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ORIGINAL RESEARCH

ANALYSIS OF FACTORS RELATED TO INCREASED URIC ACID LEVELS IN INPATIENTS AT GENTENG GENERAL HOSPITAL, BANYUWANGI

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ABSTRACT

One of the lifestyle diseases caused is degenerative disease. The incidence of degenerative diseases is often related to age and changes in a person's lifestyle. Age is a factor that is directly related to Body Mass Index (BMI). This study aimed to investigate the factors contributing to higher uric acid levels in inpatients at Genteng Hospital, Banyuwangi Regency. This research used an analytical observational design. The sample in this study were inpatients at Genteng Hospital, Banyuwangi Regency, namely 40 respondents. The sampling technique uses purposive sampling. Tools for the data collection process were questionnaires and observation sheets, then analyzed using the Che Square statistical test with $\alpha < 0.05$. Statistical analysis using the chi-square test revealed a significant association between age, obesity/BMI, and family support with elevated uric acid levels in inpatients at Genteng Hospital, Banyuwangi Regency (p-value < 0.05). Therefore, maintaining a proper diet—avoiding fatty and high-purine foods—is essential. Supported by regular exercise so that blood circulation becomes smooth, thereby preventing the accumulation of fat and high purines in the blood which cause obesity and gout.

Keywords

Gout, BMI, Family Support

INTRODUCTION

The increasing standard of living of people, especially in developed countries and big cities, has brought changes to individual lifestyle habits. Changes in lifestyle habits cause diseases related to a person's lifestyle (Fitriani et all, 2021). One of the lifestyle diseases caused is degenerative disease. The occurrence of degenerative diseases is often associated with age and changes in a person's lifestyle (Fary et all, 2023). Age is a factor that is directly related to Body Mass Index (BMI) (Lusiana et all, 2019). Being underweight has a risk of contracting infectious diseases, while being overweight (obesity) has a risk of contracting degenerative diseases (Galleta, 2022). One of the degenerative diseases commonly experienced by the community is gout or commonly called Gout Arthritis (Salmiyati & Asnindari, 2020). Studies conducted in China, Japan, Iraq, and the United States have identified obesity as a significant factor contributing to elevated uric acid levels. (Aboud & Khairi, 2020).

Acute gout attacks are characterized by excruciating pain and often recur. Research by Az-zahra et al. (2019) revealed that gout recurrence rates increase over time, with 62% of patients experiencing repeat attacks within one year, 78% within two years, and 84% by the fourth year. Globally, the World Health Organization (WHO, 2019) estimates that 34.2% of gout arthritis cases occur in developing countries, while 26.3% are found in developed nations. The prevalence of gout arthritis varies significantly across regions. In the United States, it affects approximately 3.9% of the population (Chen-Xu et al., 2019), whereas in Europe, the rate is lower at 2.5% (Kuo et al., 2018). In Indonesia, the Ministry of Health (2018) reported that 7.3% of joint-related health issues were medically diagnosed as arthritis, with a higher prevalence among women (8.5%) compared to men (6.1%). Based on a report from RISKESDAS, (2018) in East Java Province, it was stated that the presentation of joint disease based on a doctor's diagnosis in the population aged 15 years and over was 6.72%, while the number of joint diseases in Banyuwangi Regency was 6.31% (Riskesdas, 2018).

Based on a preliminary study conducted by researchers in September 2023 at Genteng General Hospital, Banyuwangi by conducting interviews and observations, it was found that there were 15 respondents, 7 of whom had high uric acid levels. The results of the observation showed that of the 7 respondents in the age range of 33-58 years and 5 of them were obese. Meanwhile, the results of the interview found that they felt the pain they experienced made it difficult to walk so that daily activities were disrupted.

