Healthy Tadulako Journal (Jurnal Kesehatan Tadulako)
Vol. 11 No. 4, September 2025
P-ISSN : 2407-8441/e-ISSN : 2502-0749

Original Research Paper

The Relationship Between Diabetes and Hypertension and Mortality in Chronic Kidney Disease Patients in Indonesia

Ade Yonata*, Nurul Islamy

Faculty of Medicine, Universitas Lampung

Access this article online
Quick Response Code :

DOI : 10.22487/htj.v11i4.1534

Email Corresponding:
adeyumi@gmail.com

Page : 517-525

Article History:
Received: 2024-08-15
Revised: 2025-09-21
Accepted: 2025-09-25

Published by:
Tadulako University, Managed by Faculty of Medicine.

Website :
https://jurnal.fk.untad.ac.id/index.php/htj/index

Abstract

Background: Chronic kidney disease (CKD) is a major global health problem that significantly increases morbidity and mortality, mainly due to cardiovascular disease (CVD). In Indonesia, cardiovascular complications account for approximately 42% of deaths among CKD patients. This study aimed to analyze the relationship between diabetes and hypertension with mortality in CKD patients in Indonesia. **Objective:** To investigate the association between diabetes and hypertension and mortality among chronic kidney disease patients undergoing hemodialysis in Indonesia. **Methods:** A cross-sectional study was conducted at Dr. H. Abdul Moeloek Regional Hospital, Lampung, from March to May 2024. The study population consisted of end-stage CKD patients undergoing hemodialysis. Data were obtained from medical records and analyzed using the Chi-Square test, with a significance level set at $p < 0.05$. **Results:** Of 110 patients, 58% of those with diabetes and 55.1% of those with hypertension died. Both comorbidities showed a significant association with mortality in CKD patients ($p = 0.0031$ for diabetes, $p = 0.019$ for hypertension). **Conclusion:** Diabetes and hypertension significantly increase mortality risk among CKD patients. These findings underscore the importance of comprehensive management of comorbidities to improve survival outcomes in CKD populations.

Keywords: *Chronic Kidney Disease; Diabetes; Hypertension; Mortality; Comorbidities.*

Introduction

Chronic kidney disease (CKD) is a progressive condition characterized by a gradual loss of kidney function and represents a major global health burden with profound implications for morbidity and mortality. The global prevalence of CKD is estimated at approximately 10–15% of the population, underscoring its public health significance [1]. CKD is strongly associated with increased morbidity and mortality, particularly from cardiovascular disease (CVD) [2]. Patients with CKD face not only the risk of progression to end-stage kidney disease (ESKD) but also a heightened risk of CVD and premature death[2,3].

Evidence has demonstrated that CKD is an independent predictor of both all-cause and cardiovascular mortality, highlighting the importance of early detection and management[3]. Patients with CKD frequently present with higher rates of comorbidities, including heart failure, which further worsens their prognosis [4]. Epidemiological studies have shown that CKD is linked to adverse outcomes such as hospitalization, long-term dialysis, and death [5]. Notably, many patients with CKD die from cardiovascular or other causes before reaching the stage of ESKD [5].

In Indonesia, cardiovascular complications remain the leading cause of death among CKD patients, accounting for approximately 42% of

cases [6]. The 2018 Indonesian Basic Health Research Survey reported that 0.38% of the population, equivalent to 739,208 individuals, were living with CKD [7]. Mortality rates are also disproportionately higher in CKD patients with comorbid conditions, particularly during the COVID-19 pandemic, where the crude mortality rate reached 44.6% in CKD patients with COVID-19, compared to 4.7% among those without COVID-19 [8].

Among the multiple risk factors associated with mortality in CKD patients, traditional cardiovascular risk factors such as diabetes mellitus, hypertension, and dyslipidemia are highly prevalent and contribute significantly to adverse outcomes [9]. CKD itself amplifies the risk of all-cause and cardiovascular mortality, particularly in patients with advanced disease who frequently harbor multiple cardiovascular risk factors [10, 11]. Diabetes and hypertension, in particular, are the most common comorbidities observed in CKD patients and are consistently linked to worse prognosis and higher mortality risk[12]. Both conditions accelerate the progression of renal dysfunction, thereby compounding disease burden [5].

