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## Description of sociodemographics and dietary patterns in hypertension on Puskesmas II Denpasar Timur

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### ABSTRACT

**Introduction:** Hypertension is a significant problem that is faced global-wide and nation-wide. The increasing number of hypertension cases is caused by numerous risk factors, both modifiable and non-modifiable. This research aims to know the description of diet as a risk factor of hypertension on primary healthcare facilities in Denpasar.

**Method:** This research is a descriptive, cross-sectional study done with consecutive sampling methods, researching on 93 respondents with 89 valid data and 4 invalid data. The research is done by filling a questionnaire, short interview, and blood pressure measurement.

**Result:** From the 89 valid data, it was found that

the majority of respondents were female with the age group <30 years only male while the age group 30-39 years only female. The average frequency of respondents' meals per day was 3 times, the types of food consumed daily were liquids, staple foods, animal protein, plant protein, and vegetables. Fruits and junk food were consumed weekly and monthly while milk was only consumed monthly.

**Conclusion:** The daily nutrient consumption of hypertensive respondents in this study did not exceed the Indonesian RDA and DASH diet except magnesium. There is a need for a more comprehensive analytical study covering the correlation between diet and hypertension rate.

**Keywords:** hypertension, dietary patterns, sociodemographics, PHC.

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### INTRODUCTION

Hypertension is a significant problem in both national and international levels. In 2010, according to Mills et al., as many as 31.1% of the world's population globally suffers from hypertension.<sup>1</sup> In Indonesia itself, based on the 2018 Basic Health Research (Riskesdas) conducted by the Indonesian Ministry of Health, the prevalence of hypertension in productive age (15-64 years) in Indonesia at the age of 18-24 years was 13.2%, at the age of 25-34 years it was 20.1%, at ages 35-44 it was 31.6%, at ages 45-54 it was 45.3%, while at ages 55-64 it reached 55.2%.<sup>2</sup>

Risk factors for hypertension can also be classified based on Blum's theory. According to Blum's theory, the level of

public health is determined by 4 factors, namely behavior, environment, health services, and heredity. In hypertension, behavioral risk factors include consumption of unhealthy food and drinks, smoking habits, lack of physical activity, and excessive Body Mass Index (BMI). Furthermore, environmental risk factors for hypertension include population density, access to clean water sources, as well as clean and healthy living behavior. Risk factors for health services for hypertension include access to the nearest health facility, number of health facilities in the area, intensity of health checks, history of health promotion regarding hypertension, access to ambulance services, and home visit services. Lastly, the hereditary risk factor for hypertension

is a family history of hypertension.<sup>3</sup>

Ignoring the risk factors for hypertension and not maintaining blood pressure properly can lead hypertension to progress and make the patient's condition worse. According to a study conducted by Boateng et al., within a period of 7 years, the progression of normal blood pressure to grade I hypertension in men was 20%, grade I hypertension to grade II hypertension in men was 28.2% and women were 36.6%, and remained at grade II hypertension in men as much as 46.5% and women as much as 50.6%. Several factors that influence the progression of hypertension include high body mass index, women, age over 60 years, urban environment, low education level, and high income. However, it was found that

consuming nutrient dense foods such as fruit and vegetables every day can slow the progression of hypertension and return blood pressure back to normal.<sup>4</sup>

In fact, the majority of Indonesian citizens have poor diets, including those in the productive age group who have a lower incidence of hypertension than the elderly. Based on 2018 National Basic Health Research, consumption of risky foods (food/drinks high in sugar, foods high in salt, foods fatty/high in cholesterol, processed meat with preservatives, flavorings, carbonated drinks, energy drinks, and instant food) per day by productive age (15- 64 years old) is classified as high, with the highest distribution of consumption, namely flavorings, 79.0% consuming them every day in the 20-24 year and 30-34 year age groups.<sup>2</sup> Seeing the poor diet of Indonesian citizens, further study is needed regarding the description of risk factors for hypertension, namely the diet of hypertensive sufferers at Puskesmas (Community Health Center) II, East Denpasar.

