

WMJ (Warmadewa Medical Journal), Vol. 7 No. 2 November 2022, Hal. 47-54

Community Survey on Blood Pressure and Levels of Blood Glucose, Cholesterol and Uric Acid Among People 45 Years and Above in Rural Villages of Bali

I Wayan Darwata¹, I Ketut Tangking Widarsa², I Nengah Kapti³, Putu Sutisna⁴

^{1,2,3,4} Faculty of Medicine and Health Sciences, Warmadewa University, Denpasar, Bali, Indonesia

Email⁴: psutisna@yahoo.com

Abstract

To observe the proportion of high blood pressure, high blood glucose, cholesterol and uric acid among people aged 45 years and older (pre-elderly and elderly) in Pejeng, Samplangan and Petak, in Gianyar Regency, Bali.

The survey's samples were all persons aged 45 years and over who came voluntarily to participate. Blood pressure was measured by a mercury sphygmomanometer (Nova). Non-fasting levels of serum glucose, cholesterol, and uric acid were assessed by rapid test method using the Easy Touch CGU apparatus. Each parameter studied was categorized as "high" and "normal" (blood pressure high: $\geq 140/90$ mmHg; blood cholesterol high: ≥ 200 mg/dl; blood glucose high ≥ 200 mg/dl; blood uric acid high: >7.0 mg/dl, while other measurements below those values were categorized as normal. Data were analyzed descriptively and presented in tables of frequencies.

A total of 650 people aged 45 years and above participated in the survey (Samplangan village: 157 people, Pejeng village: 168 people, Petak village: 225 people). Of 650 study subjects examined, 43.8% had high serum cholesterol, 22.8% had high blood pressure, 26.3% had high serum uric acid, and 9.8% had high blood glucose. According to gender, 49.5% of males and 38.2% of females had high blood cholesterol, 27.3% of males and 20.5% of females had high blood pressure, 38.4% of males and 20.3% of females had high blood uric acid, and 11.1% of males and 9.4% of females had high blood glucose, respectively.

Regarding the three villages, the greatest proportion of the study subjects had high serum cholesterol, followed in order of decreasing proportions by either high blood pressure or high blood uric acid, and the lowest proportion was with high blood glucose.

Keywords: high blood pressure, high blood glucose, high blood cholesterol, high blood uric acid, age 45 years and above, rural villages, Bali

INTRODUCTION

According to a WHO report, nowadays, most people worldwide can expect to live until 60 years and over. Every country in the world is experiencing growth in both the size and proportion of older persons in the population. By 2050, the world's population of people aged 60 years and older will double to reach 2.1 billion. It is estimated that between 2015 and 2050, the proportion of the world's population over 60 years will nearly double from 12% to 22%. This means that the number of people aged 60 years and older will outnumber children younger than five years. It is also estimated that in 2050, around 80% of the elderly will live in low-income and middle-income countries, including Indonesia. As consequence of the fast growth of the old popula-

tion, now all countries face major challenges to ensure that their health and social systems are effective and able to cope with this demographic shift. While this shift in the distribution of a country's population towards older ages (known as "population ageing") started in high-income countries like Japan, where 30% of the population is already over 60 years old, it is currently low-income and middle-income countries that are experiencing the greatest change⁽¹⁾. According to the latest report of the United Nations World Population Prospects, the total life expectancy of Indonesia in 2022 is 72.14 years⁽²⁾. It is projected that life expectancy in Indonesia in the years 2045-2050 will increase to 77.6 years, with the proportion of elderly 28.7% of the population. Bali Province has also experienced a

similar shift in the growth of the ageing population, where at this time, its proportion of the elderly population is the third largest in Indonesia, i.e. 11.3% of its whole population⁽³⁾.

Generally, as a consequence of ageing, pre-elderly and elderly are prone to suffer from several health problems, particularly chronic diseases such as hypertension, diabetes mellitus, gout or high blood uric acid, hypercholesterolemia, osteoporosis, etc.

