

ORIGINAL ARTICLE

COMPARISON OF CARDIOVASCULAR DISEASE-RELATED MORTALITY AND MORBIDITY IN URBAN AND RURAL RESIDENTIAL AREAS IN JATINANGOR SUBDISTRICT, WEST JAVA, INDONESIA: AN EPIDEMIOLOGICAL COMMUNITY STUDY

Badai Bhatara Tiksnadi¹, Kurnia Wahyudi², Rien Afrianti¹, Yulia Sofiatin², Faris Yuflih Fihaya¹, Maulana Ibrahim¹, Najmi Fauzan Tarsidin¹, Lida Amalia³, Rully MA Roesli⁴, M Rizki Akbar¹

¹Department of Cardiology and Vascular Medicine, Faculty of Medicine Universitas Padjadjaran, West Java, Indonesia, ²Department of Public Health, Faculty of Medicine Universitas Padjadjaran, West Java, Indonesia, ³Department of Neurology, Faculty of Medicine Universitas Padjadjaran, West Java, Indonesia, ⁴Department of Internal Medicine, Faculty of Medicine Universitas Padjadjaran, West Java, Indonesia

Objectives: Residential areas are considered part of the sociocultural aspect for determining health but are rarely studied in a cardiovascular disease-community study in developing countries. Jatinangor, considered a university area, has unique characteristics surrounded by urban and rural villages. We aim to investigate the association of residential areas in Jatinangor with cardiovascular morbidity and mortality.

Methodology: A cross-sectional study from July to November 2018 was done in appointed rural and urban areas in Jatinangor district, West Java, Indonesia. Cardiovascular disease is defined using a self-reported questionnaire. Cardiovascular death was identified through a verbal autopsy performed by a general practitioner as an interviewer. The morbidity data were obtained from September to October 2018, while the mortality data were obtained from July to November 2018. Poisson regression was done to determine the association of residential areas to cardiovascular disease morbidity.

Results: Data were obtained from 1469 respondents; 58.7% were from rural areas. The prevalence of cardiovascular disease morbidity is higher in urban than rural areas (5.6% vs. 2.5%, $p=0.004$). There were 42 cases of death reported during the study period, with 33 deaths considered caused by cardiovascular disease. The urban-rural differences in cardiovascular mortality showed no significant differences ($p=0.388$). The unadjusted model of the association of the urban-rural residential area with cardiovascular disease morbidity was (PR 2.253 (95% CI 1.262, 4.024)) while the adjusted model was (PR 2.264 (95% CI 1.257, 4.078, $p = 0.007$)).

Conclusion: Urban area is associated with two times higher cardiovascular disease morbidity but not with mortality than those who live in rural areas.

Keywords: Cardiovascular, Indonesia, Jatinangor, Rural-urban

Citation: Tiksnadi BB, Wahyudi K, Afrianti R, Sofiatin Y, Fihaya FY, Ibrahim M, Tarsidin MF, Amalia L, Roesli RMA, Akbar MR. Comparison of Cardiovascular Disease-Related Mortality and Morbidity in Urban and Rural Residential Areas in Jatinangor Subdistrict, West Java, Indonesia: An Epidemiological Community Study. Pak Heart J. 2023;56(04):268-272. DOI: <https://doi.org/10.47144/phj.v56i4.2582>

INTRODUCTION

Cardiovascular disease (CVD) burden in developing countries has been a growing concern over the years.¹ In Indonesia, CVDs are the leading cause of morbidity and mortality and are responsible for a third of all deaths.² Most cardiovascular diseases share common major modifiable behavioral risk factors such as tobacco use, unhealthy diet, and insufficient physical activity.³ Prior studies have shown that those

modifiable risk factors in the Indonesian population are associated with hypertension, obesity, and diabetes.⁴

Besides that, socio-cultural aspects, such as income level, educational level, and residential areas, are considered determinants of health.³ Report from 2013 Basic Health Research, official nationwide health research in Indonesia, that people living in urban areas tend to have a more sedentary lifestyle than those living in rural areas.⁵ Another study in East Java

estimated that 10-year cardiovascular event risks are higher in urban areas than in rural areas.⁶

Placed in the West Java Province of Indonesia, Jatinangor District is an accessible area for young researchers because it resides around the campus. Besides that, Jatinangor District also has subdistricts with urban and rural characteristics.⁷ Prior qualitative studies in Sub-district Jatinangor demonstrated that people living in urban areas have more comprehensive health services than those living in rural areas.^{7,8} Also, our pilot study in 2014 found the prevalence of hypertension is higher in urban than rural areas in Jatinangor.⁹ However, the urban-rural association with cardiovascular disease morbidity and mortality in the Jatinangor Subdistrict is still not defined.

