



## RESEARCH ARTICLE

# RELATION OF NUTRITIONAL STATUS ON THE EVENT OF KIDNEY STONES IN WEST NUSA TENGGARA PROVINCE GENERAL HOSPITAL

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## ABSTRACT

**Background:** Urinary tract stone disease is one of the diseases with a high rate of incidence in Indonesia based on the number of patients who come to Urology outpatient care center. One of the risk factors for urinary tract stones is a systemic disease, including hypertension and obesity. Based on previous research, there are studies who state that there was no relationship between body mass index and the incidence of urinary tract stones, other studies state that there was a relationship between body mass index and the incidence of urinary tract stones. The difference in the results of these studies prompted researchers to conduct research related to the relationship between body mass index and the incidence of urinary tract stones, especially in West Nusa Tenggara specifically in Mataram area.

**Methods:** The research method used was an analytic observational study. The research design used was cross-sectional. Study subjects were recruited from medical record patient of urology outpatient department. In this research design, researchers conducted an analysis related to the relationship between variables.

**Results:** 69 kidney stone patients at the West Nusa Tenggara Province General Hospital were enrolled. Characteristics of respondents are based on age, most of them were aged of 56 years old and over, as many as 28 patients (40.58%), most of subjects were male, most of them did not finish primary school as many 29 patients (42.03), and occupations mostly not working. While the nutritional status is mostly normal, as many as 46 respondents with a percentage of 66.67%.

**Conclusion:** This study shows that body mass index and age have a relationship with the incidence of kidney stones, while occupation and gender have no relationship with the said incidence.

**Keyword:** Kidney stones, age, occupation, gender, nutritional status.

## Introduction

Urinary tract stone disease is one of the diseases with high rate of incidence in Indonesia based on the number of patients in the Urology outpatient care center. Urinary tract stones are conditions where urine calculus were formed in the urinary tract

, ureters, bladder, and urethra. The main component of most urinary tract stone is calcium oxalate (50-70%) either in its pure form (30%) or a mixture with calcium phosphate (40%). Followed by stones of uric acid about 10-20% then struvite stones or ammonium magnesium phosphate stones as much as 5-10% and at least in the form of



cystine stones which are only 1-2% (Anhar and Widiyanto,2014).

One of the risk factor for urinary tract stones is a systemic disease, including hypertension and obesity. In individuals who are overweight, there is an increase in the incidence of urinary tract stones by more than 75%. In addition, there are also studies whose results state that a Body Mass Index (BMI) of more than 30 kg/m<sup>2</sup> is associated with an increased risk of kidney stone formation because urinary excretion of oxalate, uric acid, sodium and phosphate is higher than individuals with a normal BMI (Agustin,2019).

Body Mass Index (BMI) is a tool to monitor the nutritional status of adults. This index can be related to a person's excess weight or underweight. Inadequate or excessive nutritional condition can be a risk of certain diseases (Anhar and Widiyanto,2014).

Obesity and type 2 diabetes mellitus are both associated with urinary tract stones. As the epidemic of obesity and diabetes increases, the prevalence of urinary stones also increase. Anhar and Widiyanto (2014), stated that there was no relationship between body mass index (BMI) and the incidence of urinary tract stones, while Antonelli's research Wong, Cook, and Somani (2015) stated that there was an increase in the incidence of urinary tract stones of more than 75% in individuals who are overweight and obese.

The difference in opinion has prompted researchers to conduct further research related to the relationship between body mass index (BMI) and the incidence of urinary tract stones, in Mataram,area.

## Material and Methods

### Research design

This research conducted a cross-sectional research design, that was all research variables were collected at the same time. The

dependent variables were BMI, age, gender, and occupation of the patients with renal stones, while the independent variable was the renal stone.

The research was conducted at the NTB Provincial General Hospital. The time of the study was carried out from December 2021-February 2022.

### Research Subjects

The population in this study were all patients who suffered from urinary tract stones, especially kidney stone patients who were at the NTB Provincial General Hospital. The sample in this study was patients who met the inclusion criteria are patients diagnosed with kidney stones in January to December 2020. The research sample from this study were patients from the NTB provincial general hospital who had been diagnosed with kidney stones who met the inclusion criteria that had been determined and were taken based on total sampling recruitment.

