic profile had a higher quality of life. There is a significant association between metabolic syndrome and the quality of life of women in Tondo Permanent Residence.

INTRODUCTION

Disasters result in losses due to environmental damage and mass deaths. The need for health services and food is expected to increase in disaster areas. Therefore, disaster management, especially the fulfillment of the nutritional status of disaster survivors, must be a priority in disaster management. The fulfillment of the nutritional intake of disaster survivors is expected to prevent further disasters such as disease outbreaks, owing to the decrease in the nutritional status of disaster survivors. The most basic problem is physical, such as disrupting the fulfillment of the needs for food, drinks, shelter, health, and education.[1] These conditions trigger various health problems, both acute and chronic, and reduce the quality of life of affected communities, especially in vulnerable groups such as women. Studies show that post-disaster conditions can increase the risk of stress, trauma, and metabolic disorders.[2]

Lifestyle changes, emergency diets, and chronic stress experienced by disaster survivors are known to trigger metabolic syndrome.[3] A combination of metabolic disorders, such as hypertension, hyperglycemia, dyslipidemia, and central obesity, characterizes this condition.[4] A cross-sectional study on the detection of metabolic syndrome using the NCEP-ATP III method in

the Waai Village community, which is one of the villages affected by the earthquake in Maluku Province in 2020, found that 58% of the adult age group experienced metabolic syndrome after the earthquake with the dominance of the female sex (76%).[5] Metabolic syndrome, or syndrome X, is a condition that potentially increases a person's risk of non-communicable diseases. Based on Riskesdas' 2013 data, the prevalence of metabolic syndrome in Indonesia has reached 39% and is more prevalent in women.[6] Lifestyle can potentially influence the occurrence of metabolic syndromes[3]. However, previous studies on the relationship between lifestyle factors, including physical activity, diet, smoking, and metabolic syndrome, have shown mixed results.

Studies have also shown that metabolic syndrome has a significant impact on the quality of life, especially in women of reproductive age and the elderly.[7] However, until now, few studies have specifically examined the relationship between metabolic syndrome and the quality of life of female disaster survivors in permanent housing. This group faced a double burden due to post-disaster physical conditions and prolonged psychosocial stress. Research conducted by Helena at the Mamboro Village evacuation site, North Palu District, obtained data from 39 respondents. Six respondents had high stress levels, six had low stress levels, and six had no hypertension.[8] Persistent overriding of metabolic homeostasis, required to mobilize fuels in response to stressful stimuli, may make metabolic regulatory systems particularly vulnerable to adverse consequences.[9]

The Tondo permanent residence was a relocation settlement after the earthquake and tsunami that struck Palu City in 2018. In theory, stress levels are associated with the incidence of metabolic syndrome, stunting, and anemia in children and adolescents. Regarding the prevalence of metabolic syndrome in women, a cohort study in Bogor Regency found stress levels to be a risk factor for metabolic syndrome.[10] The cycle of metabolic syndrome and stress begins with an inflammatory process, excessive lipogenesis, and inhibition of lipolysis. These increase the release of Reactive Oxygen Species (ROS) and ultimately cause oxidative stress.[11] Oxidative stress conditions will cause damage to cells and tissues and can trigger degenerative diseases.

In addition to the increased risk of metabolic syndrome in adult women owing to food imbalances, natural disasters also affect stress levels. Disasters have been consistently associated with mental health problems such as depression and post-traumatic stress disorder.[12] The rate of depression among people who experience traumatic events is high, particularly among those who are victims of earthquakes, landslides, floods, and other disasters.[13] People who have lost their homes, jobs, communities, and possessions are affected in the emotional and social well-being of adults, adolescents, and children. This study aimed to determine the relationship between the incidence of metabolic syndrome and the quality of life of women living in Tondo Permanent Residence.