The objective of this study was to describe the prevalence of morbidity and mortality of cardiovascular disease in urban-rural areas of Jatinangor.

METHODOLOGY

Data Sampling: This cross-sectional study was conducted in two villages in Jatinangor District, Sumedang, West Java Province, Indonesia. The Cilayung village was appointed to represent the rural area, and the Cipacing village represented the urban area. Cipacing village has long relied on services such as traders and factory employees for livelihood. The village's location is closer to the provincial road that connects Bandung City with Tasikmalaya City or Sumedang City. Meanwhile, in Cilayung Village, even though the map looks close to the main provincial road, the access is circular, with most residents being farmers. Also, the distance from the village to the primary health center is about 3 kilometers or 15 minutes, and to the hospital is about 6 kilometers or 30 minutes (Figure 1).¹⁰

The sample size was determined accordingly from the previous study. Using cluster random sampling, we chose fifteen clusters as the sampling frame. Cluster units consisted of the 15 citizen associations of the districts. From each cluster, participants who met the inclusion criteria were recruited consecutively, consisting of participants who came to Pos Binaan Terpadu (POSBINDU). People above 18 years old were included in this study. Non-resident people were excluded. The protocol of this study was reviewed and approved by The Ethical Committee of the Faculty of Medicine, Universitas Padjadjaran. No. 27/UN6.KEP/EC/2018. Participation in this study was voluntary, and informed consent was waived.

Data Collection: A trained community village cadre approached the participants and asked questions from the questionnaires. The age of participants was determined from the date of birth to the date of the interview. Gender was determined as written on the residence identification card. Educational levels were categorized as middle school or below and secondary school, determined by the participants' highest education level. Height and weight measurements were conducted using the automatic measuring instrument. Body Mass Index (BMI) is calculated as weight (kg) / height (m²). Blood pressure measurement was conducted using automatic sphygmomanometers OMRON HEM-7124, with three sitting recordings taken at 1-minute intervals. Records were averaged and reported as systole and diastole separately (mmHg).



Figure 1: Research location in Jatinangor. Cipacing village is directly connected to the main provincial road, although Cilayung village is far from the main provincial road

The morbidity questionnaire was developed based on the existing basic National Research 2013 questionnaire.¹¹ The history of cardiovascular morbidity was defined as Cardiovascular disease, including Coronary artery disease, heart failure, or stroke, which was self-reported.

The mortality data were obtained from the family relatives of the deceased reported from the Pos Binaan Terpadu (POSBINDU). The mortality questionnaire was developed using the existing World Health

Organization verbal autopsy questionnaire.¹² Data from the mortality questionnaire were discussed by a team consisting of the Internist and the Cardiologist to confirm the final cause of death. CVD death is defined as death caused by coronary artery disease, heart failure, or stroke. The morbidity data were obtained from September until October 2018 to establish the baseline data, while the mortality data were obtained from July until November 2018.

Data Analysis: Data were entered and analyzed using SPSS software version 25. Means and standard deviations were reported for continuous variables, and frequencies and percentages were reported for categorical variables. The Chi-Square test or Mann-Whitney U test compared the differences in participant characteristics between urban-rural areas. The Chi-square test compared the differences in cardiovascular morbidity in urban-rural areas. The Fisher's Exact Test compared the differences in reported mortality caused during study time divided by the total population (22063 residents) of urban (17398 residents) and rural areas (4665 residents) in 2018.¹³ The Poisson regression analysis was conducted to estimate the association of demographic factors and rural-urban differences with cardiovascular disease morbidity prevalence as prevalence ratio (PR). All test was considered significant if $p < 0.05$. All test was considered significant if $p < 0.05$.