This survey was undertaken in 2016 in three rural villages in Gianyar Regency, Province of Bali, as a part of the program of Community Health Service carried out under the auspices of the Faculty of Medicine, Warmadewa University. The objective of the survey was to observe the ratio of high blood pressure, high blood glucose, high blood cholesterol, and high blood uric acid among the inhabitants aged 45 years and above (pre-elderly and elderly) of the Villages of Pejeng, Samplangan, and Petak, all located in the Regency of Gianyar, Bali.

We are reporting the results of this survey in this publication in consideration that the living condition and lifestyle of people in the three rural villages surveyed in 2016 have not changed much until now, so the data obtained from the survey may still be relevant and represent the current condition of Bali's population in the rural villages.

METHOD

Study design

The survey was carried out concomitantly with a program of Community Health Service (comprising free health check-ups and treatment) carried out by the Faculty of Medicine and Health Sciences, Warmadewa University, in the villages of Pejeng, Samplangan and Petak, in the Regency of Gianyar, Bali. This survey was a cross-sectional survey with a descriptive qualitative design to explore the health condition of the villages' inhabitants aged 45 years and above (pre-elderly and elderly).

Place and time of the survey

The survey activities were sched-

uled on three different dates during October - December 2016 in Pejeng, Samplangan and Petak in Gianyar Regency, Bali. (Figure 1). According to the respective three villages' statistical data of 2016, the population number of Pejeng village was 6126, Samplangan village: 4770, and Petak village: 4096 (personal communication).

Population and sample

Population of the survey was all people aged 45 years and older in the villages of Pejeng, Samplangan and Petak. The number of samples was determined by non-random and non-probability sampling method, by which the number of samples was all people aged 45 years and older who presented themselves voluntarily to participate in the survey. The minimal number of samples was 365 people based on an assumed disease prevalence of 0.5, sampling error of 0,05, and reliability of 95%. We included people aged 45 years and above in our survey considering that this age classification includes people 45-59 years old (pre-elderly) that immediately precede elderly age (60 years and above), and both age groups are similarly prone to hypertension, hypercholesterolemia, diabetes and hyperuricemia.

Data collection

Data collection was carried out for one day of each survey activity in the village hall of the respective villages. Measurement of blood pressure was done by medical students who had been trained prior to the commencement of the survey, using a pre-calibrated mercury sphygmomanometer (Nova). Measurements of levels of blood glucose, blood cholesterol, and blood uric acid (in a non-fasting condition) were carried out by trained paramedics of the local health centers by rapid test method using CGU Easy Touch apparatus. Each parameter assessed was categorized into two classes, i.e. "high" and "normal". Blood pressure was classified as "high" if the measurement was $\geq 140/90$ mmHg; blood cholesterol high: ≥ 200 mg/dl; blood glucose high ≥ 200 mg/dl; and blood uric acid high: >7.0 mg/dl. In this survey, we

used the same upper normal limit of blood uric acid for both male and female subjects (i.e. 7.0 mg/dl), considering that the female subjects 45 years and above are approaching or already in menopause state.

Data analysis

Data obtained from the survey were analyzed descriptively and presented in ta-

bles of frequencies to show the proportions of the samples having the “high” categories of measurement results. Of all the people who came to participate in the surveys, only the subjects aged 45 years and above and those found to have “high” categories of measurement were included for data analysis.

