Risk factors of hyperuricemia in Banjar Kertabuana, Desa Tianyar Barat, Kabupaten Karangasem

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Abstract. Uric acid is the end product of purine metabolism in the human body. At least allantonin causes the human body susceptible to hyperuricemia. Hyperuricemia can cause gout arthritis. According to Bali Province Basic Health Research in 2013, Karangasem Regency occupied the first position of prevalence of arthritis incidence in Bali Province. Puskesmas Kubu 2 occupied the fourth position of arthritis incident in Karangasem and most patients from Banjar Kertabuana. This study was aimed to determine the risk factors of hyperuricemia occurrence in people aged over 24 years in Banjar Kertabuana. Cross sectional method was used with systematic random sampling technique. The instruments of this study were questionnaires, measurements of uric acid, and calculation of body mass index. Data were analyzed by Chi Square bivariate test and multivariate test of Binary Logistic Regression with Backward Conditional method. The result was 102 (60%) respondents had hyperuricemia and 68 (40%) of respondents did not have hyperuricemia. Chi Square test showed that age, sex, family history, high purine consumption pattern, alcohol consumption, obesity were hyperuricemia risk factors and significant (p <0,005). Multivariate analysis with Binary Logistic Regression Test, high purine consumption pattern was risk factor with highest odd ratio (OR) of 12,179 (95% CI: 4,978-29,798) and family history did not pass multivariate test with p equal to 0,104. This study is expected to be used as guidance of counseling to the community to prevent the incidence of hyperuricemia and to provide scientific information to researchers about risk factors that affect the incidence of hyperuricemia.

Keyword : Risk, Hyperuricemia.

1 Introduction

Uric acid is the final product of purine metabolism in the human body. The low enzyme urate oxidase in the human body compared to other mammals causes inhibition of conversion of uric acid into allantonin, so that humans are susceptible to hyperuricemia. Hyperuricemia can cause arthritis, gouty arthritis [1].

Based on Indonesia's Basic Health Research [2], the prevalence of arthritis diagnosed by the health workers in Indonesia was 11.9% and based on its symptoms the prevalence was 24.7%. Bali Province was ranked third in arthritis cases in Indonesia with a percentage of 30% [2]. Data from the Basic Health Research of Bali Province (2013) showed that Karangasem District has the highest prevalence of arthritis in Bali. A health centre that occupied the fourth position as an area of incidence of arthritis in the Karangasem was Kubu 2. There were 46 cases of arthritis and the Community Health Centre of Kubu 2 was in the first position as the region which found the 10 most diseases. The majority of the patients were from Banjar Kertabuana (12% of total patients?), from ages 25 years old to 60 years old [3].

Accurate data that provide information of the prevalence of the incidence of hyperuricemia in Bali is indeed limited, but there have been studies conducted in several areas in Bali. The prevalence of hyperuricemia in rural tourism areas in Ubud Subdistrict, Gianyar District was 12%, in Denpasar City was 18.2%, in Nusa Ceningan Village, Klungkung District was 17%, and in Sembiran Village, Bangli District was 18.9%. A study carried out in the village of Tenganan, Karangasem District revealed that the prevalence of hyperuricemia was more than 29%, with the proportion of cases in male was 21% and in women was 7%, compared to some areas in the Province of Bali [4].

Risk factors for hyperuricemia are classified into two: modifiable risk factors and unmodifiable risk factors. Modifiable risk factors include age, gender, and family history. Meanwhile, unmodifiable risk factors comprise obesity, high purine food intake, alcohol, and consumption of certain drugs [5]. Based on the data mentioned above, this study was conducted to uncover the factors that cause the incidence of hyperuricemia in Banjar Kertabuana, Desa Tianyar Barat.

2 Method

This research was conducted in Banjar Kertabuana, Desa Tianyar Barat, Kubu Sub-district, Karangasem District for 5 months, starting from September 2017 to January 2018. This study was an observational study with an analytical method. Cross-sectional approach was the approach applied in this study design. The cross-sectional approach was used to describe and elucidate a situation in a group. This was done by connecting the independent and dependent variables at the same time. The data obtained in this study were primary data, collected through interviews with informants, questionnaires, calculation of Body Mass Index (BMI), and examination of blood uric acid levels using Easy Touch GCU.

The target population of this study were people aged ≥ 25 years in the coverage area of the Community Health Center of Kubu 2 and the accessible population was the community aged ≥ 25 years of Banjar Kertabuana, Desa Tinyar Barat, Kubu Sub-district, Karangasem Distict. Samples for this study were a number of persons drawn from an affordable population by applying systematic random sampling and by calculating according to the cross-sectional method that met the inclusion and exclusion criteria, with a sample of 170 persons.