RESULTS

We completed the interviews with 1621 respondents from the two villages. Among those who completed the interview, complete information was obtained from 1,469 respondents (90.6% complete data).

In this study, respondents from rural areas accounted for 58.7%. More women are participating in this study than men from these villages. The mean age of respondents in urban areas is older than in rural areas ($p=0.001$).

Respondents from urban areas were significantly more likely to complete secondary high school than those in rural areas ($p<0.001$). There are no significant differences in BMI, systole, and diastole between respondents from rural and urban areas (Table 1).

Respondents from urban areas reported a significantly higher prevalence of cardiovascular disease than in rural areas ($p=0.004$). In detail, respondents from urban areas reported a higher prevalence of coronary artery disease ($p=0.14$), heart failure ($p=0.14$), and stroke ($p=0.001$) (Table 2).

During the study period, there were 42 cases of death reported by the respondents. After The Internist and Cardiologist confirmed verbal autopsy reports, we found no significant difference in cardiovascular death between urban-rural areas (Table 3 and 4).

Table 1: Demographic characteristics of respondents

Variables	Urban	Rural	P-value
Total (N)	607	862	-
Gender			
Men	316 (36.7)	206 (33.9)	0.283
Women	546 (63.3)	401 (66.1)	
Age, year	43.04 ± 15.04	40.80 ± 15.48	0.001
Educational Level			
Middle school or below	484 (56.1)	458 (75.5)	<0.001
Secondary school	378 (43.9)	149 (24.5)	
Body mass index, kg/m ²	23.92 ± 4.10	23.60 ± 4.12	0.214
Systole, mmHg	124.17 ± 16.67	123.20 ± 15.87	0.276
Diastole, mmHg	79.11 ± 9.87	78.98 ± 9.58	0.902

Table 2: The prevalence of cardiovascular disease morbidity between urban-rural areas of Jatinangor

Variables	Total	Urban	Rural	P-value
Total (N)	1469	607	862	-
Morbidity prevalence				
Cardiovascular disease	63 (4.3)	48 (5.6)	15 (2.5)	0.004
Coronary Artery Disease	40 (2.7)	28 (3.2)	12 (2.0)	0.14
Heart Failure	16 (1.1)	10 (1.2)	6 (1.0)	0.755
Stroke	23 (1.6)	21 (2.4)	2 (0.3)	0.001

Table 3: The prevalence of mortality between urban-rural areas of Jatinangor during the study period

Variables	Total	Urban	Rural	P-value
Total (N)	22063	17398	4665	-
Mortality prevalence				
Cardiovascular death	33 (0.14)	24 (0.16)	9 (0.59)	0.388
Non-Cardiovascular death	9 (0.04)	6 (0.17)	3 (0.63)	0.37

Table 4: Poisson Regression Model for Association of Residential Areas with Cardiovascular Disease Morbidity

Variables	PR (95% CI)	P-value
Urban	2.253 (1.262, 4.024)	0.006
Rural	ref.	
Urban*	2.118 (1.186, 3.781)	0.011
Rural	ref.	
Urban**	2.581 (1.438, 4.633)	0.001
Rural	ref.	
Urban***	2.264 (1.257, 4.078)	0.007
Rural	ref.	

*Adjusted with age, **adjusted with educational level, ***adjusted with age and educational level, PR = prevalence ratio, ref. = references

DISCUSSION

The association of urban and rural residential areas with the disease's prevalence is a particular concern in epidemiological studies. Results from epidemiological community studies might be helpful for healthcare planning.¹⁴ Our study demonstrated that people living in urban areas are more likely to associate with two times higher cardiovascular disease morbidity, especially stroke than those who live in rural areas. This finding could be affected by awareness of noncommunicable diseases, which is higher in people who live in urban areas than those who live in rural areas.¹⁵ In addition, people in urban areas have easier access to healthcare facilities than those who live in rural areas.^{7,8} Therefore, these findings might be over-reporting the prevalence of cardiovascular disease morbidity in urban areas. However, based on social determinant research, people who live in urban areas are more prone to a sedentary lifestyle than those who live in rural areas, which increases the risk of cardiovascular disease.¹⁶

