Research Article

Early Detection Patterns Of Chronic Kidney Disease Based On Differences In Individual Health Status In Kendari City

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ABSTRACT

Background: The prevalence of chronic kidney disease (CKD) was small but it continued to increase every year in Kendari City. The patients were difficult to monitor. The aim of this research is to formulate an early detection pattern for CKD based on differences in individual health status in Kendari City.

Methods: This quantitative research used a cross sectional study design which was conducted at 4 Community Health Centers and 3 Hospitals in Kendari City, Southeast Sulawesi, Indonesia. Recruited 136 respondents aged between 24-70 years. Data collection by interviews with questionnaires. The dependent variable is health status, and the independent variables include behavior, psychological environment, stress and genetics. Data analysis used chi square statistical tests, crosstabulation and multinomial logistic regression.

Results: There is a significant difference in drinking water consumption behavior of less than 1000 ml a day (p<0.0001, OR=1.56, B=-20.276), calorie intake of less than 1534 calories a day (p<0.05, OR=2.13, B=-19.969), physical activity (p<0.05, OR=5.7, B=1.735), medication adherence (P<0.01, OR=0.4,B=1.999) and psychological stress environment (p<0.0001,OR=8.6, B=2.151) with the respondent's health status. Meanwhile, herbal consumption behavior (p=0.195) and genetic factors (p=0.813) did not show significant differences with individual health status.

Conclusion: Early detection patterns for CKD can use the variable such as less drinking water consumption in healthy people and no obedient medication in single disease group. Using variables of less daily drinking water consumption and heavy physical activity in multiple diseases group, and less drinking water consumption, less physical activity, and moderate stress in CKD group.

Key words: Pattern, early detection, chronic kidney disease, physical activity, health status

INTRODUCTION

The prevalence of chronic kidney disease is very small compared to hypertension and diabetes mellitus in Kendari City, Southeast Sulawesi, Indonesia. Therefore, the non-communicable disease program at the Community Health Centre does not include a chronic kidney disease control program. Even though the prevalence of chronic kidney disease is small, the trend has increased from 0.2% in 2013 to 0.38% in 2018 [1], [2]. Several previous studies stated that hypertension and diabetes mellitus are the main risk factors for chronic kidney disease [3], [4], [5], [6]. Apart from hypertension and diabetes mellitus, other risk factors for chronic kidney disease have also been suggested, such as water consumption, diet, physical activity, medication adherence, consumption of herbal and genetic medicines [7], [8], [9], [10], [11].

Chronic kidney disease is a silent killer disease, where sufferers only seek treatment when they are at stage 3 or 5, namely the chronic stage. That is why the prevalence of chronic kidney disease appears to be small in Kendari City. However, if we look at chronic kidney diseases such as hypertension and diabetes, the prevalence is very high in Kendari City, compared to other districts in Southeast Sulawesi Province. This means that there are already many individuals suffering from acute chronic kidney disease, but they are simply unable to be detected. Therefore, it is important to formulate a model for the stages of early detection of chronic kidney disease that can be carried out effectively by both health workers and lay people. The stages of the natural course of a disease start from the initial stage where a person is still healthy or has not been infected by a disease agent. Then the infection continues with initial signs, then clinical symptoms appear. The disease progresses to the developmental stage and if not prevented will progress to disability or death. However, the stages for early detection of kidney disease that are easy for everyone to carry out have not been clearly formulated. Therefore, this study aims to formulate an early detection pattern for chronic kidney disease based on differences in individual health status in Kendari City, Southeast Sulawesi Province, Indonesia.

METHOD

Design, location and time of research

This quantitative research method uses a cross sectional study design. This research links risk factors such as drinking water consumption, diet, herbal medicine consumption, medication adherence, physical activity, stress and family history with health status. Health status is grouped into four categories, namely healthy groups, single disease, multiple diseases and acute/chronic kidney sufferers.

This research was conducted in 3 sub-districts in the Kendari City area, Southeast Sulawesi Province, Indonesia, namely in West Kendari sub-district, Baruga sub-district and Abeli sub-district. The location selection was based on geographical representation in Kendari City. This research was carried out from June to August 2023.

Population and sample

People aged 20-70 years are the population in this study. The sample size was 136 people. Cluster random sampling technique. The inclusion criteria are those who are willing to be respondents, can communicate well, and have no physical disabilities since birth.