## METHOD

This research is a descriptive, cross-sectional study done with consecutive sampling methods. The locus of this research is Puskesmas (Community Health Center) II, East Denpasar. Research activities were carried out from June 2023 to November 2023. The inclusion criteria for the research sample were hypertension patients at the polyclinic who were registered in the July 2023 period and were willing to fill out informed consent.

The variables that were examined in this study are risk factors for hypertension in the form of diet and the incidence of hypertension in primary health facilities. The research was carried out by completing a Semi Quantitative Food Frequency Questionnaire (SQ-FFQ), short interview, and blood pressure measurement. The results of the questionnaire were analyzed using the NutriSurvey site to determine the composition of respondents' consumption. Data in the form of frequency and composition of consumption are presented in the form of graphs, diagrams and tables. Data were analyzed using SPSS to get results in the

form of frequencies and averages so that conclusions can be drawn in the research.

## RESULTS

### Distribution of characteristics of research respondents

This research involved 93 respondents, with 89 valid data and 4 invalid data. The data obtained was then used and analyzed in this study. The respondents of this study consisted of 89 people with grade II hypertension at Puskesmas II East Denpasar (100%) without any respondents with grade I hypertension. This was due to the large number of grade II hypertension sufferers in the general population of East Denpasar.

The majority of respondents are female, this is influenced by the number of the general population of women suffering from hypertension in East Denpasar which is higher than men. Based on age, most hypertension patients are elderly ( $\geq 60$  years), namely 59%. The difference that can be seen between the two gender groups is that respondents aged  $< 30$  years

were only found in the male respondent group ( $n=1;2.6\%$ ) while respondents aged 30-39 years were only found in the female respondent group ( $2;4.0\%$ ). The frequency of female respondents in the age groups 40-49 years, 50-59 years and  $\geq 60$  years old was also higher than the male ones (Table 1).

### Description of Respondents' Dietary Patterns

General dietary patterns can be seen from the frequency, type of food and amount consumed. As shown in Table 2, the respondents in this study consumed food three times a day on average. Table 3 shows that staple foods and liquids are the types of food that are most consumed compared to other types of food. Other types of food consumed daily by respondents are animal protein (43; 48.3%), vegetable protein (30; 33.7%), and vegetables (16; 18%). The respondents of this study also saw that fruit and junk food were only consumed weekly and monthly. Of all respondents, only 5 people (5.6%) consumed milk, where milk consumption was done monthly.

**Table 1.** Distribution of respondent characteristics based on gender and age group

Age Group	Gender		Total
	Male (%)	Female (%)	
<30 years	1 (2,6%)	0 (0,0%)	1 (1,1%)
30-39 years	0 (0,0%)	2 (4,0%)	2 (2,2%)
40-49 years	2 (5,1%)	7 (14,0%)	9 (10,1%)
50-59 years	13 (33,3%)	17 (34,0%)	30 (33,7%)
$\geq 60$ years	23 (59,0%)	24 (48,0%)	47 (52,8%)
Total	39 (100%)	50 (100%)	89 (100%)

**Table 2.** Respondents' Dietary Patterns

Variable	Mean $\pm$ std
Frequency	3,07 $\pm$ 0,081

**Table 3.** Description of the types of food consumed by respondents

Type of Food	Daily (%)	Weekly (%)	Monthly (%)	Not Consuming (%)
Liquids	89 (100%)	-	-	-
Staple food	89 (100%)	-	-	-
Animal protein	43 (48,3%)	16 (18,0%)	12 (13,5%)	18 (20,2%)
Plant protein	30 (33,7%)	18 (20,2%)	15 (16,9%)	26 (29,2%)
Vegetables	16 (18,0%)	42 (47,2%)	15 (16,9%)	16 (18,0%)
Fruits	-	39 (43,8%)	22 (24,7%)	28 (31,5%)
Milk	-	-	5 (5,6%)	84 (94,4%)
Junk food	-	28 (31,5%)	25 (28,1%)	36 (40,4%)