Our finding is in concordance with the nationwide Indonesia health survey in 2013 and 2018.^{11,17} Another study analyzing data from the Indonesian Family Life Survey collected from households in 13 of 27 Indonesian provinces also demonstrated that people in urban areas have a higher prevalence of chronic disease than rural areas.¹⁸

In addition, our study demonstrated that the urban population tends to complete secondary high school than those in rural areas. Our findings are in concordance with the study conducted in East Java province, Indonesia.⁶ In a large cohort study, a higher educational level is more likely to develop cardiovascular disease than people who only complete primary school. However, those findings are also mediated by hypertension, obesity, and diabetes mellitus associated with a higher educational level.¹⁹

Our study demonstrated no difference in the prevalence of cardiovascular death in rural and urban areas in the Jatinangor subdistricts. Longitudinal studies in Tianjin, China, in 1999 - 2008, found a narrowing gap in the ratio of the incidence of cardiovascular death in rural and urban areas.²⁰ Another study in India demonstrated that in the year 2000, cardiovascular death was higher in urban areas than in rural areas. However, in 2015, cardiovascular death was higher in rural areas than in urban areas.²¹ It is postulated that the trends of the cause of mortality in urban-rural areas are affected by the improvement of healthcare services faster in urban areas than in rural areas.²⁰ However, during the study period, the percentage of cardiovascular mortality is higher than non-cardiovascular mortality. Therefore, with a longer study time, there might be a higher difference in cardiovascular mortality than non-cardiovascular morbidity. Since Indonesia's mortality report is well documented, there are minimal biases in the data collection process in this study.

Several limitations are worthy of being mentioned in the study. The nature of a cross-sectional study design would not allow us to accurately determine the causalities between variables. Since the recruitment process is conducted through village cadres and *Pos Binaan Terpadu (POSBINDU)* participants, the recruited participants may be those with health issues and already familiar with the cadres. On the other hand, the accuracy of self-reported diagnosis may lead to under or over-reporting. Therefore, the information from our population may need to be more generalizable.

Our finding may be underpowered due to the prevalence of morbidity and mortality rates lower than 10% to measure the prevalence ratio. We only collected gender, age, educational level, BMI, systole, and diastole data. More robust and comprehensive demographic characteristic data are needed to explore disease correlation with rural-urban characteristics.

Since this survey is conducted self-funded with a limited budget. Our data is valuable for capturing community studies. This study demonstrated that community studies can be conducted. Along with standardized data collection tools and trained village cadres, data presented in our study follows a standard protocol.

CONCLUSION

In the present study, urban residential areas were associated with two times higher cardiovascular morbidity than rural areas. No differences were found in terms of cardiovascular mortality. Further studies

are required to explore the correlation of rural-urban associations to cardiovascular disease morbidity and mortality.

AUTHORS' CONTRIBUTION

BBT and KW: Concept and design, data acquisition, interpretation, drafting, final approval, and agree to be accountable for all aspects of the work. BBT, KW, RA, YS, FYF, MI, NFT, LA, RMAR, and MRA: Data acquisition, interpretation, drafting, final approval and agree to be accountable for all aspects of the work.

Conflict of interest: Authors declared no conflict of interest.

Acknowledgment: There are no special acknowledgments in this study.