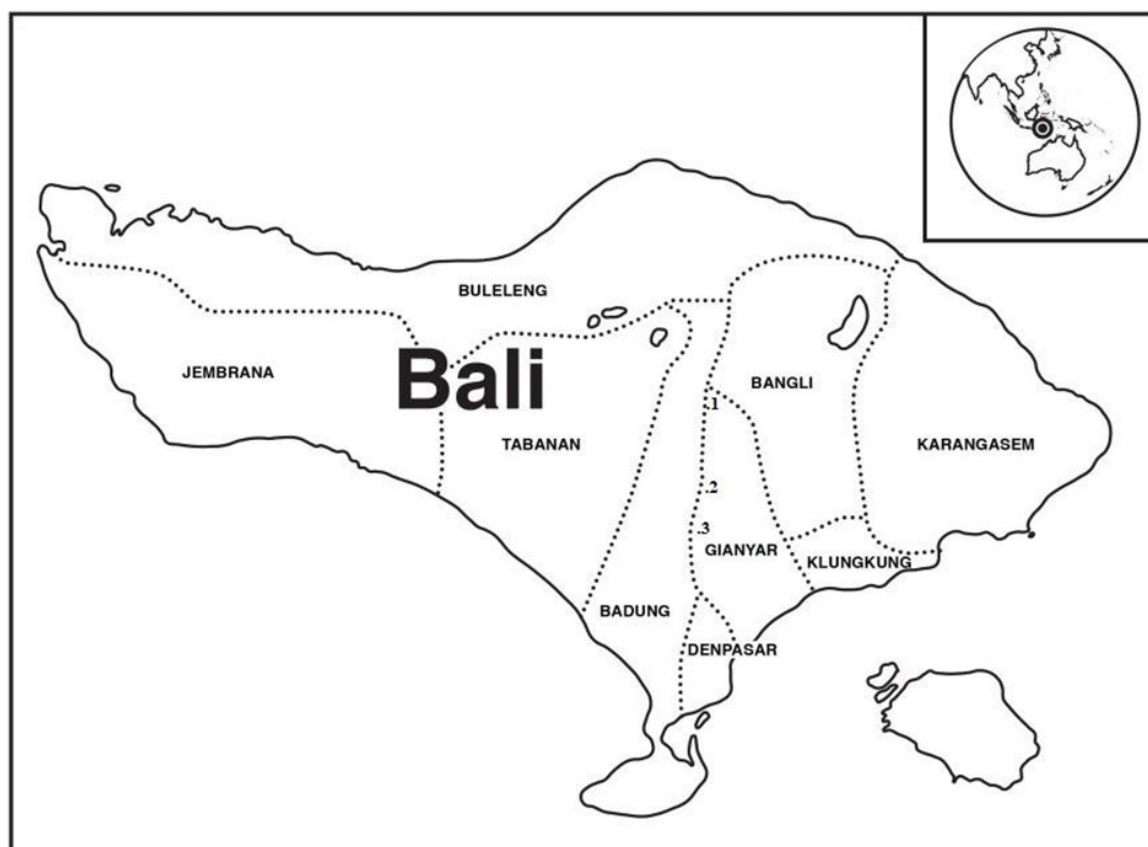


Figure 1. Map of Bali to show the eight regencies and approximate locations of the three villages surveyed in Gianyar Regency and the capital city of Denpasar.
1= Pejeng Village, 2=Petak Village, 3=Samplangan Village.

RESULTS

The results of the survey are summarized in Table 1-4. Table 1 shows the distribution of the number of subjects ex-

amined according to village and gender. The total number of subjects examined was 650 people, who were predominantly females

Table 1: Number of people 45 years and above examined in three villages in Gianyar Regency, Bali (2016)

Names of Villages	Males	Females	Total
Pejeng	65	103	168
Samplangan	90	167	257
Petak	61	164	225
TOTAL	216	434	650

Table 2: Proportion of people 45 years and above with high blood pressure, high blood glucose, high blood

Villages	Measurement Criteria	Proportion (%)
Pejeng (n = 168)	HBP	56/168 (33.3%)
	HBG	9/168 (5.4%)
	HBC	75/168 (44.6%)
	HBU	21/168 (12.5%)
Samplangan (n = 257)	HBP	63/257 (24.5%)
	HBG	51/257 (19.8%)
	HBC	100/257 (38.9%)
	HBU	74/257 (28.8%)
Petak (n = 225)	HBP	27/225 (12.0%)
	HBG	5/225 (2.2%)
	HBC	98/225 (43.5%)
	HBU	76/225 (33.8%)

HBP = high blood pressure; HBG = high blood glucose;
HBC = high blood cholesterol; HBU = high blood uric acid

Table 3: Proportions of people 45 years and above with high blood pressure, high blood glucose, high blood cholesterol and high blood uric acid in three villages in Gianyar Regency, Bali, by gender (2016)