Given the substantial morbidity and mortality associated with CKD and the critical role of comorbidities such as diabetes and hypertension, this study aims to analyze the association between these comorbidities and mortality among CKD patients undergoing hemodialysis in Indonesia. While previous studies have examined the impact of diabetes and hypertension on CKD outcomes, limited research has specifically addressed their relationship with mortality in Indonesian hemodialysis populations. The novelty of this study lies in its focus on a local Indonesian cohort, which is expected to generate contextually relevant data to guide more tailored management strategies aimed at reducing mortality and improving quality of life among CKD patients in Indonesia.

Materials and Methods

Study Design

This study employed a descriptive-analytic design with a cross-sectional approach to analyze the association between comorbidities and mortality among patients with end-stage chronic kidney disease (CKD) undergoing hemodialysis at Dr. H. Abdul Moeloek Regional Hospital, Lampung Province, Indonesia. Data were extracted from patient medical records at a single point in time without additional interventions. The study was conducted from March to May 2024. Cross-sectional designs are widely applied in epidemiological research to evaluate associations between exposures and outcomes.

Sampling

The study population consisted of patients diagnosed with end-stage CKD undergoing routine hemodialysis at the hospital. A purposive sampling technique was applied, in which participants were selected based on predefined eligibility criteria until the required sample size was reached. Inclusion criteria were: (1) patients aged ≥18 years, (2) diagnosis of end-stage CKD undergoing hemodialysis, and (3) complete medical records documenting demographic characteristics, comorbidities, and mortality status. Patients with incomplete records or missing information on comorbidities were excluded. Purposive sampling is an appropriate method for clinical studies focusing on specific populations.

The independent variables were the presence of comorbidities, specifically diabetes mellitus and hypertension. The dependent variable was mortality in patients with end-stage CKD undergoing hemodialysis. Demographic information, comorbidity status, and survival outcomes were obtained from patient medical records. Diabetes and hypertension are among the most prevalent

comorbidities in CKD patients and have been strongly associated with increased mortality risk.

Data Collection Technique

Data were collected retrospectively from patient medical records that fulfilled the inclusion criteria. The extracted data included age, sex, comorbidity status (diabetes and hypertension), and mortality outcomes. Medical record review is a widely used and reliable approach for obtaining clinical information in CKD epidemiological studies. All data were anonymized prior to analysis to ensure patient confidentiality and compliance with ethical research standards.

Data Analysis Technique

Data analysis was performed using Statistical Package for the Social Sciences (SPSS) version 26.0 for Windows (IBM Corp., Armonk, NY, USA). Descriptive statistics were applied to summarize demographic characteristics and comorbidity prevalence using frequency distributions and percentages. Bivariate analysis was conducted to evaluate the association between comorbidities (independent variables) and mortality (dependent variable). The Chi-Square test was employed to assess statistical associations, with Fisher's Exact Test used as an alternative when Chi-Square assumptions were not met. A significance level of $p < 0.05$ was applied. Statistical approaches such as Chi-Square testing are commonly used for categorical variables in medical research.

Ethical Considerations

The study was approved by the Ethics Committee of Dr. H. Abdul Moeloek Regional Hospital, Lampung Province, Indonesia. All data were collected from secondary medical records, and patient confidentiality was maintained by anonymizing identifying information. Ethical approval ensures compliance with research standards and protection of patient rights.

Results

This study examined the relationship between comorbidities, particularly diabetes and hypertension, and mortality among patients with chronic kidney disease (CKD). Data were collected from 110 patients at Dr. H. Abdul Moeloek Regional General Hospital. The results are presented in two main tables that describe the demographic and clinical characteristics of the study population and the statistical associations between comorbidities and mortality outcomes.