METHODS

This study had a cross-sectional design[14]. This study was conducted in the Tondo Permanent Residence in Palu City. Eighty respondents were included in this study. This study was conducted from September 10-25, 2023. Metabolic syndrome was the independent variable and quality of life was the dependent variable. The sampling technique was carried out using purposive sampling which was adjusted to the following inclusion criteria: 1) willingness to be a respondent, 2) residing in the Tondo residential area, 3) lack of mental and cognitive problems, 4) ability to communicate well, and 5) women aged 18 - 65.

The instruments used in this study were the first questionnaire on respondent characteristics, the second form of laboratory testing (cholesterol, HDL, LDL, triglycerides, and glucose) and the third form of the WHOQOL-HIV BREF questionnaire (World Health Organization Quality of Life-HIV BREF)[15]. All the questionnaires used in this study were valid and reliable. Data analysis used Univariate analysis was performed on all variables to determine the distribution of data (percentage). Data analysis was performed using the chi square test and odds ratio (OR) using the STATA software.

This study was approved by the Ethics Commission of Tanjung Karang Health Polytechnic, "ETHICAL EXEMPTION" No.481/KEPKTJK/X/2023. This research was declared ethically feasible

according to 7 (seven) WHO Standards 2011: 1) Social Value, 2) Scientific Value, 3) Equalization of Burden and Benefit, 4) Risk, 5) Inducement/Exploitation, 6) Confidentiality and Privacy, and 7) Informed Consent, which refers to the 2016 CIOMS Guidelines. The fulfillment of the indicators for each standard indicates this.

RESULTS

Table 1. Respondent Characteristics and Research Variables (n=80)

Characteristics	Number (n)	Percent (%)
Age (years)		
≤34	29	36.25
35-54	31	38.75
>55	20	25.00
Systole Pressure		
≤130	47	58.75
>130	33	41.25
Diastole Pressure		
≤85	54	67.50
≥86	26	32.50
Blood Pressure		
≤130/85	49	61.25
>130/85	31	38.75
Cholesterol		
≤200	59	73.75
>200	21	26.25
HDL		
≥40	50	62.50
<40	30	37.50
LDL		
≤160	74	92.50
>160	6	7.50
Triglycerides		
≤200	25	31.25
>200	55	68.75
Glucose		
≤100	38	47.50
>100	42	52.50
Abdominal Circumference		
≤80	25	31.25
>80	55	68.75
Quality of Life		
Excellent	23	28.75
Good	57	71.25
Metabolic Syndrome		
No	37	46.25
Yes	43	53.75

Source: Primary Data, 2023

Table 1 shows that most respondents were aged 35 - 54 years (38.75%), indicating that the middle-aged group was the dominant population in this study. A total of 36.25% of the participants were women aged ≤34 years, whereas only 25% were older than 55 years. This group is essential because middle age is often associated with an increased risk for metabolic health and other chronic diseases.

Furthermore, blood pressure measurements were obtained from 61,25% of the respondents with normal blood pressure (≤130/85 mmHg. However, 38,75% had blood pressure above the normal limits. High systolic pressure (>130 mmHg) was found in 41,25% of the respondents, while high diastolic pressure (≥86 mmHg) was recorded in 32,5%. This condition is

an early indication of hypertension risk in a large proportion of the population.

In the lipid profile measurement results, 73.75% of the respondents had total cholesterol levels of ≤200 mg/dL, indicating a relatively good lipid condition. However, triglyceride levels >200 mg/dL were found in 68.75% of respondents, indicating a significant metabolic health risk. In addition, 37.5% of the respondents had HDL <40 mg/dL, indicating low cholesterol, whereas 92.5% had LDL ≤160 mg/dL, which is relatively normal.

Blood glucose levels >100 mg/dL were found in 52.5% of respondents. This indicates that more than half of the population is at risk of prediabetes or diabetes, which are components of the metabolic syndrome. Most respondents (68.75%) had an abdominal circumference of >80 cm, indicating the prevalence of abdominal obesity. It is a major factor that is closely associated with metabolic syndrome and cardiovascular complications.