Data collection and analysis

Data were obtained by interviews with questionnaires and blood pressure measurements. Respondent participation is based on informed consent given by the

RESULTS

Respondent characteristics

This research has analysed data from 136 respondents, most of whom were women (60.3%) and only 39.7% were men. The majority of respondents were in the 51–60-year age group (30.1%) and the least were in the 36–40-year age group. Subjects in the 41–50-year age group were also the second largest (27.2%). The rest were in the age group less than 35 years (17.6%) and more than 60 years (15.4%).When viewed from the level of education, the subjects were dominated by those with high school education (33.8%) and the lowest were those with doctoral (0.7%) and master's education (5.1%). Then followed by the second largest, namely Bachelor (28.7%). Meanwhile, the proportion of subjects with primary school and junior high school education was the same (13.2%). In the research, there were 2.2% of subjects who had not completed elementary school. Half of the subjects were unemployed or housewives and retired (50%). The second highest proportion is civil

respondent. Data analysis using the chi-square statistical test, Kruskal Wallis H comparison and Multinomial Logistic Regression. Data were analyzed using SPSS version 25.

servants (21.3%) followed by private sector/BUMN workers (13.2%). Only a few subjects worked as farmers (3.7%) and laborers (2.2%).

Univariate analysis results

Most of the respondents in this study had acute or chronic kidney disease (39.0%), and only a few were healthy (11.8%) (Table 1). The majority of respondents consumed less than 1000 ml of drinking water per liver (64%) and only a few consumed good drinking waters (5.1%). Meanwhile, calorie intake is mostly moderate (61.8%) and very few are classified as good calorie intake per day (8.1%). Most did not consume herbs (60.3%), but adhered to taking medication (71.3%). The majority of them lack physical activity, namely less than 4 hours per day (50%). However, most of them were mentally healthy or not stressed (59.6%), and only a few had mild stress (10.3%). Most of them did not have a family history of kidney disease (92.6%).

Table 1. Distribution of health status, behavioural factors, psychological and genetic environment

Variables	Categories	N	Marginal Percentage
Health status	Healthy	16	11.8%
	Single disease	40	29.4%
	Multiple diseases	27	19.9%
	Acute / Chronic Kidney	53	39.0%
Daily Drinking Water	Good (>2000 ml)	7	5.1%

Variables	Categories	N	Marginal Percentage
Consumption	Moderate (1000-1999 ml)	42	30.9%
	Less (<1000 ml)	87	64.0%
Daily Calorie Intake	Good (> 1534 calorie/ cal.)	11	8.1%
	Moderate (768-1533 cal.)	84	61.8%
	Less (< 767 cal.)	41	30.1%
Herbal Consumption	No	82	60.3%
	Yes	54	39.7%
Daily Physical Activity	Normal (5-8 hours/ hr)	45	33.1%
	High (> 9 hr)	23	16.9%
	Low (< 4 hr)	68	50.0%
Medication Adherence	Obedient	97	71.3%
	Not obey	39	28.7%
Psychological Environment Of Stress	Normal (<11)	81	59.6%
	Mild (12-22)	41	30.1%
	Moderate (23-32)	14	10.3%
Genetic	No	126	92.6%
	Yes	10	7.4%
Total		136	100.0%

Multivariate analysis results

The influence of behavioural factors, environmental stress psychology and genetics on health status

The results of the multinomial logistic regression test explained that only some behavioural and psychological stress (pvalue < 0.0001) had a significant influence on health status (Table 2). Meanwhile, genetics and some behaviours do not significantly influence health status. Significant behaviour regarding health status is drinking water consumption (p value <0.0001), healthy physical activity (p value <0.05), compliance with taking medication (p value <0.01). Meanwhile, behaviours that have no significant influence on respondents' health status are herbal consumption, daily calorie intake, and generic factors.

Table 2. Influence of behavioural factors, psychological stress and genetic environment on health status

Variables	-2 Log Likelihood of Reduced Model	Likelihood Ratio Tests		
		Chi-Square	df	Sig.
Intercept	178.727	.000	0	.
Daily Drinking Water Consumption	216.101	37.374	6	.000
Daily Physical Activity	195.202	16.474	6	.011
Medication Adherence	192.088	13.360	3	.004
Psychological Environment Of Stress	204.741	26.014	6	.000

Early detection patterns for chronic kidney disease

Early detection of individuals at risk of chronic kidney disease can be carried out by healthy groups, single disease, multiple disease and acute/chronic kidney sufferers (Fig 1). In a group of healthy individuals, observations can be made of drinking water consumption of less than 1999 ml per day. Physical activity less than 5 hours, and not stressful. For healthy people, it is not recommended to take medicine because they don't get sick.