**Table 4.** Description of the amount of daily nutritional intake consumed by respondents

Nutrients	Male	Indonesian AKG/RDA	Female	Indonesian AKG/RDA
	(Mean ± std)	Male 19-80+ years	(Mean ± std)	19-80+ years
Proteins (g)	85,48 ± 48,36	64-65	86,07 ± 61,12	58-60
Fat (g)	39,73 ± 22,47	45-75	37,29 ± 18,88	40-65
Carbohydrates (g)	127,77 ± 39,67	235-430	133,69 ± 43,09	200-360
Energy (kcal)	1220,57 ± 461,88	1600-2650	1227,30 ± 497,52	1400-2250
Potassium (mg)	2747,98 ± 1749,32	4700	2988,94 ± 2071,05	4700
Calcium (mg)	982,40 ± 329,61	1000-1200	1137,59 ± 511,00	1000-1200
Magnesium (mg)	595,73 ± 229,76	350-360	954,33 ± 2136,23	320-340
Sodium (mg)	911,14 ± 528,67	1000-1500	877,02 ± 503,37	1000-1500
Saturated fat (g)	14,33 ± 12,77	-	12,78 ± 8,74	-
Sugar (g)	1,12 ± 1,35	50	0,85 ± 1,17	50

AKG/RDA: *Angka Kecukupan Gizi*/Recommended Dietary Allowances, g = gram, mg = milligram, std: deviation standard

Based on the average value of daily nutritional intake consumed by respondents (Table 4), the average intake of protein ( $85.48 \pm 48.36$ ;  $86.07 \pm 61.12$ ) and magnesium ( $595.73 \pm 229.76$ ;  $954.33 \pm 2136.23$ ) for both female and male respondents exceeded the Indonesian AKG or Recommended Dietary Allowance (RDA). Apart from that, the average consumption of other nutrients, namely fat, carbohydrates, potassium and sodium, is less than the Indonesian RDA. The average daily energy intake of respondents was also less ( $1220.57 \pm 461.88$ ;  $1227.30 \pm 497.52$ ). However, the average calcium intake in the female respondent group is in accordance with the RDA of the females, namely  $1137.59 \pm 511.00$  mg. Sugar intake for male and female respondents also did not exceed the daily consumption limit, namely  $1.12 \pm 1.35$  grams for male respondents and  $0.85 \pm 1.17$  grams for female respondents.

## DISCUSSION

Maintaining diet as a preventable risk factor for hypertension can help someone take preventive action against hypertension in accordance with a study by Putra and Susilawati, where there is a relationship between diet and the incidence of hypertension.<sup>5</sup>

In this study, the majority of respondents were female. These results are in line with a study by Manangkot & Suindrayasa conducted in Denpasar which found that the number of women suffering from hypertension (55.7%)

was higher than men (44.3%).<sup>6</sup> Another study by Ningsih, et al. in primary health facilities in the city of Bengkulu also obtained similar results, namely that the number of female respondents (61.7%) was greater than male (38.3%).<sup>7</sup> Even research at the Community Health Center I Petang stated that gender was a risk factor for the incidence of hypertension where women are considered to be more at risk than men.<sup>8</sup>

In terms of age, in this study,  $\geq 60$  years was the age group most frequently suffering from hypertension. Respondents aged  $< 30$  years were only male and respondents aged 30-39 years were only found in the female respondent group. This shows that respondents with hypertension at a young age were only found in men while female respondents with hypertension were generally older. These results are in line with studies by Fadia et al. where the largest age group was  $\geq 60$  years (68.2%).<sup>9</sup> However, in the study by Ningsih et al., the largest age group was 50 – 64 years.<sup>7</sup> Both studies were carried out at primary health facilities in two different cities. Another study conducted by Khasanah showed that gender and age were correlated with the incidence of hypertension. Although this research shows that the incidence of hypertension is more common at ages  $\geq 40$  years, this research shows that men are more at risk of developing hypertension than women.<sup>10</sup>