Table 1. Characteristics of the study sample

Characteristics	Frequency	Percentage (%)
Age		
<65 years	64	58.2
≥65 years	46	41.8
Sex		
Male	59	53.6
Female	51	46.4
Diabetes		
Positive	50	45.5
Negative	60	54.5
Hypertension		
Positive	49	44.5
Negative	61	55.5
Mortality		
Positive	47	42.7
Negative	63	57.3

Table 1 summarizes the demographic and clinical characteristics of the sample. A total of 58.2% of patients were younger than 65 years, while 41.8% were 65 years or older. The sex distribution was relatively balanced, with 53.6% male and 46.4% female. Regarding comorbidities, 45.5% of patients had diabetes and 44.5% had hypertension. Overall, 42.7% of patients died during the study period, while 57.3% survived.

The age distribution indicates a slightly higher prevalence of CKD in patients younger than 65 years, which may reflect the rising incidence of CKD at younger ages due to

lifestyle-related risk factors. The balanced sex distribution suggests that the findings are generalizable across genders. The presence of diabetes and hypertension in nearly half of the sample highlights the high prevalence of these comorbidities among individuals with CKD, consistent with prior reports.

Table 2. Association of diabetes and hypertension with mortality in CKD patients

Variable	Mortality Positive	Mortality Negative	Total	p-value
Diabetes				
Positive	29 (58%)	21 (42%)	50	0.0031
Negative	18 (30%)	42 (70%)	60	
Hypertension				
Positive	27 (55.1%)	22 (44.9%)	49	0.019
Negative	20 (32.8%)	41 (67.2%)	61	

Table 2 explores the relationship between diabetes, hypertension, and mortality among CKD patients. Among patients with diabetes, 58% died compared with 30% of those without diabetes. A chi-square analysis yielded a p-value of 0.0031, indicating a statistically significant association between diabetes and increased mortality risk.

Hypertension was also significantly associated with mortality. A total of 55.1% of hypertensive patients died, compared with 32.8% of non-hypertensive patients. The chi-square analysis yielded a p-value of 0.019, further confirming the significant correlation between hypertension and mortality risk in CKD patients. These findings align with existing literature showing that diabetes and hypertension are major contributors to adverse outcomes in CKD.

Discussion

Chronic kidney disease (CKD) is a major global health problem characterized by a persistent decline in kidney function for more than three months, affecting nearly 500 million individuals worldwide, with a particularly high prevalence in developing countries[13]. Epidemiological studies consistently show that CKD is closely associated with multiple comorbidities, particularly cardiovascular disease (CVD), which remains the leading cause of death in this population. Patients with CKD have an 8–10 fold higher risk of cardiovascular mortality compared with the general population, and this risk is further amplified by the presence of hypertension and diabetes, two highly prevalent comorbidities among CKD patients [14].

The multifactorial nature of CKD-related mortality is well established. Cardiovascular events are the major contributors, especially in those with reduced estimated glomerular filtration rate (eGFR), who are at increased risk for acute cardiovascular events and long-term mortality [15]. In addition, CKD is associated with anemia, mineral and bone disorders, and higher susceptibility to infections, all of which further worsen outcomes[13,16]. Infectious diseases, particularly pneumonia and sepsis, are also significant causes of death, as CKD has been identified as an independent risk factor for these conditions [17]. Moreover, CKD patients have an elevated risk of malignancies, such as urinary tract and lung cancers, which further contribute to mortality [18].

Our findings align with previous studies that identified diabetes as a key risk factor for poor outcomes in CKD [2,12]. Pathophysiological mechanisms such as hyperglycemia-induced nephropathy contribute to CKD progression and increased mortality risk. The significant p-values in our analysis emphasize the need for strict diabetes management in CKD to improve survival. Diabetes mellitus, particularly type 2 diabetes, is a global health concern due to its strong association with premature death. Both microvascular complications (e.g., diabetic nephropathy and retinopathy) and macrovascular complications (e.g., CVD) drive this risk[19,20]. Furthermore, psychosocial factors, such as comorbid depression, worsen prognosis, highlighting the importance of

integrated care addressing both physical and mental health [21].