### Research Instruments

The instrument used for data collection was a data sheet which were filled out from medical record data of patients diagnosed with kidney stones in the NTB Provincial General Hospital and also data from patient interviews via telephone

### Data analysis

Data analysis in this study used the software SPSS (Statistical Package Social Service) version 21. Data were performed descriptively by using the frequencies table. The analysis of the relationship between variables used the Binomial test.

## Results and Discussion

### Characteristics of respondents



As many as 69 patients with kidney stone enrolled in this research. The characteristic of those patient demonstrated in table I.

**Table I.** Characteristics of respondents with kidney stones at the NTB Provincial Hospital.

Characteristics	Frequency	Percentage (%)	Binomial Test
<b>Age</b>			
Early adulthood 26-35 years	7	10.14	p = 0.002
Late adult 36-45 years	8	11.59	
Early elderly 46-55 years	26	37.68	
Late Elderly > 56 years	28	40.58	
Total	69	100	
<b>Gender</b>			
Female	30	43.48	p = 0.336
Male	39	56.52	
Total	69	100	
<b>Education</b>			
uneducated	29	42.03	
School Elementary	12	17.39	
Junior High School	5	7.25	
Senior High School	14	20.29	
Diploma-3	1	1.45	
Bachelor/Undergraduate	7	10.14	
Postgraduate	1	1.45	
Total	69	100	
<b>Occupation</b>			
unemployment	35	50.72	p = 0.057
Farmer	3	4.35	
Labor	5	7.25	
Entrepreneur	8	11.59	
Student	1	1.45	
Civil Servant	11	15.94	
Others	6	8.70	
Total	69	100	

According to Haerudin, Kusmiati and Budiman (2015), age is one of the factors that influence the occurrence of kidney stones, especially at the age of 55 years and over. This is also supported by research conducted by Fauzi and Putra (2016), that age above 40 years is the age with the most cases of nephrolithiasis, kidney stones that occur at a young age are usually

due to family history or local medical conditions and gout. The results of this study are in line with the two opinions above where data is obtained that the age of the late elderly and the early elderly is the age with the most cases of kidney stones.

Age is one of the factors that are often associated with the incidence of kidney stones.



The results of this study indicate that the incidence of kidney stones has a relationship with a person's age with a value of  $p = 0.02$  ( $p < 0.05$ ). In this study, it was found that patients who experienced kidney stones were in the elderly age, specifically 56 years and over. The results of this study are in accordance with research conducted by Nurfitriani and Oka (2019) that the incidence of urinary tract stones, which in this case includes kidney stones, has a significant relationship with the age of the patient.

Increasing age is in line with the increase in the work of stones in the kidneys and reaches a maximum level in adulthood. As we age, the capacity of the kidneys increases. If it is not balanced with appropriate metabolism, there will be a high deposition process in the Loop of Henle. In the elderly, some of the nephrons are no longer functioning properly, and are equally characterized by a decrease in proximal tubular volume or a Loop of Henle. This results in an increased chance of stone deposition occurrence (Ratu, Badji and Hardjoeno, 2006).

The results of this research on gender are in line with research conducted by David, Frederic and Orson (2008), that men are more progressive than women in kidney stone disease which were thought to be because the urinary tract in men is longer than the urinary tract in women.

The incidence of kidney stones from several studies states that male patients are more likely to experience kidney stones than female patients. The results of this study indicate a significant value of the relationship between gender and the incidence of kidney stones, the value of  $p = 0.336$  ( $p > 0.005$ ), indicates that the incidence of kidney stones has no relationship with the gender of the patient. The results of this study are different

from the research conducted by Muthia et al. (2015) wherein the incidence of urinary tract stones has a relationship with gender in which the male gender is more likely to be at risk of experiencing the disease. There is no relationship between gender and the incidence of kidney stones, it can also be caused by women's habits that can cause the disease, for example, holding back urination, sedentary life style and a high protein diet (Nurlina, 2008).

The occurrence of kidney stones can also be caused by hormones, one of which is testosterone. Testosterone has toxic properties on the kidneys, which can induce podocytes and TGF- $\beta$ 1 which is associated with accelerated processes of sclerosis and renal fibrosis. Testosterone also induces renin-angiotensin-aldosterone system (RAAS) which results in both glomerular and systemic hypertension. Unlike the hormone estrogen. Estrogen is protective due to the mechanism of inhibition of RAA, so that the incidence of kidney stones is more in men than women.