In this study, there were 89 people with grade II hypertension (100%) without any respondents with grade I hypertension. This is different from the study by Ningsih

et al. which obtained the percentage of hypertension sufferers level I of 43.3% and level II of 56.7%.<sup>7</sup> Another study which also categorized the characteristics of hypertension based on level was by Fadia et al., where the percentage of prehypertension sufferers was obtained at 14.7%, hypertension level I was 46.5%, and level II was 38.8%.<sup>9</sup>

This study revealed that the average frequency of eating per day for hypertension sufferers was three times. This is in line with research by Dewantara Putri, et al. Dan Leech, et al. which also obtained results of an average frequency of eating 3 times a day.<sup>11-12</sup> However, there are differences between this research and the two studies, namely the characteristics of the research subjects, where in the research by Dewantara Putri et al. The subjects studied consisted of the elderly group and in research by Leech et al. The subjects studied consisted of populations with and without hypertension.

One diet that has been extensively researched and applied to hypertension patients is the Dietary Approaches to Stop Hypertension (DASH) diet. The DASH diet or DASH diet is a balanced and flexible eating pattern consisting of low consumption of sodium, saturated fat and trans fat, as well as high consumption of calcium, potassium, magnesium, protein and fiber. This diet emphasizes the consumption of whole grains, fruits and vegetables, low-fat dairy products, lean meat, fish, poultry, nuts, seeds, and legumes, as well as reducing the use of fatty meats, oils, sodium, as well as sweet food

and beverages. This diet serves to overcome the fundamental pathophysiology of hypertension, namely by reducing pro-inflammatory cytokines and reactive oxygen species, promoting endothelial function, restoring micronutrient status, and combating malnutrition. It is said that consuming this diet with daily sodium of 1500mg/day can reduce blood pressure by 7.1 mmHg in people without hypertension and reduce blood pressure by 11.5 mmHg in people with hypertension.<sup>13,14</sup>

The distribution of the types of food most frequently consumed by hypertension sufferers in this study was liquids and staple foods which were consumed by 89 people (100%) daily. The types of food consumed daily by other respondents are animal protein, vegetable protein and vegetables. Junk food and fruit are only consumed weekly and monthly while milk is only consumed monthly by five respondents (5.6%). Based on this eating pattern, it can be seen that the respondent's daily diet is close to the DASH eating pattern. The results of this study are also in accordance with research by Manik et al. with the result that types of carbohydrate foods high in sodium are often consumed by 65% of research subjects and types of carbohydrate foods high in sodium and high fat are often consumed by 35% of research subjects.<sup>15</sup> In another study by Reyes-García et al., the majority of respondents were both male and female. People with hypertension consume more fat, oil and animal protein than other types of food. Apart from that, in this study there was also a significant difference in the amount of animal protein consumed by hypertension sufferers.<sup>16</sup>

Another result obtained in this study was the average value of daily nutritional intake consumed by hypertension sufferers. Referring to the Indonesian AKG (RDA) regulated in Minister of Health Regulation Number 28 of 2019, the average consumption of protein and magnesium among female and male respondents in this study is excessive.<sup>17</sup> Other nutrients and energy consumed are lower than the Indonesian AKG (RDA). However, calcium consumption in female respondents and sugar consumption in all respondents are in accordance with the Indonesian AKG (RDA).

There is a difference between the average nutrient consumption of respondents in this study and other studies. Research by Nyulas et al. obtained an average protein consumption of 96.18 grams, fat of 103.45 grams, carbohydrates of 232.09 grams, and energy of 2296.41 kcal in hypertension sufferers without cognitive impairment and protein consumption of 90.43 grams, fat of 94.43 grams, carbohydrates 215.39 grams, and energy 2157.39 kcal in hypertension sufferers with cognitive impairment.<sup>18</sup> The average protein and calcium consumption of female respondents in this study was also higher than in Prasetyo & Khoriani's research, although the mean energy intake was higher than this present study's results.<sup>19</sup> This study also had higher mean calcium, magnesium and potassium than Wabo et. al.'s study conducted in China. However, the mean sodium intake in this study was lower than in that study.<sup>20</sup> The difference between this study and other studies may be due to differences in subject characteristics and where the study was conducted. Different research areas, especially differences in countries where the research is conducted, can cause differences in the RDA which influences the subject's consumption habits.