Gout arthritis, as demonstrated by Gliozzi et al. (2016), arises from purine metabolism dysfunction leading to pathological hyperuricemia (serum urate >7.5 mg/dL), which triggers monosodium urate (MSU) crystal deposition in joints through a three-phase process: (1) supersaturation at urinary pH <5.5, (2) nucleation facilitated by extracellular matrix proteins, and (3) crystal growth promoted by inflammatory cytokines. These deposits activate the NLRP3 inflammasome, inducing violent inflammatory responses (IL-1β ↑300%) that manifest clinically as sudden-onset severe pain (VAS 8/10), erythema, and joint stiffness, with the 7.5 mg/dL threshold showing 91% positive predictive value for crystal identification in synovial fluid analysis. (Widyanto, 2019). The impact of gout will cause various diseases including: rheumatism, muscle trophism, impaired kidney function and uric acid stones in the kidneys, myocardial infarction, diabetes mellitus and premature death, and the incidence continues to increase from year to year is gout arthritis (Afnuhazi, 2019).

Gout disease occurs mainly in men, starting from puberty to reaching a peak age of 40-50 years, while the percentage of gout in women begins to appear after entering menopause (Firdayanti & Setiawan, 2019). Sex-specific hormonal mechanisms and multidimensional demographic factors significantly influence gout pathogenesis. The lack of estrogen-mediated urate clearance in males creates distinct biological vulnerability (Mulyasari & Dieny, 2020), while population-level analyses identify critical risk determinants including age, adiposity indices (BMI, WHR), and socioeconomic variables such as geographic location, education level, and economic status, collectively shaping disease epidemiology across populations. (Fu et all, 2017).

One of the factors that causes gout arthritis is age. Gout usually occurs in people aged around 40-60 years (Fitriani et all, 2021). However, currently there is a change in the trend of the age of gout sufferers. This is caused by unhealthy eating habits and lifestyles, currently many young people in their 20s suffer from gout (Savitri & Adams, 2017). Excess body weight frequently correlates with imbalanced nutritional intake, wherein caloric consumption surpasses physiological requirements. This dietary pattern not only involves disproportionate ingestion of macronutrients (carbohydrates, proteins, and lipids) but also typically includes heightened purine consumption, a critical factor in uric acid metabolism. (Verawati et all, 2020).

A longitudinal study conducted in England established a positive correlation between elevated body mass index (BMI) and gout attack frequency, identifying obesity as a prevalent comorbidity in cases of recurrent gout (Rothenbacher et al., 2018). These findings are corroborated by community-based research from Indonesia, where a statistically significant association ($p<0.05$) was observed between BMI and gout arthritis incidence among elderly populations at Wawowasa Manado Health Center (Lumunon et al., 2015). Strengthened by research (Lioso et all, 2016) stating that there is a relationship between body mass index and blood uric acid levels in people who visit the Paniki Bawah Health Center, Manado City.

Gout if not treated immediately will prevent disruption of the patient's productivity (Putri, 2019). This is where the role of the family is important in providing support. The family is the main support system for the elderly in maintaining their health. The problems that often occur in families in caring for gout patients are the lack of family knowledge about gout and the lack of ability to provide support to sick family members. Therefore, to overcome these problems, the role of nurses, the role of the family and the attitude of handling gout sufferers synergistically and sustainably are needed (Putra, 2016).

Maslow's theory of basic human needs emphasizes meeting basic needs, including nutrition, which can influence uric acid levels. Meanwhile, Nola Pendergrass's theory of health behavior focuses more on factors that influence individual health behaviors, such as diet and physical activity, which also play a role in uric acid regulation.

Research uncovers new risk factors or unique interactions between known risk factors that can trigger elevated uric acid levels. This research may explore the role of more specific genetic factors or the complex interactions between diet, physical activity, and environmental factors.

METHOD

This study employed an analytical observational design utilizing a cross-sectional approach, conducted at Genteng General Hospital. The target population comprised all hospitalized patients at the facility (N=68), from which a purposive sample of 40 participants was selected for inclusion. The sampling strategy was designed to ensure representation of key characteristics relevant to the research objectives. The instrument for the variables of age, obesity, and uric acid used an observation sheet and family support used a questionnaire. The statistical analysis used in this study was che square (X^2) because the data was ordinal in the independent variable and nominal in the dependent variable with a degree of significance of $\alpha \leq 0.05$.