The results of this study stated that there was no significant relationship between occupation and the incidence of kidney stones where the  $p$ -value = 0.057 ( $p > 0.05$ ). The results of this study are different from research conducted by Silalahi (2020) where sitting while working is one of the causes of urinary tract stones. On average, kidney stone patients at the West Nusa Tenggara Provincial Hospital are not work, some are retired employees and some choose to quit their jobs because they are no longer able to work due to old age. The incidence of kidney stones can be caused by excessive activity and bad habits of patients. Patients who have jobs cannot do activities such as sitting for an excessive period of time. Therefore, work does not affect the occurrence of kidney stones.

## Nutritional status



Table 2. Nutritional status of kidney stone patients in NTB Provincial Hospital

No	Nutritional status (BMI)		Frequency	Percentage (%)	Binomial Test
1	Underweight	Heavy (< 17.0 kg/m <sup>2</sup> )	2	2.90	p = 0.00
		Light (17.0-18.4 kg/m <sup>2</sup> )	0	0	
2	Normoweight (18.5-25.0 kg/m <sup>2</sup> )		46	66.67	
3	Overweight	Light (25.1-27.0 kg/m <sup>2</sup> )	10	14.50	
		Obese Heavy (>27.0 kg/m <sup>2</sup> )	11	15.95	
Total			69	100	

Nutritional status is one of the most important factors in supporting human health. Susetyowati (2002), states that malnutrition in patients with kidney disease is usually caused by several factors including lack of food intake, increased catabolism, or the characteristics of the patient himself. The common method to assess nutritional status is by calculating the BMI.

The results of this study indicate that the highest number of patients suffering from kidney stones in the NTB Provincial Hospital was normoweight, that were 46 patients (66.67%). This means that most patients are not obese or malnourished. This is in accordance with research conducted by Haerudin, Kusmiati, and Budiman (2015) that the incidence of kidney stones in Majalengka Hospital in 2013 was experienced by most of the normoweight patients.

The incidence of kidney stones is caused by inadequate of water consumption, sleep patterns, hypertension, or the influence of other diseases. When the body lacks of water, the consequence is water reabsorption will occur in the kidney. Excessive consumption of minerals, vitamins, or other substances will be excreted through the urine.

Excessive of minerals and vitamins cannot be excreted by the kidneys and then will affect the decline in kidney function and the excessive minerals and vitamins will precipitate and kidney stones (Han et al.,2015).

### **The Relationship between Nutritional Status (BMI) and the Incidence of Kidney**

Kidney stones are a group of urinary tract stones. Kidney stones are defined as a condition in which there are stones containing crystalline components and organic matrix in the kidneys, which affects the function of these organs. Types of kidney stones consist of calcium stones, struvite stones, uric acid stones, and other types of stones such as cystine, xanthine, and brush (Fauzi and Putra, 2016).

Body Mass Index (BMI) is one method of nutritional assessment. BMI will categorize three categories, namely underweight, normal and obese. Body mass index is often associated with the incidence of urinary tract stones, especially in the obesity category. Obesity can cause various kinds of dangerous diseases such as hypertension, diabetes mellitus, and even urinary tract stones (Anhar and Widiyanto, 2014) .



The results of this study indicate that BMI has a significant relationship with  $p$  value = 0.000 ( $p > 0.05$ ) on the incidence of kidney stones in the Regional General Hospital (RSUD) of NTB Province. The results of this study are in accordance with research conducted by Nurfitriani and Oka (2019), that body mass index has a significant relationship with the incidence of urinary tract stones. Research conducted by Kim et al (2011) also states the same thing that one of the factors causing the occurrence of urinary tract stones is a person's Body Mass Index (BMI).

There is a significant relationship between BMI and the incidence of kidney stones because irregular food consumption can result in an increase in calcium, oxalate, and uric acid lithogenic substances that cause stone formation. This is in accordance with the opinion of Silalahi (2020) that the occurrence of kidney stones is caused by an excessive amount of calcium, oxalate, phosphate, and uric acid compounds in the body, compounds that are not used will precipitate and become kidney stones.

## Conclusion

This study concluded that body mass index and age have a relationship with the incidence of kidney stones, while occupation and gender do not have relationship with the incidence of kidney stones.

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