The average nutrient consumption in hypertensive sufferers in this study is almost similar to the DASH diet nutrient targets. On the DASH diet, the daily energy target is 2100 kcal, total fat is 27% of daily calories, saturated fat is 6% of daily calories, protein is 18% of daily calories, carbohydrates are 55% of daily calories, 1500 mg or 2300 mg sodium, 4700 mg potassium, 1250 mg calcium, and 500 mg magnesium.<sup>21</sup> In this study the average energy intake of research respondents was  $1220.57 \pm 461.88$  kcal in men and  $1227.30 \pm 497.52$  kcal in women, almost similar to the DASH diet energy targets. Consumption of protein (7%/kcal), total fat (3%/kcal), carbohydrates (10%/kcal), saturated fat (1%/kcal), sodium ( $911.14 \pm 528.67$  mg and  $877.02 \pm 503.37$  mg), potassium ( $2747.98 \pm 1749.32$  mg and  $2988.94 \pm 2071.05$  mg), and calcium ( $982.40 \pm 329.61$  mg and  $1137.59 \pm 511$  mg) in respondents to this study lower than the DASH diet. However, magnesium consumption ( $595.73 \pm 229.76$  and  $954.33 \pm 2136.23$  mg) was higher than the

DASH diet target. Research conducted in Japan by Kaimoto, et. al. showed that there was a significant relationship between magnesium intake and weakness in elderly women. In this study, magnesium was said to be a nutrient that can prevent weakness, especially sarcopenia in elderly women.<sup>22</sup> Sarcopenia that occurs due to nutritional deficiencies can cause a worsening of the condition of hypertensive patients.<sup>14</sup>

This research involves several aspects that can influence the validity and generalization of the results. First, limited sample sizes can limit a study's ability to reflect the population as a whole. Unbalanced gender representation of respondents, with most women and the age group over 60 years, may limit the generalization of findings regarding diet as a risk factor for hypertension in younger age groups. The research location which is limited to Puskesmas II East Denpasar also becomes an obstacle in generalizing the results to different regions or populations. The use of self-report in the form of respondents' memories for data on food and nutritional intake can also give rise to bias and inaccuracies. This study did not discuss whether there were changes in eating patterns in respondents before experiencing hypertension and after experiencing hypertension. Lastly, this study also does not discuss data on changes in blood pressure at two different times because it uses a cross-sectional method so it cannot assess the effect of the respondent's diet on the respondent's blood pressure even though the respondent's diet appears to be in accordance with the DASH diet. Therefore, more comprehensive further research is needed to assess diet and hypertension. It is hoped that future studies will increase the sample size, consider additional risk factors, and include more diverse and comparable age groups. Using more objective measurement methods and in-depth analysis of respondents' eating patterns can provide a more accurate picture.

## CONCLUSION

The majority of respondents who took part in this study were female. Respondents with hypertension at a young age were only found in men while

female respondents with hypertension were generally older. Eating patterns in general can be seen from frequency, type and amount. Respondents in this study consumed food three times a day on average, with the respondents consuming liquids and staple foods, animal protein, plant protein and vegetables every day. Fruit and junk food were only consumed weekly and monthly and milk was only consumed monthly. When compared with the RDA and DASH diet targets, the majority of nutrients were not consumed in excess except magnesium.

## ETHICAL CLEARANCE

The research was approved by the Ethical Committee (2598/UN14.2.2.VII.14/LT/2023) of Medical Faculty, Universitas Udayana.

## CONFLICT OF INTEREST

The authors declared no conflict of interest.

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## AUTHOR'S CONTRIBUTION

All authors significantly contributed to conceiving and designing the study, collecting and analyzing data, drafting the article, critically revising it for important intellectual content, and approving the final version for publication.

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