A total of 71.25% of respondents reported a good quality of life, while 28.75% reported an excellent quality of life. This suggests that, despite significant health risks, subjective perceptions of quality of life (QoL) remain high. Social and cultural support may have played an essential role in this outcome. A total of 53.75% of respondents were diagnosed with metabolic syndrome. This high prevalence suggests the need for special attention to address risk factors such as abdominal obesity, high blood pressure, and lipid profile disorders to improve quality of life.

Table 2. Relationship of Age, Blood Pressure, Lipid Profile, Glucose, and Abdominal Circumference with Metabolic Syndrome (n=80)

Variables	Metabolic Syndrome		Chi² (p-value)	OR (95%CI)
	No; n (%)	Yes; n (%)		
Age (years)				
≤34	21(72.41)	8(27.59)	13.1	5.7
35-54	11(35.48)	20(64.52)	(0.001)	(1.89-18.02)
>55	5(25.00)	15(75.00)		
Blood Pressure (mmHg)				
≤130/85	34(69.39)	15(30.61)	27.2	21.2
>130/85	3 (9.68)	28(90.32)	(0.001)	(5.11-119.89)
Cholesterol				
≤200	35(59.32)	24(40.68)	15.4	13.9
>200	2(9.52)	19(90.48)	(0.001)	(2.82-129.60)
HDL				
≥40	27(54.00)	23(46.00)	3.2 (0.07)	2.3
<40	10(33.33)	20(66.67)		(0.83-6.77)
LDL				
≤160	36(48.65)	38(51.35)	2.2 (0.13)	4.7
>160	1(16.67)	5(83.33)		(0.48-230.1)
Triglycerides				
≤200	21(84.00)	4(16.00)	20.8 (0.001)	12.7
>200	16(29.09)	39(70.91)		(3.43-57.36)
Glucose				
≤100	29(76.32)	9(23.68)	26.3 (0.01)	13.7
>100	8(19.05)	34(80.95)		(4.19-46.36)
Abdominal Circumference				
≤80	24(96.00)	1(4.00)	30 (0.001)	32
>80	13(23.64)	42(76.36)		(3.04-10.5)

Source: Primary Data, 2023

Chi square analysis revealed a significant relationship between age and MetS (p=0.001). Women aged >55 years had the highest prevalence of metabolic syndrome (75%) compared to other age groups. Odds Ratio (OR) of 5.7 (95% CI: 1.89-18.02) indicates that advanced age is a significant risk factor for metabolic syndrome, and women aged >55 years have a 5.7 times greater risk of developing metabolic syndrome compared to the age group below. The analysis of blood pressure variables showed a significant association between blood pressure and metabolic

syndrome (p < 0.000), with an OR of 21.2 (95% CI: 5.11-119.89). This indicates that women with hypertension (blood pressure >130/85) have a 21 times greater risk of developing metabolic syndrome than those with normal blood pressure.

The results of the analysis of the lipid profile variables indicated a significant relationship between total cholesterol levels (p < 0.001), triglycerides (p < 0.001) and metabolic syndrome. The OR value for total cholesterol levels 13.9 (95% CI: 2.82-129.60) shows a high risk of metabolic syndrome in women with high cholesterol levels (>200 mg/dl) had a 13.9 times greater risk than women with normal cholesterol levels. Similar to triglyceride levels, the analysis results showed an OR value of 12.7 (95% CI: 3.43-57.36), which means that high triglyceride levels (>200 mg/dl) are a significant risk factor, with a risk of developing metabolic syndrome 12.7 times greater than women with normal triglyceride levels.

The analysis of glucose and abdominal circumference variables revealed a significant relationship between glucose levels (p < 0.001), abdominal circumference (p < 0.001) and metabolic syndrome. The OR value of 13.7 (95% CI: 4.19-46.36) indicates that women with glucose >100 mg/dL have a 13.7 times higher risk of developing metabolic syndrome than women with normal glucose. This indicates a strong association between hyperglycemia and metabolic syndrome. Similarly, abdominal circumference had an OR of 32 (95% CI: 3,04-10,5), indicating that women with abdominal circumference >80 cm had a 77.5 times greater risk of developing metabolic syndrome than women with abdominal circumference ≤80 cm. This suggests that central obesity is the dominant risk factor for metabolic syndrome.