Measurement criteria	Male Proportion (%)	Female Proportion (%)
High blood pressure	N = 216 59/216 (27.3%)	N = 434 89/434 (20.5%)
High blood glucose	24/216 (11.1%)	41/434 (9.4%)
High blood cholesterol	107/216 (49.5%)	166/434 (38.2%)
High blood uric acid	83/216 (38.4%)	88/434 (20.3%)

Table 4: Overall proportion of total people 45 years and above with high blood pressure, high blood glucose, high blood cholesterol, and high blood uric acid in three villages in Gianyar Regency, Bali (2016) (n = 650)

Measurement criteria	Proportion (%)
High blood pressure	148/650 (22.8%)
High blood glucose	65/650 (10.0%)
High blood cholesterol	273/650 (42.0%)
High blood uric acid	171/650 (26.3%)

Table 2 shows that in each of the three villages, most people 45 years and above had high serum cholesterol, and the lowest proportion had high blood glucose; however, the proportions of people having high blood pressure and uric acid fluctuated. In Pejeng village, more people had high blood pressure than high blood uric acid, while in Petak village, more people had high blood uric acid than high blood pressure. According to gender, the highest proportion in both male and female subjects had high blood cholesterol, and the lowest proportion had high blood glucose, while proportions of males and females with high blood pressure and uric acid varied (Table 3).

Of the total 650 subjects examined, we found the highest proportions had high blood cholesterol, followed in the order of decreasing proportions by high blood pressure, high blood uric acid and high blood glucose (Table 4).

DISCUSSION

Results of our survey on 650 people aged 45 years and above (pre-elderly and elderly) in three rural villages in Gianyar Regency, Bali, show 42.0% had high blood cholesterol, 26.3% had high blood uric acid, 22.8% had high blood pressure, and 10.0% had high blood glucose. In another survey of 68 civil servants aged 26 – 65 years in Gianyar town, Bali, Adnyana and Padmiari⁽⁴⁾ found that 20.6% had high blood cholesterol; this figure is much lower than our finding (42.0%), which is probably due to more number of older people examined in our survey than that examined by Adnyana and Padmiari^(4,5). at South Denpasar Health Center found that 31.9% of 115 elderly patients (60 years and above) had high blood cholesterol; this figure is not much different from the figure obtained from our survey (42.0%). They also found that more female patients tended to have high blood cholesterol than male patients (22.6% females vs 16.5% males). This latter finding is contrary to our finding (38.2% of females and 49% of males had high blood cholesterol) (Table 3). Prastiwi et al. also noted that patients in the age group 65

-74 years had a higher proportion of high serum cholesterol than the younger age groups⁽⁵⁾. In our survey, however, we did not analyze the proportions based on different age groups.

A quantitative statistical study by Rubiah et al. in 2020 on 165 elderly patients (aged 65 – 75 years) that were confirmed to have high serum cholesterol at a Health Center in Daik, Riau Islands Province, found that the habit of eating food containing high-fat and less physical exercise had a significant influence on the occurrence of hypercholesterolemia⁽⁶⁾. A study by Widiyono et al. in 2021 at an Integrated Health Service Post (Posyandu) in the village of Betengsari Kartasura on 29 elderly patients that had been confirmed to have hypercholesterolemia found that 89.7% had a history of frequently consuming food rich-in fat, 100% not doing regular exercise, and 10.3% having a habit of cigarette smoking⁽⁷⁾.

In a study by Jeanne in 2016 in the village of Susut, Bangli regency, Bali, it was found 37% of 89 subjects aged 18 – 64 years examined had hypertension⁽⁸⁾. This figure is much higher than the overall hypertension prevalence for Indonesia (26.5%) and Bali (19.9%) as well as than our finding (22.8%) (Table 4). In a study on 75 subjects aged 45 -59 years at Health Center Dawan 1, Klungkung Regency, Bali, Widia and Sudhana found most cases of hypertension were encountered in males, in those with a history of hypertension in the family, in those who smoked, had a high salt intake, and who were obese⁽⁹⁾.

A study by Astari et al. in 2018 on 58 people aged 18 - 45 years in the village of Nongan, Karangasem Regency, Bali, found a significant correlation between level of blood uric acid and pattern of food intake, physical exercise, gender, and level of knowledge⁽¹⁰⁾.