The dependent variable in this study was hyperuricemia and the independent variables were age, gender, family history, high purine intake, alcohol history, and obesity. The types of data obtained in this study were primary data and secondary data. Primary data collection was done by interviewing the participants, distributing questionnaires, checking blood uric acid levels using Easy Touch GCU, and calculating the body mass index performed by measuring the height and the weight. The interview guidelines used in collecting the data of the study were in the form of closed questions and open questions about factors related to the incidence of hyperuricemia. Secondary data in the form of a list of residents aged ≥25 years were obtained from the office of the head of Desa Tianyar Barat.

3 Results And Discussion

3.1 Sample Description

The data presented in table 1 show that of the 170 samples examined, the difference between the incidence of hyperuricemia and non hyperuricemia is 34 people. Respondents who are more than 40 years old are less than those under 40 years old, with a comparison of 10 people. In terms of gender, there were more female respondents than male, with a difference of 28 people. Most respondents have a family history of hyperuricemia, with a ratio of 6 people. In terms of high purine consumption patterns, the majority of respondents with high purine consumption patterns are classified as not good, with a difference of 46 people. Likewise with alcohol consumption, most of the respondents consumed alcohol, with a difference of 42 people. Based on the results of measurements of body mass index (BMI), respondents who are obese are more than those who were not obese, with a difference of 8 people.

Table 1. Characteristics of Sample

Characteristics	Frequency (person)	Percentage	Characteristics	Frequency (person)	Percentage
Hyperuricemia			High purine consumption pattern		
Hyperuricemia	102	60%	Poor	108	63,5%
Non-hyperuricemia			Good	62	36,5%
Age	68	40%	Alcohol consumption		
40 Years	80	47,1%	Consuming	106	62,4%
< 40 Years	90	52,9%	Not consumsing	64	37,6%
Genre			Obesity		
Female	99	58,2%	Obese	89	52,4%
Male	71	41,8%	Not obese	81	47,6%
Family History			Obesity		
with history	88	51,8%	Obese	89	52,4%
without history	82	48,2%			

Bivariate and Multivariate Analysis

Table 2. Bivariate analysis using Chi-Square Test

Variable Independent	P	OR	CI 95%	Variable Independent	P	OR	CI 95%
Age	0,000	7,701	3,461-14,447	Alohol Consumtion	0,001	2,973	1,560-5,666
Gender	0,000	3,272	1,723-6,213	Obesity	0,001	2,897	1,534-5470
Family History	0,004	2,504	1,333-4,702				
High purine consumption pattern	0,000	11,239	5,379-23,480				
Gender	0,000						
Family History	0,004						

As shown in table 2, all the variables examined were significant risk factors for hyperuricemia ($p < 0.05$) with more than one Confident Interval (CI) range.

Table 2 shows that the independent variables included in the candidate variables of the multivariate test which were (p <0.25), were age (p = 0,000), gender (p = 0,000), family history (p = 0,004), high purine consumption pattern (p = 0,000), alcohol consumption (p = 0.001), and obesity (p = 0.001). The results of the bivariate analysis show that all variables belong to the multivariate analysis criteria (p <0.25) and multivariate analysis can be performed. The results of the multivariate analysis are presented in table 3.

Table 3. Multivariate Analysis with Backward Conditional Method

Variable Independent	P	OR	CI 95%	Variable Independent	P	OR	Variable
Ent				**t**			
Step 1				*Step 2*			
Age	0,002	4,848	1,802-13,047	Age	0,001	5,325	2,059-13,771
Genre	0,017	5,752	1,364-24,256	Genre	0,030	4,725	1,159-19,265
Family History	0,104	2,047	0,863-4,851				
High Purine Comsumption Pattern	0,000	12,179	4,978-29,798	High Purine Comsumption Pattern	0,000	11,932	4,950-28,763
Alcohol Consumption	0,018	1,145	1,029-3,720	Alcohol Consumption	0,007	1,196	1,369-7,360
Obesity	0,006	3,358	1,426-7,908	Obesity	0,036	3,174	1,043-3,901

The first stage disclosed that the family history variable had the largest p-value of 0.104. In the second stage, the family history variable was not included because the p-value is more than 0.05, so the variable strengths from the largest to the smallest, which risks in increasing uric acid in the blood based on multivariate analysis, are the high purine consumption pattern (OR = 11,932), age (OR = 5.325), gender (OR = 4.725), obesity (OR = 3.174), and alcohol consumption (1,196).