The duration and severity of diabetes-related complications strongly influence mortality risk. Studies show that higher burden of complications, measured for example by the Diabetes Complications Severity Index (DCSI), is directly correlated with mortality in both type 1 and type 2 diabetes [22, 23]. Obesity further complicates outcomes, with body mass index (BMI) demonstrating a U-shaped relationship with mortality in diabetes, where both underweight and obese individuals are at increased risk [24]. Emerging biomarkers, such as shorter telomere length, may also provide prognostic information, being linked with increased cardiovascular mortality among patients with diabetes [25].

Consistent evidence confirms that diabetes remains a significant predictor of mortality among CKD patients, even at advanced stages[26]. The World Health Organization has identified CKD and diabetes as the most common risk factors for severe COVID-19, reinforcing their clinical importance [27]. Type 2 diabetes, the leading cause of CKD, is associated with increased all-cause mortality, frequent infections, and higher cardiovascular events[28,29,30]. The synergistic effect of diabetes and CKD doubles the mortality risk compared to diabetes alone [31, 32].

Hypertension, another highly prevalent comorbidity, emerged as a significant predictor of mortality in our study. Prior research consistently shows hypertension accelerates CKD progression and increases CVD risk [33-37]. Hypertension is the second leading cause of CKD and is strongly associated with vascular damage, glomerulosclerosis, and higher risk of cardiovascular events[38,39]. Severe or uncontrolled hypertension is linked with all-cause and cardiovascular mortality [40,41], and resistant hypertension is particularly concerning in CKD, requiring aggressive management [42,43,44,45].

The bidirectional relationship between CKD and hypertension creates a vicious cycle where each condition exacerbates the other, further elevating mortality risk [46]. Our findings reinforce previous reports that hypertensive CKD patients face markedly higher cardiovascular mortality, especially in advanced stages [47]. In addition, comorbid diabetes, CKD, and hypertension form a “high-risk triad” associated with adverse clinical outcomes and high mortality [48,49,50,51].

Taken together, our results highlight that both diabetes and hypertension independently and synergistically increase mortality risk in CKD patients. Effective management requires a comprehensive approach encompassing glycemic control, blood pressure management, early detection and treatment of complications, and integrated care for psychosocial factors. Future research should further elucidate biological pathways, such as oxidative stress and endothelial dysfunction, to develop more targeted interventions that may reduce mortality among this high-risk population.

Conclusion

Diabetes mellitus and hypertension were found to be significant predictors of mortality among patients with end stage chronic kidney disease (CKD) undergoing hemodialysis. These findings are consistent with previous studies reporting that both diabetes and hypertension accelerate vascular complications and increase the risk of adverse outcomes in CKD patients. Effective management of diabetes and hypertension is therefore essential to improve therapeutic outcomes and reduce mortality rates in this population [4,5]. Future studies with larger cohorts and prospective designs are recommended to validate these results and explore additional modifiable risk factors.

Acknowledgments

The authors would like to thank the Hemodialysis Unit Coordinator of Dr. H. Abdul Moeloek Regional Hospital, Lampung Province, for valuable input and support during this study.