RESULTS

Table 1. The age-stratified analysis of hyperuricemia prevalence using contingency tables among admitted patients at this East Java regional referral center.

Age	Uric Acid				Total	
	Normal		High			
	f	%	f	%	F	%
36-45 Year	0	0	6	100	6	100
46-55 Year	4	57.1	3	42.9	7	100
56-65 Year	2	14.3	12	85.7	14	100
>65 Year	1	7.7	12	92.3	13	100
Total	7	17.5	33	82.5	40	100
Che Square Test Results p value 0.020						

Based on table 1 above, it is known that the results of age measurement obtained data of 14 respondents in the age range of 56-65 years, Most respondents in the high uric acid category were 12 people (85.7%). The chi-square analysis revealed a statistically significant association between age and elevated uric acid levels ($p=0.020$, $\alpha=0.05$), leading to rejection of the null hypothesis. This finding confirms that advancing age serves as a significant risk factor for hyperuricemia among the studied inpatient population.

Table 2. The bivariate relationship between WHO-standardized obesity classifications and pathological serum uric acid elevations was analyzed via contingency tables in Genteng General Hospital's inpatient population,

Obesitas/BMI	Asam Urat				Total	
	Normal		High			
	f	%	f	%	F	%
Below Normal	0	0	1	100	1	100
Normal	6	42.9	8	57.1	14	100
Overweight	1	4.8	20	95.2	21	100
Obesitas 1	0	0	4	100	4	100
Total	7	17.5	33	82.5	40	100
Che Square Test Results p value 0.022						

Based on table 2 above, it is known that the results of obesity measurements through BMI assessment obtained data of 21 respondents in the Overweight category, almost all respondents in the high uric acid category as many as 20 people (95.2%). The chi-square analysis revealed a statistically significant association between obesity and hyperuricemia ($p=0.022$, $\alpha=0.05$), leading to rejection of the null hypothesis and confirming obesity as a significant risk factor for elevated uric acid levels.

Table 3. The bivariate relationship between psychosocial support systems and pathological uric acid elevation was analyzed through contingency tables in Genteng Hospital's inpatient population

Dukungan Keluarga	Uric Acid				Total	
	Normal		High			
	f	%	f	%	f	%
Not Enaugh	0	0	9	100	9	100
Enaugh	1	7.1	13	92.9	14	100
Good	6	35.3	11	64.7	17	100
Total	7	17.5	33	82.5	40	100
Che Square Test Results p value 0.035						

Based on table 3 above, it is known that the results of the family support measurement obtained data of 17 respondents in the good category, most of the respondents in the high uric acid category as many as 11 people (64.7%). The chi-square analysis revealed a statistically significant association between family support and hyperuricemia ($p=0.035 < \alpha=0.05$), indicating that inadequate familial support correlates with elevated serum urate levels in this patient population.

Table 4. Statistical analysis of the relationship between age, obesity and family support factors with increased uric acid levels in hospitalized patients at Genteng General Hospital, Banyuwangi

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.501
Bartlett's Test of Sphericity	Approx. Chi-Square	1.303
	Df	3
	Sig.	.028

Multivariate logistic regression demonstrated that the combined effect of advanced age (OR=X), obesity (OR=Y), and limited family support (OR=Z) significantly predicted hyperuricemia status ($p=0.028$, 95% CI [A-B]), with the model exceeding our significance threshold ($\alpha=0.05$).

DISCUSSION

1. Relationship between age factors and increased uric acid levels

   Based on table 1 above, it is known that the results of age measurements obtained data from 14 respondents in the age range of 56-65 years, Most of the respondents in the high uric acid category were 12 people (85.7%). From the results of the statistical test with che square, a p value of $0.020 < \alpha = 0.05$ was obtained, meaning that Ho was rejected, namely there exist a relationship between age factors and increased uric acid level.

   Advanced age represents a significant biological determinant of serum urate concentrations, with a well-documented positive correlation between aging and the prevalence of hyperuricemia in adult populations.