3.2 Age as a Risk Factor for Hyperuricemia

The findings of this study indicate that age is a significant risk factors for hyperuricemia. This is indicated by the results of the bivariate statistics obtained, wherein, the value of X^2 = 31,875, OR = 7,701 (95% CI: 3,461-14,447), and the p-value is less than 0.05 which is 0,000, and the results of multivariate statistics are OR = 5,325 (95% CI: 2,059-13,771) with a p-value of less than 0.05, which is 0.001. The statistical results are in accordance with the hypothesis which claims that people with the age of less than or equal to 40 years are a risk factor for the incidence of hyperuricemia. Hence, the respondents with the age above and equal to 40 years have a greater risk of hyperuricemia than those under the age of 40 years.

The results of this study are complying with the results of a cross-sectional study conducted by Putra and Hensen on hyperuricemia in one of the villages of Ubud, Bali. With the Chi-Square test, the results of the study showed significant results with a PR value of 1.03 (95% CI: 1.01 - 1.06) with a p-value of 0.014 [6]. A cohort study conducted by Seunghuo found that there is a significant relationship between the age of 40 and hyperuricemia. In people over 40 years old, usually there is an increase in uric acid levels that occur due to decreased kidney function in the excretion process of metabolic waste that is marked by an

increase in urea and creatinine levels, so that uric acid that is supposed to come out from the body will remain circulating in in the blood [7].

3.3 Gender as a Risk Factor for Hyperuricemia

Gender is another risk factor for hyperuricemia that is also statistically significant. It can be seen from the results of the bivariate test statistics with the value of X^2 = 11,595, OR = 3.272 (95% CI: 1,723- 6,213), and the p-value which is less than 0.05, that is, 0,000. Similarly, the results of multivariate test statistics with OR = 4.725 (95% CI: 1.159-19.265), with a p-value of less than 0.05, which is 0.03. The statistical results are in accordance with the hypothesis which states that male sex can be a risk factor for hyperuricemia. This implies that male respondents have a greater risk of hyperuricemia than female.

The findings of this study confirm the findings of a case control study conducted by Setyoningsih on factors related to hyperuricemia. The results of the study revealed that gender is a significant risk factor for hyperuricemia. Data analysis using bivariate Chi-Square test and multivariate test Multiple Logistic Regression showed odd ratio (OR) = 5,231 (95% CI: 1,657 -16,515) values, with p-value is less than 0.05, that is 0.003. Furthermore, it also shows that male sex has a risk of 5.2 times greater in experiencing hyperuricemia than female. According to Terkeltaub in Setyoningsih, in men, uric acid levels in the blood at puberty can reach 5.2 mg / dl and will increase with age. This happens because in men there is no estrogen hormone that functions as a uricosuric agent, a chemical that functions to help excretion of uric acid through the kidneys by inhibiting the urate transporters 1 from the lumen to proximal tubular cells when regulating electrolyte fluid balance. The absence of the estrogen hormone makes men more susceptible to hyperuricemia than women [8].

3.4 Family History as a Risk Factor for Hyperuricemia

The result of this study also shows that family history is not a risk factor for hyperuricemia and according to statistics multivariate tests do not show significant results. Based on bivariate statistical analysis, a value is obtained, that is X^2 = 10.657, OR = 2.504 (95% CI: 1.333-4702), with the p-value being significant, which is 0.004. However, in the statistical analysis of the multivariate test results, the family history shows insignificant p-values, i.e. > 0.05 and the confidence interval included 1 is 0.104 with OR = 2.047 (95% CI: 0.863-4.851), and therefore it was excluded from multivariate analysis. The statistical results do not match the hypothesis, in that, there is a family history of hyperuricemia which is not a risk factor for hyperuricemia.

3.5 High Purine Consumption Pattern as a Risk Factor for Hyperuricemia

The results of this study also show that high purine consumption patterns are a risk factor for hyperuricemia and statistically significant. Based on bivariate test statistics, it is found that the high purine consumption pattern is a risk factor and is significant for hyperuricemia, in that, the value of X^2 = 47,544, OR = 11,239 (95% CI: 5,379-23,480), and p-value is less than 0,05, i.e. 0,000. Similarly, in the statistics of multivariate test results, the pattern of consumption of high purine foods have the highest OR value of 11,932 (95% CI: 4,950-28,763) compared to that of other risk factors, with a p-value of less than 0.05, that is 0,000. These statistical results are in accordance with the hypothesis claiming that the pattern of high purine consumption is a risk factor for hyperuricemia. This shows that respondents with high purine consumption have a higher risk of hyperuricemia than those with good purine consumption patterns.