REFERENCES

- Gaziano TA, Bitton A, Anand S, Abrahams-Gessel S, Murphy A. Growing Epidemic of Coronary Heart Disease in Low- and Middle-Income Countries. *Curr Probl Cardiol.* 2010;35(2):72-115.
- World Health Organization. Noncommunicable diseases country profiles 2018. Geneva; 2018.
- Yusuf S, Joseph P, Rangarajan S, Islam S, Mentz A, Hystad P, et al. Modifiable risk factors, cardiovascular disease, and mortality in 155,722 individuals from 21 high-income, middle-income, and low-income countries (PURE): a prospective cohort study. *Lancet.* 2020;395(10226):795-808.
- Hussain MA, Al Mamun A, Peters SA, Woodward M, Huxley RR. The Burden of Cardiovascular Disease Attributable to Major Modifiable Risk Factors in Indonesia. *J Epidemiol.* 2016;26(10):515-21.
- Kusumawardani N, Tarigan I, Suparmi et al, Schlotheuber A. Socio-economic, demographic and geographic correlates of cigarette smoking among Indonesian adolescents: results from the 2013 Indonesian Basic Health Research (RISKESDAS) survey. *Glob Health Act.* 2018;11(sup1):54-62.
- Maharani A, Sujarwoto, Praveen D, Oceandy D, Tampubolon G, Patel A. Cardiovascular disease risk factor prevalence and estimated 10-year cardiovascular risk scores in Indonesia: The SMARThealth Extend study. *PLoS ONE.* 2019;14(4):1-13.
- Herawati E, Sofiatin Y. Socio-cultural aspects of noncommunicable disease prevention in three villages in the West Java. *Masyarakat, Kebudayaan dan Politik.* 2021;34(3):340-54.
- Sofiatin Y, Lailah N, Sitorus TDR, Roesli RMA. Qualitative Analysis of Establishing Diagnosis and Management of Hypertension from Patient's Perspective in Jatinangor. *Althea Med J.* 2018;5(4):208-13.
- Fihaya FY, Sofiatin Y, Ong PA, Sukandar H, Roesli RMA. Prevalence of Hypertension and Its Complications in Jatinangor 2014. *J Hypertens.* 2015;33:e35.
- Sofiatin Y, Roesli RMA. Kesiapan Masyarakat dalam Melaksanakan dan Memanfaatkan Posyandu Penyakit Tidak Menular di Desa Cilayung dan Cipacing, Kecamatan Jatinangor. *GMHC.* 2017;5(2):123.
- Ministry of Health of Republic of Indonesia. Basic Health Research (RISKESDAS) 2013. Jakarta; 2013.
- Huong DL, Minh H Van, Byass P. Applying verbal autopsy to determine cause of death in rural Vietnam. *Scand J Public Health Suppl.* 2003;62:19-25.
- Badan Pusat Statistik Kabupaten Sumedang. Kecamatan Jatinangor dalam Angka 2019. Sumedang; 2019.
- Verheij RA. Explaining urban-rural variations in health: a review of interactions between individual and environment. *Soc Sci Med.* 1996;42(6):923-35.
- Ridwan FR, Heryaman H, Kusumawati M. Kesadaran Masyarakat untuk Melakukan Penapisan Diabetes Melitus Tipe 2 di Desa Cilayung dan Desa Cipacing Kecamatan Jatinangor. *J Health Syst.* 2019;4(4):173-9.
- Machado-Rodrigues AM, Coelho-E-Silva MJ, Mota J, Padez C, Martins RA, Cumming SP, et al. Urban-rural contrasts in fitness, physical activity, and sedentary behaviour in adolescents. *Health Promot Int.* 2014;29(1):118-29.
- Adisasmito W, Amir V, Atin A, Megraini A, Kusuma D. Geographic and socioeconomic disparity in cardiovascular risk factors in Indonesia: analysis of the Basic Health Research 2018. *BMC Pub Health.* 2020;20(1):1004.
- Hussain MA, Huxley RR, Al Mamun A. Multimorbidity prevalence and pattern in Indonesian adults: an exploratory study using national survey data. *BMJ Open.* 2015;5(12):e009810.
- Dégano IR, Marrugat J, Grau M, Salvador-González B, Ramos R, Zamora A, et al. The association between education and cardiovascular disease incidence is mediated by hypertension, diabetes, and body mass index. *Sci Reports.* 2017;7(1):12370.
- Jiang G, Wang D, Li W, Pan Y, Zheng W, Zhang H, et al. Coronary heart disease mortality in China: age, gender, and urban-rural gaps during epidemiological transition. *Rev Panam Salud Publica.* 2012;31(4):317-24.
- Ke C, Gupta R, Xavier D, Prabhakaran D, Mathur P, Kalkonde Y V, et al. Divergent trends in ischaemic heart disease and stroke mortality in India from 2000 to 2015: a nationally representative mortality study. *Lancet Glob Health.* 2018;6(8):e914-23.

Address for Correspondence:

Mr. Badai Bhatara Tiksnadi, Department of Cardiology and Vascular Medicine, Faculty of Medicine, Universitas Padjadjaran, Bandung, Indonesia

Email: badai.bhatara.tiksnadi@unpad.ac.id