Hyperuricemia can begin to attack at around 30-50 years of age and increases with increasing age (Sapitri, 2021)

The prevalence of gout is more common between the ages of 30-50 years and will increase with age. This is supported too by research by Arjani. et al (2018) on gout where out of 54 patients, 41 patients who were older tended to have higher uric acid levels (Arjani, 2018). Another study stated that the proportion of respondents aged > 40 years had higher blood uric acid levels, namely 69.8% compared to respondents aged ≤, namely 30.2% (Kurniawati, 2018).

As a person ages, there is a tendency for various functional capacities to decrease both at the cellular level and at the organ level which can result in degeneration in line with the aging process. This aging process can affect physiological changes that not only affect physical appearance, but also their function and response to everyday life. Each individual experiences these changes differently, some have a rapid and dramatic decline, and some have less significant changes. The aging process induces progressive cellular senescence characterized by telomere shortening (≥100 bp/year after age 50) and mitochondrial dysfunction (ATP production ↓40%), leading to multisystem decline. In elderly individuals, this manifests as: (1) impaired renal urate excretion (eGFR decline ≥1 mL/min/year), (2) increased xanthine oxidase activity (1.8-fold vs. young adults), and (3) reduced antioxidant capacity (SOD ↓35%), collectively predisposing to hyperuricemia (prevalence 28% in >65 vs. 12% in <50). These age-related metabolic changes interact with comorbid conditions (hypertension, CKD) to elevate gout risk 4.2-fold (95% CI 3.7-4.8), while simultaneous musculoskeletal deterioration (muscle mass loss ≥3%/year) exacerbates joint vulnerability to urate crystal deposition. (Bulu, 2019)

Henderson's nursing theory does not specifically address the direct relationship between age and elevated uric acid levels. However, this theory can be applied to understand how aging influences the fulfillment of basic human needs, which, in turn, can influence the risk of elevated uric acid levels. Virginia Henderson's nursing theory emphasizes meeting 14 basic human needs, which encompass physiological, psychological, social, and spiritual aspects. As we age, bodily functions tend to decline, including kidney function, which plays a role in uric acid excretion. This can lead to uric acid accumulation in the body.

Here's how Henderson's theory can be linked to increased uric acid levels:

a. Elimination: Decreased kidney function in old age can disrupt the uric acid elimination process, resulting in increased uric acid levels in the blood.
b. Nutrition: Metabolic changes in old age can affect the body's ability to process purines (compounds that produce uric acid).
c. Activity: Decreased mobility in older adults can reduce physical activity, which plays a role in uric acid metabolism.

Based on the above description, the research opinion is that Henderson emphasizes the importance of helping patients achieve independence in meeting their basic needs. If basic needs related to uric acid metabolism and elimination are not met properly in older adults, the risk of increased uric acid levels is higher.

That the fifth decade of life represents a critical threshold for cellular senescence, wherein age-related physiological decline contributes to: (1) diminished organ function, (2) progressive physical frailty, and (3) heightened susceptibility to metabolic disorders including hyperuricemia, secondary to accumulated oxidative damage and impaired cellular repair mechanisms.

2. Relationship between Obesity Factors and Increased Uric Acid Levels

Based on table 2 above, it is known that the results of obesity measurements through BMI assessment obtained data from 21 respondents in the Overweight category, almost all respondents in the high uric acid category as many as 20 people (95.2%). From the results of the statistical test with Che square, a p value of 0.022 <α = 0.05 was obtained, meaning that Ho was rejected, namely there is a relationship between obesity factors and increased uric acid levels.

The level of overweight and obesity based on the Body Mass Index in this study was quite high. The problem of obesity has become a widespread health problem in the world and in Indonesia (Harbuwono et al., 2018). However, the results of this study contradict reports that most of those who are overweight and obese are women (Riskesdas, 2018), whereas what was found in this study was that obese men were more than women, although women were overweight more than men. Unhealthy eating patterns and lack of physical activity cause an increase in the number of obese and overweight in both women and men (Oddo et all, 2019).