In a survey on the level of blood glucose (in a non-fasting state) among 39 elderly inhabitants (aged 45 – 90 years) of two nursing homes at Denpasar and Tabanan, Bali, Putra in 2019 found 10.25% had high blood glucose levels above 200 mg/dl (confirmed diabetes mellitus)⁽¹¹⁾.

This finding is the same as our finding (10.0%) (Table 4).

It is estimated that in Indonesia, 18% of the total population has blood lipid disorders (dyslipidemia). Elevated blood cholesterol level has been clinically and epidemiologically confirmed as the leading risk factor associated with coronary heart disease (CHD). CHD is well known as one of the major causes of mortality and morbidity in both developed and developing countries⁽¹²⁻¹⁴⁾. Hypertension is often called a “silent killer” since, in most cases, patients do not feel any symptoms; hence they do not realize they have the disease until it may result in sudden death due to coronary heart disease or congestive heart failure, stroke and renal failure⁽¹³⁾.

The prevalence of hyperuricemia in Indonesia is estimated to be between 1,6-13,6/100.000 people. Indonesia takes fourth place in the world regarding its population with hyperuricemia. This disease is more common in males than in females, but once females become menopause, the prevalence are about the same in both genders. Hyperuricemia often coexists with hypertension, and in a group of patients it causes arthritis (gout) due to the accumulation of uric acid crystals in joints. In contrast, in the other group it can cause the formation of stones in the kidney and the urinary tracts⁽¹⁰⁾.

Diabetes mellitus, long considered a disease of minor significance to human health, has in the past two decades become a serious threat to human health in most countries of the world. Changes in human behavior and lifestyle over the past century have led to the explosive increase in the incidence of diabetes worldwide. Hypertension and hypercholesterolemia are extremely common comorbid associated with diabetes, accounting for 20 – 60% of people with diabetes. The three diseases are major risk factors for cardiovascular morbidity and mortality^(12,15).

Weaknesses of this survey include that the survey samples examined were not in a fasting state, and likely there was bias in the sample selection since people came voluntarily to participate in the survey,

probably reason to seek treatment for their health problems. As such, the data obtained from the examinations of the levels of blood cholesterol, blood glucose and blood uric acid tend not to reflect the actual condition; namely, the values tend to be higher. Notwithstanding these weaknesses, however, we think the data obtained from this survey may still reflect the tendency regarding blood cholesterol, blood uric acid and blood glucose in pre-elderly and elderly people in the three rural villages surveyed.

CONCLUSION AND RECOMMENDATION

Conclusions

According to the results of our survey of people 45 years old and above, it can be concluded as follows:

- 1) In Samplangan village, 30.9% of the people examined had high serum cholesterol, 28.8% had high serum uric acid, 24.5% had high blood pressure, and 19.8% had high blood glucose.
- 2) In Pejeng village, 44.6% of the people examined had high serum cholesterol, 34.5% had high blood pressure, 12.5% had high serum uric acid, and 5.4% had high blood glucose.
- 3) In Petak village, 43.5% had high serum cholesterol, 33.8% had high serum uric acid, 12.0% had high blood pressure, and 6.2% had high blood glucose,
- 4) Overall, of 650 people examined, 42.0% had high serum cholesterol (males 49.5%, females 38.2%), 26.3% had high serum uric acid (males 38.4%, females 20.8%), 22.8% had high blood pressure (males 27.3%; females 20.5%), and 9.4% had high blood glucose (males 11.1%, females 8.5%).
- 5) The highest proportion of people examined had high serum cholesterol, followed by decreasing percentage by either high blood pressure or high blood uric acid, and the lowest proportion had high blood glucose.

Recommendation

It is recommended that health education be conducted for the rural communities studied about the risk factors for high serum cholesterol, high serum uric acid, high blood pressure and high blood glucose and their prevention in order to prevent people from getting bad cardiovascular events and other complicating outcomes.

ETHICAL CLEARANCE

Prior to commencement of the survey, an ethical clearance was obtained from the Ethical Clearance Committee of Warmadewa Faculty of Medicine as well as official permission to carry out the survey in the three villages was obtained from the Office of the Gianyar Regency Government.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest with any other parties associated with the survey.