Nucleic acids in foods that enter into the digestive tract will be degraded in the intestine into nucleutides. Nucleutides are further broken down into nucleusides which can be

absorbed by the intestinal mucous membrane or broken down again into purine and ribose bases. Nucleusides (adenosine and guanosine) from the nucleutide degradation (AMP and GMP), then undergo catabolism and produce uric acid [9]. Excretion of uric acid mostly through urine and the rest through feces. However, 90% of the uric acid in the glomerular filtrate is reabsorbed in the proximal tubule, while the remaining 10% is excreted. URAT1, GLUT9, and ABCG2 are transporters that play a role in regulation of uric acid levels in the serum by regulating the reabsorption and secretion of urate in the proximal tubule of the kidneys [10].

3.6 Alcohol Consumption as a Risk Factor for Hyperuricemia

Regarding alcohol consumption, the results of this study also indicate that alcohol consumption is a risk factor that is statistically significant for hyperuricemia. Based on bivariate statistical tests, the alcohol consumption is a risk factor that is significant for hyperuricemia, with a value of X^2 = 11,293, OR = 2,973 (95% CI: 1,560- 5,666), and a p-value less than 0,05, which is 0,001. Likewise in the multivariate analysis alcohol consumption is a significant risk factor for hyperuricemia, with an OR value of 1.196 (95% CI: 1.043-3.901) and p-value = 0.036. The statistical results match the hypothesis that alcohol consumption is a risk factor for hyperuricemia. Respondents who consumed alcohol had a greater risk of hyperuricemia than those who did not.

The findings of this study are in line with the case control research conducted in Sudan by Mohamed on the evaluation of alcohol consumption with uric acid levels. The study showed that consuming alcohol significantly (p = 0,000) can increase uric acid levels in the blood with a risk 2.7 times greater than not consuming the alcohol. The type of alcohol that often increases uric acid in the blood and the incidence of gout are beer and liquor [5]. Similarly, research conducted by Rama Putra about the relationship between alcohol consumption and hyperuricemia, wherein, it was found that beverages such as beer, palm wine, tape and others, can increase uric acid levels in the blood, especially in men [11].

3.7 Obesity as a Risk Factor for Hyperuricemia

The results of bivariate statistics revealed that obesity is also a risk factor that is statistically significant for hyperuricemia incidence, with a value of X^2 = 11,040, OR = 2,897 (95% CI: 1,534-5470), and a p-value less than 0,05, which is 0,001 . Similarly, the results of multivariate statistics, wherein, OR value = 3.174 (95% CI: 1.369-7.360) and p-value is less than 0.05, which is 0.007. The statistical results are in accordance with the hypothesis that has been formulated that obesity is a risk factor for hyperuricemia. This shows that obese people have a greater risk of suffering hyperuricemia than those who are not obese.

According to the WHO cited in the Putra and Hensen study, an obese state in person increases the risk of hyperuricemia and gout by 2-3 times compared to non-obese.[6] This is also supported by the results of a previous study which discloses that individuals with excessive weight or with an obesity rate of 3.25 times higher (95% CI: 2.50-4.23) would experience hyperuricemia compared to those who had normal weight. In obese people (BMI> 25 kg / m ^ 2) with an obesity rate more than 30% of ideal body weight, hyperuricemia tends to occur [12].

Leptin levels in the body of obese people will increase. Leptin is a helical protein secreted by adipose tissue. Leptin is released into the circulatory system thereby increasing gluconeogenesis in the liver and decreasing glucose uptake by peripheral tissue, as well as causing hyperinsulinemia. This condition of hyperinsuliemia increases the process of

reabsorption by the renal tubules which can cause hyperuricemia, so an increase in leptin levels along with increased levels of uric acid in the blood [13].

4 Conclusions

Age, gender, high purine consumption patterns, alcohol consumption, and obesity are the risk factors for hyperuricemia. Meanwhile, family history is excluded as a risk factor for hyperuricemia. People aged more than or equal to 40 years 5.3 times more likely to experience hyperuricemia compared to people aged less than 40 years. Males has 4.7 times greater risk of hyperuricemia compared to females. A poor high purine consumption pattern has a risk of 11.9 times greater compared to high purine consumption pattern in suffering a hyperuricemia. Consuming alcohol has a 1.1 times greater risk of experiencing hyperuricemia than not consuming alcohol. Obese people has a risk 3.1 times more likely to experience hyperuricemia than not obese ones.

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