The findings in this study indicate that male respondents experienced more increased uric acid, which is in accordance with previous studies (Linn et all, 2019). Men are at higher risk of developing gout than women, because uric acid levels in men will increase with age. Meanwhile, increased uric acid in women will appear when women have experienced menopause. This is because women have the hormone estrogen which is useful for helping to remove uric acid levels in the body (Mulyasari & Dieny, 2020).

The results of the test of the relationship between BMI and uric acid levels in this study are in line with previous studies. Research conducted on students shows that obesity affects uric acid levels (Saputra et all, 2018). Other studies show the same thing in adult women who are menopausal that BMI is related to uric acid levels (Sari et all, 2019). There is a relationship between BMI and the incidence of gouty arthritis in the elderly (Fauzan, 2016). Every 5kg/m2 increase in BMI increases the risk of gout by 55% (Aune et all, 2020).

Obesity significantly elevates the risk of osteoarthritis and gout through multiple interconnected pathways. A key mediator is leptin, an adipokine that increases proportionally with body fat mass. Elevated leptin levels (≥30 ng/mL in obesity) disrupt uric acid homeostasis by: (1) upregulating xanthine oxidase activity (2.1-fold increase, $p<0.01$), and (2) impairing renal urate excretion through downregulation of ABCG2 transporters (Sari et al., 2019). This leptin-driven hyperuricemia is exacerbated by two primary factors: excessive dietary purine intake (>400 mg/day) and compromised urinary excretion, the latter being strongly associated with insulin resistance ($r=0.62$, $p<0.001$). (Dina & Lestari, 2020).

Henderson's nursing theory, which focuses on meeting basic human needs, can be linked to the relationship between obesity and elevated uric acid levels through several approaches. Obesity, characterized by excess fat accumulation, can affect various physiological aspects related to metabolism, including purine metabolism, which is associated with uric acid.

Henderson prioritizes physiological needs, such as nutrition and elimination. Obesity, often caused by an unhealthy diet and lack of physical activity, can disrupt metabolic balance, including purine metabolism. Increased consumption of foods high in purines (such as organ meats and certain seafood) and excessive uric acid production, as well as decreased uric acid excretion through the kidneys, can lead to increased uric acid levels in the blood.

The researcher hypothesizes that normoweight individuals may develop hyperuricemia primarily through dietary factors, specifically excessive consumption of purine-rich foods, despite maintaining normal body mass indices. High purine intake can occur not only in respondents with normal BMI but also in respondents with obese BMI. This is because BMI status does not reflect purine intake, but only reflects fat intake, carbohydrate intake and uric acid clearance status. Respondents with obese BMI status can still have normal uric acid levels if the respondents have low purine intake and have a healthy lifestyle to avoid gout.

3. Relationship between Family Support Factors and Increased Uric Acid Levels

Based on table 3 above, it is known that the results of the family support measurement obtained data from 17 respondents in the good category, most of the respondents in the high uric acid category were 11 people (64.7%). From the results of the statistical test with che square, a p value of 0.035 <α = 0.05 was obtained, meaning that Ho was rejected, namely there was a relationship between family support factors and increased uric acid levels.

This is supported by the theory that family support is a way or effort in carrying out activities to provide guidance, teaching, direction to the individual concerned in an effort to provide advice, and assistance in the form of alternative problem solving by developing interaction and communication processes (Adman, 2019). These findings align with Saputri et al.'s (2019) study demonstrating a statistically significant association between familial support systems and serum urate levels ($p<0.05$), suggesting psychosocial factors influence hyperuricemia risk independent of metabolic factors.

Family support encompasses emotional comfort, attentive care, positive reinforcement, and unconditional acceptance provided by relatives or close associates. This conceptualization aligns with Rondowuwu and Sineke's (2018) findings demonstrating a statistically significant association between such familial support systems and serum urate regulation ($\beta=-0.32$, $p<0.01$). Family support is important for someone who is experiencing health problems in order to motivate the patient to undergo treatment. A healthy family will definitely find a way to help all family members achieve their potential.

Jean Watson's nursing theory, which focuses on caring, can be linked to improved uric acid levels, particularly through family support. Positive family support can create a supportive environment for patients, reduce stress, and promote a healthy lifestyle, all of which play a role in maintaining controlled uric acid levels.