ACKNOWLEDGEMENTS

The authors would like to thank the dean of the Faculty of Medicine and Health Sciences, Warmadewa University for providing funds for this survey. Thanks are also due to the medical students who voluntarily helped with blood pressure measurements during the survey and to the team of doctors and paramedics of the health centers of the respective villages surveyed for assisting in the examination of the blood parameters studied. Many thanks to the teaching staff of the Faculty of Medicine Warmadewa University, who gave assistance in the preparation of the survey and in some parts of the data analysis.

REFERENCES

1. World Health Organization (WHO). Ageing and health [Internet]. [cited 2022 Nov 28]. Available from: <https://www.who.int/news-room/fact-sheets/detail/ageing-and-health>
2. United Nations World Population Prospects. Indonesia Life Expectancy 1950-2022 | MacroTrends [Internet]. [cited 2022 Nov 28].

- Available from: <https://www.macrotrends.net/countries/IDN/indonesia/life-expectancy>
3. BPS. Statistik Indonesia 2019 (Indonesian statistics). Badan Pusat Statistik Indonesia. 2019.
 4. Adnyana S, Padmiari E, Bali BP. Faktor-Faktor Yang Mempengaruhi Kadar Kolesterol Pada Pegawai Negeri Sipil (Pns) Di Pemda Kabupaten Gianyar Provinsi Bali. *Ejournal Sumsel prov GoId* [Internet]. 2014;8(1). Available from: <http://www.ejournal.sumselprov.go.id/pptk/article/view/277>
 5. Swastini IGAAP. Gambaran kolesterol total pada lansia di Puskesmas I Denpasar Selatan. *Meditory J Med Lab*. 2021;9(2):68–77.
 6. Rubiah R. Factors Affecting Hypercolesterolemia in Lansia in the Working Area of Puskesmas Daik 2020. *J Vokasi Keperawatan*. 2020;3(2):134–44.
 7. Aryani A, Herawati VD, Keperawatan PI, Surakarta US. Kondisi Lanjut Usia Yang Mengalami Hiperkolesterolemia Di Pos Pelayanan Terpadu (Posyandu) Lanjut Usia Desa Betengsari, Kartasura : Pilot Study. *J Perawat Indones*. 2021;5(1):527–36.
 8. Jeanne B. Prevalensi Konsumsi Rokok Pria Usia 18 - 64 Tahun Dengan Hipertensi Di Desa Susut, Kabupaten Bangli Bali Tahun 2014. *Intisari Sains Medis*. 2016;6(1):16.
 9. Widia MYGW, Sudhana IW. Gambaran Faktor Risiko Hipertensi Pada Masyarakat Pra Lansia di Wilayah KERJA Puskesmas Dawan I Periode Mei 2013. 2013;10(3):37–49.
 10. Astari RWD, Mirayanti NKA, Arisusana IM. Faktor-Faktor Yang Mempengaruhi Kadar Asam Urat Pada Usia Produktif Di Desa Nongan, Kabupaten Karangasem. *Bali Med J*. 2018;5(2):273–80.
 11. Putra IGY. Gambaran Gula Darah Pada Lansia Di Panti Sosial Tresna Wredha Wana Sraya Denpasar Dan Panti Sosial Wredha Santi Tabanan. *Bali Med J*. 2019;6(1):44–9.

12. Kadek Ngurah Hariawan KS. Hubungan kendali Glikemik dengan Asymmetric Dimethylarginine penderita Diabetes Mellitus Tipe 2 Lanjut Usia. *Kesehatan*. 1999;(13):8.
13. World Health Organization (WHO). The top 10 causes of death. 2020.
14. Lionakis N, Mendrinou D, Sanidas E, Favatas G, Georgopoulou M. Hypertension in the elderly. *World J Cardiol*. 2012 May;4(5):135–47.
15. Padma M, Putri D, Gede IP, Ariawan E, Budiapsari PI. Hubungan antara Dislipidemia dengan Kejadian Hipertensi di Bali Tahun 2019. 2021;1(1).