Bivariate analysis revealed that all variables tested (age, blood pressure, cholesterol, triglycerides, glucose, and abdominal circumference) were significantly associated with metabolic syndrome, with abdominal circumference being the strongest predictor.

Table 3. Relationship of Age, Blood Pressure, Lipid Profile, Glucose, and Abdominal Circumference with Women's Quality of Life

Variables	Quality of Life		Chi² (p-value)	OR (95%CI)
	Excellent	Good		
Age (years)				
≤34	10(34.48)	19(65.52)	1.0565	1.5
35-54	7(22.58)	24(77.42)	(0.590)	(0.50-4.61)
>55	6(30.00)	14()		
Blood Pressure (mmHg)				
≤130/85	18(36.73)	31(63.27)	3.9 (0.047)	3.0
>130/85	5(16.13)	26(83.87)		(0.90-11.71)
Cholesterol				
≤200	21(35.59)	38(64.41)	5.13	5.25
>200	2(9.52)	19(90.48)	(0.023)	(1.07-50.03)
HDL				
≥40	18(36.00)	32(64.00)	3.4	2.8
<40	5(16.67)	25(83.33)	(0.06)	(0.83-10.92)
LDL				
≤160	22(29.73)	52(70.27)	0.46 (0.49)	2.1
>160	1(16.67)	5(83.33)		(0.21-104.51)
Triglycerides				
≤200	12(48.00)	13(52.00)	6.58	3.69
>200	11(20.00)	44(80.00)	(0.01)	(1.16-11.62)
Glucose				
≤100	15(39.47)	23(60.53)	4.06	2.7
>100	8(19.05)	34(80.95)	(0.04)	(0.91-8.77)
Abdominal Circumference				
≤80	11(44.00)	14(56.00)	4.12	2.8
>80	12(21.82)	43(78,.18)	(0.04)	(0.89-8.72)

Source: Primary Data, 2023

Table 3 shows no significant relationship between age and quality of life (p=0.590). However, women aged ≤34 years had a higher proportion of "very good" quality of life (34.48%) than the other age groups. Blood pressure analysis revealed a significant association between blood pressure and quality of life (p=0.047). Women with normal blood pressure (≤130/85 mmHg) had a better quality of life (36.73% "excellent") than those with hypertension. An OR value of 3.0 (95% CI: 0.90-11.71) indicates that high blood pressure has a three times greater risk of developing a lower quality of life.

Lipid profile analysis indicated a significant relationship between total cholesterol levels (p=0.023), triglycerides levels (p=0.01) and quality of life. These results indicate that women with high cholesterol levels (>200 mg/dl) have a 5.25 times greater risk of having a lower quality of life than women with normal cholesterol levels. Similarly, women with normal triglyceride levels had a better quality of life (48% "very good"), with OR = 3.69 (95% CI: 1.16-11.62) which means that women with high triglyceride levels (>200 mg/dl) have a 3.69 times greater risk of having a lower quality of life than women with normal triglyceride levels.

The analysis of glucose variables indicated a significant relationship between glucose levels (p=0.04), abdominal circumference (p=0.04) and quality of life. Hyperglycemia (>100 mg/dL) was significantly associated with decreased quality of life. Women with normal glucose levels had a better quality of life (39.47% "very good"), with OR = 2.7 (95% CI: 0.91-8.77) which means that women with hyperglycemia (glucose >100 mg/dl) have a 2.7 times greater risk of having a lower quality of life than women with normal glucose levels. Similarly, women with an abdominal circumference ≤80 cm had a better quality of life (44% "excellent"), with OR = 2.8 (95% CI: 0.89-8.72), indicating that women with an abdominal circumference >80 cm had a 2.8 times greater risk of having a lower quality of life than those with an abdominal circumference ≤80 cm.

Normal blood pressure, total cholesterol ≤200 mg/dL, triglycerides ≤200 mg/dL, glucose ≤100 mg/dL, and abdominal circumference ≤80 cm were significantly associated with better quality of life. Focusing interventions on these factors may improve women's quality of life.