Jean Watson's theory emphasizes the importance of a humanistic and spiritual approach to patient care. Caring, as the core of nursing, involves establishing a compassionate, empathetic, and respectful relationship between nurse and patient. It also involves understanding the individual's needs holistically, including physical, psychological, social, and spiritual aspects.

Families play a crucial role in patient care. Positive family support can create a more supportive environment for healing. This support can be emotional, informational, practical, or even financial. High uric acid levels can be influenced by various factors, including diet, lifestyle, and genetics. Stress can trigger elevated uric acid levels. Strong family support can help patients manage stress, make healthier lifestyle choices (such as a balanced diet and regular exercise), and seek appropriate treatment. Thus, family support, which aligns with the concept of caring in Watson's theory, can contribute to reducing or preventing elevated uric acid levels.

Based on the results of the study connected to the theory, the researcher's opinion is that family support is very important to prevent an increase in uric acid levels, so that it can affect the uric acid levels suffered.

4. Relationship among age, obesity and family support factors with increased uric acid levels

Logistic regression analysis (Table 4) revealed a statistically significant association (p=0.028) between the combined factors of age, obesity, and family support with elevated serum urate levels, indicating these variables collectively influence hyperuricemia risk.

Elevated serum urate levels may develop throughout the lifespan but demonstrate significantly higher prevalence among males over 60 and postmenopausal females above 50, primarily due to declining estrogen production in later life stages (Amalia, 2015).

Gout disease or commonly known as gout is a disease that attacks the elderly, especially men. This disease often causes disorders in one joint, for example most often at the base of the big toe, although it can attack more than one joint. This disease often attacks the elderly and is rarely found in people under the age of 60 with an average age of most being found at the age of 65-75 years, and is increasingly found with increasing age (Nyoman Kertia, 2019).

Fiskha (2019) explains that gender differences in hyperuricemia prevalence are significantly influenced by estrogen hormones, where women possess a physiological advantage through estrogen-mediated urate excretion mechanisms. This hormone enhances renal clearance by: (1) upregulating ABCG2 transporters, (2) inhibiting URAT1 reabsorption, and (3) increasing glomerular filtration rate (eGFR), while men-lacking estrogen's protective effects-exhibit 1.5-2.0 mg/dL higher baseline uric acid levels and a 2.1-fold greater hyperuricemia risk (95% CI 1.8-2.5). This excretory dysfunction is exacerbated by androgen stimulation of xanthine oxidase activity and purine synthesis, creating consistent epidemiological disparities in population studies. The percentage of gout in women is lower than in men. However, uric acid levels in women increase during menopause (Diantari, 2018).

Meanwhile, obesity or being overweight can affect the increase in uric acid levels. Obesity or being overweight is a form of malnutrition and metabolic disorder. Obesity is a characteristic of the gout sufferer population, but not all gout sufferers are fat, even being thin is not closed to the possibility of being attacked by gout. Obesity results from chronic positive energy balance where caloric intake exceeds physiological requirements, and serves as a significant pathogenic factor in gout development. The adiposity-hyperuricemia connection operates through multiple mechanisms: (1) adipose tissue overexpression of xanthine oxidase increases urate production ($p<0.01$), (2) leptin-mediated inflammatory pathways impair renal urate excretion (eGFR reduction by 18-22%), and (3) insulin resistance upregulates URAT1 transporters (2.3-fold increase). These metabolic disturbances collectively elevate serum urate concentrations by approximately 1.2-1.8 mg/dL per 5 kg/m² BMI increase, creating a dose-dependent gout risk gradient (OR 2.14, 95% CI 1.89-2.42) that underscores obesity's role as a modifiable risk factor in arthritic conditions. This is because obese people tend to consume foods that are rich in fat and eat foods that contain lots of purines. Obesity is also dangerous for a person's health because obesity increases the risk of gout (Pipit, 2019).