References

1. Deursen VM v, Urso R, Laroche C, et al. Co-morbidities in Patients With Heart Failure: An Analysis of the European Heart Failure Pilot Survey. *Eur J Heart Fail*. 2013;16(1):103-111. doi:10.1002/ejhf.30
2. Lim CC, Teo BW, Ong PG, et al. Chronic Kidney Disease, Cardiovascular Disease and Mortality: A Prospective Cohort Study in a Multi-Ethnic Asian Population. *Eur J Prev Cardiol*. 2014;22(8):1018-1026. doi:10.1177/2047487314536873
3. Matsushita K, Velde M v d, Astor BC, et al. Association of Estimated Glomerular Filtration Rate and Albuminuria With All-Cause and Cardiovascular Mortality in General Population Cohorts: A Collaborative Meta-Analysis. *The Lancet*. 2010;375(9731):2073-2081. doi:10.1016/s0140-6736(10)60674-5
4. Tedeschi A, Agostoni P, Pezzuto B, et al. Role of Comorbidities in Heart Failure Prognosis Part 2: Chronic Kidney Disease, Elevated Serum Uric Acid. *Eur J Prev Cardiol*. 2020;27(2_suppl):35-45. doi:10.1177/2047487320957793
5. Nishikawa K, Takahashi K, Yamada R, Kinaga T, Matsumoto M, Yamamoto M. Influence of Chronic Kidney Disease on Hospitalization, Chronic Dialysis, and Mortality in Japanese Men: A Longitudinal Analysis. *Clin Exp Nephrol*. 2016;21(2):316-323. doi:10.1007/s10157-016-1293-5
6. Harfonso EEB. Association Between Albuminuria and Serum Phosphate Levels in Non-Dialysis Stage 3-5 Chronic Kidney Disease Patients. *Current Internal Medicine Research and Practice Surabaya Journal*. 2023;4(2). doi:10.20473/cimrj.v4i2.49184
7. Alsagaff MY, Pikir BS, Susilo H, et al. The Role of Oxidative Stress Markers in Indonesian Chronic Kidney Disease Patients: A Cross Sectional Study. *F1000Res*. 2022;11:132. doi:10.12688/f1000research.74985.1
8. Gibertoni D, Reno C, Rucci P, et al. COVID-19 Incidence and Mortality in Non-Dialysis Chronic Kidney Disease Patients. *PLoS One*. 2021;16(7):e0254525. doi:10.1371/journal.pone.0254525
9. Piko N. The Role of Oxidative Stress in Kidney Injury. *Antioxidants*. 2023;12(9):1772. doi:10.3390/antiox12091772
10. Han SS, Kim KW, Na KY, et al. Quality of Life and Mortality From a Nephrologist's View: A Prospective Observational Study. *BMC Nephrol*. 2009;10(1). doi:10.1186/1471-2369-10-39
11. Gargiulo G, Capodanno D, Sannino A, et al. Moderate and Severe Preoperative Chronic Kidney Disease Worsen Clinical Outcomes After Transcatheter Aortic Valve Implantation. *Circ Cardiovasc Interv*. 2015;8(2). doi:10.1161/circinterventions.114.002220
12. Huber M, Ozrazgat-Baslanti T, Thottakkara P, et al. Mortality and Cost of Acute and Chronic Kidney Disease After Vascular Surgery. *Ann Vasc Surg*. 2016;30:72-81.e2. doi:10.1016/j.avsg.2015.04.092
13. Bishaw F, Woldemariam MB, Mekonen G, Birhanu B, Abebe A. Prevalence of Anemia

and Its Predictors Among Patients With Chronic Kidney Disease Admitted to a Teaching Hospital in Ethiopia: A Hospital-Based Cross-Sectional Study. *Medicine*. 2023;102(6):e31797. doi:10.1097/md.0000000000031797