Furthermore, early detection in groups at risk of chronic kidney disease, namely individuals with a single disease. Groups of individuals with single diseases such as people with hypertension, diabetes mellitus, ulcers, gout, or other single diseases. Aspects that can be identified are drinking water consumption of less than 2 litters per day, physical activity for less than 5 hours, not

taking medication as prescribed by a doctor, and mild stress.

Meanwhile, in groups with multiple diseases, early detection can be directed by monitoring drinking water consumption of less than 1999 ml, high physical activity, namely more than 9 hours a day, compliance with taking medication prescribed by a doctor, and mild stress.

In the group of individuals who already suffer from chronic kidney disease, early detection to avoid severity or death is by monitoring aspects of drinking water consumption of no more than 1000 ml a day, physical activity of no more than 4 hours, compliance with taking medication prescribed by a doctor, and moderate stress.
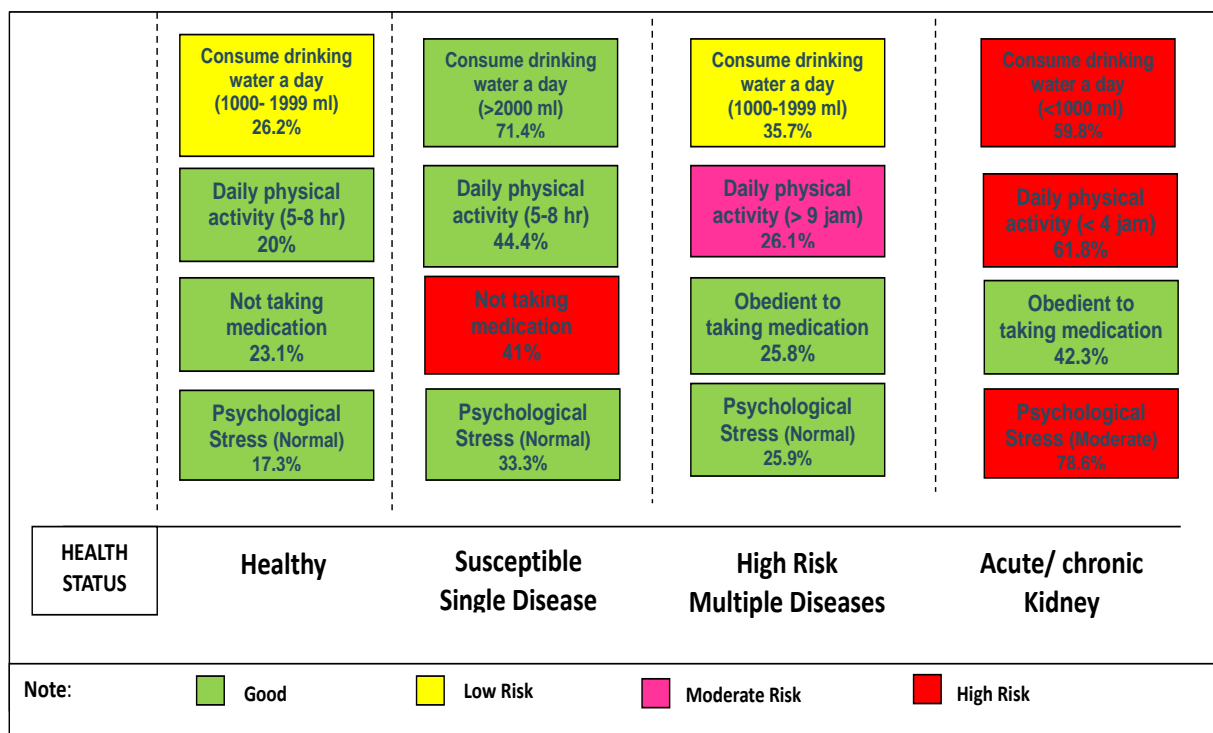
Fig 1. Behavioural Patterns of Drinking Water Consumption, Physical Activity, Medication Compliance and Psychological Stress Based on Different Health Status

DISCUSSION

The deficiency and severity of behavioural factors such as daily water consumption, physical activity, medication adherence and psychological stress have had a significant impact on an individual's health status. Healthy individuals will be at risk of chronic kidney disease if their drinking water consumption is less than 1000 ml per day. Lack of drinking water results in an imbalance of fluids in the body, namely between fluids going in and going out. This condition will result in dehydration and affect the body's metabolism (12). The body is said to be dehydrated when it has lost more than 2% of the individual's body weight (13). When the body is dehydrated, cognitive function or concentration levels become low. Mild dehydration is when only 1-2% of fluid is lost from the body and this results in impaired cognitive function. The worst consequence is unconsciousness or even coma and death (13). Repeated dehydration eventually triggers chronic kidney disease (14).