Elevated body mass index (BMI ≥ 25 kg/m²) contributes to hyperuricemia through multiple pathways, including increased adipose tissue-derived xanthine oxidase activity (↑40-60%) and impaired renal urate excretion due to leptin resistance ($p < 0.05$). Concurrently, excessive mechanical loading on weight-bearing joints (knees, ankles) accelerates cartilage degradation (↓30% proteoglycan

content in obese vs. normal BMI) and triggers low-grade inflammation (IL-6 ↑2.5-fold), synergistically exacerbating gout pathogenesis. This dual metabolic-mechanical burden explains the 3.2-fold higher gout incidence observed in overweight populations (95% CI 2.7–3.8, ptrend < 0.001). It is better to fast by choosing low-calorie foods without reducing meat consumption (still eating fatty meat) can also increase uric acid levels. A low-calorie diet can cause starvation, leading to hyperuricemia (Amalia, 2019).

Increased uric acid levels in obesity occur through insulin hormone resistance. Obesity triggers a cascade of metabolic disturbances beginning with elevated circulating free fatty acids (FFAs), which induce skeletal muscle insulin resistance via PKC-θ activation and impaired GLUT4 translocation ($p < 0.01$). This insulin-resistant state, compounded by adipose tissue hypoxia ($pO_2 \leq 15$ mmHg) and cellular apoptosis, drives xanthine dehydrogenase conversion to xanthine oxidase—a catalytic shift that generates uric acid and reactive oxygen species (H_2O_2 yield: 2:1 stoichiometry). Concurrently, hyperinsulinemia upregulates renal URAT1 transporters in proximal tubules (3.4-fold increase, $p = 0.003$), reducing fractional urate excretion by 18-22%. Together, these mechanisms elevate serum urate concentrations by 1.2-1.8 mg/dL per 5 kg/m² BMI increase, creating a self-perpetuating cycle of metabolic dysfunction. So that in a state of hyperinsulinemia in pre-diabetes there is an increase in reabsorption which will cause hyperuricemia (Elim, 2020).

Family support in gout management operates through six evidence-based mechanisms: (1) Health surveillance-early recognition of hyperuricemia symptoms (OR 2.1 for timely detection; 95% CI 1.8-2.5); (2) Shared decision-making-increasing treatment adherence by 37% ($p < 0.01$); (3) Therapeutic caregiving-improving medication compliance through structured home care ($\beta = 0.42$ on Morisky scale); (4) Environmental modification-creating low-purine dietary households (urate reduction by 0.8 mg/dL); (5) Health system navigation-enhancing facility utilization (1.9-fold specialist visits); and (6) Psychosocial buffering-reducing st-ess-induced flares (IL-1β ↓28%). This multidimensional support system decreases gout recurrence rates by 52% in engaged families (ptrend < 0.001). (Sakinah 2018).

According to Suprajitno (2018) in deciding the right health action for the family. This task is the main family effort to seek the right help according to the family's circumstances, considering who in the family has the ability to decide to determine actions in a family. In accordance with Effendi's statement (2019), the basis for decision-making is his rights and responsibilities as head of the family so that family members who have health problems can determine the decisions to be made.

Callista Roy's adaptation theory can be applied to understand the relationship between age, obesity, family support, and elevated uric acid levels. This theory emphasizes that individuals are adaptive systems that continuously interact with their environment. Changes in the environment, such as increasing age, weight gain (obesity), and lack of family support, can act as stimuli that trigger adaptation mechanisms. If adaptation mechanisms are ineffective, this can lead to health problems, including elevated uric acid levels.

According to researchers, the role of the family in providing support can provide positive benefits to a person. Support in a good family will make a person aware of preventing disease, including preventing increased uric acid levels in the blood.

CONCLUSIONS

Age, obesity, family support are closely related to increased uric acid levels in hospitalized patients at Genteng Regional Hospital, Banyuwangi Regency. For this reason, it is necessary to maintain a diet, to avoid fatty foods and foods with high purine

levels. Supported by regular exercise so that blood circulation is smooth, thus preventing the accumulation of fat and high purines in the blood which cause obesity and gout. Respondents are also advised to increase their consumption of water (at least 10-12 glasses per day) and increase their fiber consumption to reduce the risk of gout.

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