DISCUSSION

This study showed that more than half of the women living in Tondo Permanent Residence had metabolic syndrome, and this condition was significantly associated with reduced quality of life. The main risk factors were advanced age, high blood pressure, high cholesterol and triglyceride levels, hyperglycemia, and abdominal circumference exceeding 80 cm, with central obesity being the strongest predictor. Additionally, women with a better metabolic profile had a higher perceived quality of life.

These findings are in line with previous studies that suggest that metabolic syndrome is more common in women, especially those who have entered menopause, due to hormonal changes that affect metabolism.[7] Soleimani et al. reported that components of metabolic syndrome, such as hypertension and dyslipidemia, significantly reduce the quality of life, especially in the physical dimension. Increased sugar consumption, in the form of fructose and sucrose, correlates with increased prevalence of metabolic syndrome. Diets with a high fat content, together with an increased intake of fructose and salt, accelerate the development of metabolic syndrome. Therefore, metabolic syndrome affects quality of life.[16]

Not only does metabolic syndrome affects blood pressure, it also affects quality of life. Similarly, Delgado et al. (2021) showed that changes in metabolic syndrome status negatively impact the mental aspects of quality of life.[17] The results of this study showed a significant association between high blood pressure, total cholesterol >200 mg/dL, triglycerides >200 mg/dL, and hyperglycemia (>100 mg/dL). Dyslipidemia (high cholesterol and triglycerides) also affects the quality of life. A systematic study by Trisnawati et al. confirmed that dyslipidemia is a major factor that worsens health-related quality of life.[18]

Physiologically, high blood pressure, lipid disorders, and hyperglycemia are interrelated in triggering insulin resistance, chronic inflammation, and oxidative stress, which are the key mechanisms in metabolic syndrome. Visceral fat accumulation, indicated by an abdominal circumference >80 cm plays a significant role in triggering these metabolic changes, making it an

important clinical indicator.[19] In the post-disaster context, psychosocial stress and lifestyle changes, such as consuming low-nutrient emergency food and decreased physical activity contribute to worsening metabolic conditions. Research after the Tsunami in Japan showed that women living in temporary shelters had an increased risk of metabolic syndrome owing to stress, decreased physical activity and dietary changes. This is in line with observations of socio-economic factors affecting the metabolic state of disaster victims.[20]

The strength of this study lies in its focus on vulnerable groups in post-disaster relocation areas, which have not been studied extensively. The cross-sectional design with objective measurements and valid instruments strengthened the analysis. However, this study has some limitations. The cross-sectional design does not allow the exploration of causal relationships, and purposive sampling limits the generalizability of the results. In addition, psychosocial variables and diet were not analyzed in detail.

Practically, the results of this study underscore the importance of screening for metabolic syndrome in post-disaster relocation communities and the need for intervention programs that target the control of blood pressure, lipid profile and central obesity. Theoretically, this study strengthens the conceptual framework that quality of life is not only determined by psychosocial factors, but is also strongly influenced by chronic metabolic conditions.

CONCLUSIONS

This study found a significant association between metabolic syndrome and the quality of life among women residing in the Tondo Permanent Residence, a post-disaster relocation site in Palu City. More than half of the participants were diagnosed with metabolic syndrome, with central obesity (abdominal circumference >80 cm), high blood pressure, elevated cholesterol, triglyceride levels, and hyperglycemia identified as major contributing factors. Among these, central obesity was the strongest predictor of metabolic syndrome.

Women with healthier metabolic profiles—characterized by normal blood pressure, lipid levels, glucose levels, and abdominal circumference—reported a better quality of life. These findings underscore the pressing need for routine metabolic health screenings and targeted health education programs for women residing in post-disaster settlements. Interventions focusing on lifestyle modification and early detection of metabolic risks are crucial for improving long-term health outcomes and overall well-being in these vulnerable communities.

Conflict of Interests: We declare that there is no conflict of interest

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