There are three main possible mechanisms by which dehydration and volume depletion can lead to chronic kidney disease (14). Firstly, with reduced fluid, hyperosmolarity occurs. Second, this hyperosmolarity then activates vasopressin stimulation, the central sympathetic nervous system, and the aldose reductase pathway in the renal cortex.(15). The aldose pathway then promotes the formation of sorbitol which can be converted into fructose (16). Endogenous fructose is then metabolized by fructokinase, an enzyme in the proximal tubule, into fructose-1-phosphate. This

process causes depletion of intracellular phosphate, activation of AMP deaminase, and the formation of uric acid, oxidative stress, and chemokines. Local oxidative stress causes tubular injury and stimulates fibrosis. Thirdly, dehydration results in hyperuricemia due to increased production and decreased excretion of urate which is associated with renal vasoconstriction. Hyperuricemia is a risk factor for acute and chronic kidney injury.

Each individual needs fluids in their body differently. For example, an adult male aged 30-64 years, his water needs are around 2600 ml. Meanwhile, adult women of the same age need around 2300 ml of water a day (17). Every time the body exhales, it dries up, produces urine and defecates and releases body fluids. Therefore, it must be replaced again so as not to disturb the organs in the body.

Previous studies suggest that increasing water intake can slow the growth of renal cysts in animals through direct vasopressin suppression, and pharmacological blockade of vasopressin-V2 receptors.(18) Water contains many minerals such as silica, magnesium, calcium, potassium, sodium and zinc.(12) All of these nutritional elements are beneficial for the body, such as improving blood circulation in blood vessels, healthy skin, hair, bone structure, muscle contraction, blood clotting and immunity. Water also plays a role in reducing toxic levels in the body, so that kidney function is not disturbed.(19)

In groups of individuals who are at high risk of chronic kidney disease or individuals with single diseases, such as people with hypertension, diabetes mellitus, ulcers, gout, or other single diseases, early detection can be seen from compliance with taking medication. Compliance with taking medication here is according to the doctor's prescription for the disease.(20) Compliance with taking medication is the main thing in managing the disease or slowing the progression of the disease towards complications.(21) The level of individual compliance with treatment is greatly influenced by several reasons, including the relationship between doctor-patient, service facilities including pharmacy, and the number of drugs prescribed.(22), (23), (24).

Early detection of high risk groups with multiple diseases can be directed at drinking water consumption of less than 1000 ml per day and heavy physical activity, namely more than 9 hours a day. The risks of lack of fluid in the body have been explained above. For physical activity, how the mechanism can affect kidney function can be explained as follows. Physical activity plays a very important role in lowering blood pressure, increasing glucose and lipid metabolism, so that it can reduce the incidence of diabetes mellitus.(25), (26),(27)

For individuals who already suffer from chronic kidney disease, it is hoped that early detection can slow the development of chronic kidney disease and improve the quality of life for chronic kidney sufferers. Early detection is directed at drinking water consumption of less than 1000 ml a day. Also monitored is physical activity of less than 4 hours a day. Apart from that, it is important to evaluate the patient's psychological level of stress. Moderate levels of stress in chronic kidney sufferers have become very risky for the development of this disease. The two indicators above, except psychological stress, are important to analyze for their role in accelerating the development of chronic kidney disease towards a worse quality of life. Stress results in high levels of pain which ultimately

results in a lower quality of daily physical life and also a decrease in the mental component.(28) Besides that, stress also causes behavioral abnormalities in chronic kidney sufferers (29), (30).

CONCLUSION

There are four factors that can be used as a basis for early detection of chronic kidney disease based on health status. The four variables are daily drinking water consumption, daily physical activity, compliance with taking medication, and psychological stress. Regarding the pattern of early detection of chronic kidney disease which is associated with differences in individual health status, it is described as follows: In the group of healthy people, early detection can be seen in drinking water consumption of less than 1999 ml per day. Meanwhile, in people with single disease, it can be detected by non-compliance with taking medication. In people with high risk or multiple diseases, namely by identifying daily drinking water consumption of less than 1999 ml, and physical activity of more than 9 hours a day. Chronic kidney sufferers can detect drinking water consumption of less than 1000 ml per day, physical activity for less than 4 hours, and moderate stress.

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CONFLICT OF INTEREST

We certify that there is no actual or potential conflict of interest in relation to this article.

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