14. Ajam F. Cardiac Arrhythmias in Patients With End Stage Renal Disease (ESRD) on Hemodialysis; Recent Update and Brief Literature Review. *American Journal of Internal Medicine*. 2019;7(1):22. doi:10.11648/j.ajim.20190701.16
15. Nagai K, Yamagata K, Iseki K, et al. Antihypertensive Treatment and Risk of Cardiovascular Mortality in Patients With Chronic Kidney Disease Diagnosed Based on the Presence of Proteinuria and Renal Function: A Large Longitudinal Study in Japan. *PLoS One*. 2019;14(12):e0225812. doi:10.1371/journal.pone.0225812
16. Hruska KA, Sugatani T, Agapova OA, Fang Y. The Chronic Kidney Disease — Mineral Bone Disorder (CKD-MBD): Advances in Pathophysiology. *Bone*. 2017;100:80-86. doi:10.1016/j.bone.2017.01.023
17. McDonald HI, Thomas SL, Millett ERC, Nitsch D. CKD and the Risk of Acute, Community-Acquired Infections Among Older People With Diabetes Mellitus: A Retrospective Cohort Study Using Electronic Health Records. *American Journal of Kidney Diseases*. 2015;66(1):60-68. doi:10.1053/j.ajkd.2014.11.027
18. Wong G, Staplin N, Emberson J, et al. Chronic Kidney Disease and the Risk of Cancer: An Individual Patient Data Meta-Analysis of 32,057 Participants From Six Prospective Studies. *BMC Cancer*. 2016;16(1). doi:10.1186/s12885-016-2532-6
19. Al-Rubeaan K, Almashouq MK, Youssef AM, et al. All-Cause Mortality Among Diabetic Foot Patients and Related Risk Factors in Saudi Arabia. *PLoS One*. 2017;12(11):e0188097. doi:10.1371/journal.pone.0188097
20. Pop-Busui R, Evans GW, Gerstein HC, et al. Effects of Cardiac Autonomic Dysfunction on Mortality Risk in the Action to Control Cardiovascular Risk in Diabetes (ACCORD) Trial. *Diabetes Care*. 2010;33(7):1578-1584. doi:10.2337/dc10-0125
21. Kofod DH, Carlson N, Ballegaard EF, et al. Cardiovascular Mortality in Patients With Advanced Chronic Kidney Disease With and Without Diabetes: A Nationwide Cohort Study. *Cardiovasc Diabetol*. 2023;22(1). doi:10.1186/s12933-023-01867-8
22. Bjerg L, Hulmán Á, Carstensen B, Charles M, Witte DR, Jørgensen ME. Effect of Duration and Burden of Microvascular Complications on Mortality Rate in Type 1 Diabetes: An Observational Clinical Cohort Study. *Diabetologia*. 2019;62(4):633-643. doi:10.1007/s00125-019-4812-6
23. Yoo H, Choo E, Lee J. Study of Hospitalization and Mortality in Korean Diabetic Patients Using the Diabetes Complications Severity Index. *BMC Endocr Disord*. 2020;20(1). doi:10.1186/s12902-020-00605-5
24. Li S, Wang J, Zhang B, Li X, Liu Y. Diabetes Mellitus and Cause-Specific Mortality: A Population-Based Study. *Diabetes Metab J*. 2019;43(3):319. doi:10.4093/dmj.2018.0060
25. Chen Y, Zhou X, Chen Z, et al. The Use of High-Sensitivity Cardiac Troponin T and Creatinine Kinase-Mb as a Prognostic Markers in Patients With Acute Myocardial

Infarction and Chronic Kidney Disease. *Ren Fail*. 2023;45(1). doi:10.1080/0886022x.2023.2220420

26. Kofod DH, Carlson N, Ballegaard EF, et al. Cardiovascular Mortality in Patients With Advanced Chronic Kidney Disease With and Without Diabetes: A Nationwide Cohort Study. *Cardiovasc Diabetol*. 2023;22(1). doi:10.1186/s12933-023-01867-8
27. Singh AN. A Short Review on Impact of Covid-19 in Diabetic Chronic Kidney Disease Patients. *Ip Journal of Nutrition Metabolism and Health Science*. 2022;5(1):7-10. doi:10.18231/j.ijnmhs.2022.002
28. Chen J, Wu C, Jenq C, et al. Association of Glucagon-Like Peptide-1 Receptor Agonist vs Dipeptidyl Peptidase-4 Inhibitor Use With Mortality Among Patients With Type 2 Diabetes and Advanced Chronic Kidney Disease. *JAMA Netw Open*. 2022;5(3):e221169. doi:10.1001/jamanetworkopen.2022.1169
29. Afkarian M, Katz R, Bansal N, et al. Diabetes, Kidney Disease, and Cardiovascular Outcomes in the Jackson Heart Study. *Clinical Journal of the American Society of Nephrology*. 2016;11(8):1384-1391. doi:10.2215/cjn.13111215
30. Afkarian M, Sachs M, Kestenbaum B, et al. Kidney Disease and Increased Mortality Risk in Type 2 Diabetes. *Journal of the American Society of Nephrology*. 2013;24(2):302-308. doi:10.1681/asn.2012070718
31. Wong WS, McKay G, Stevens K. Diabetic Kidney Disease and Transplantation Options. *Practical Diabetes*. 2021;38(2):28. doi:10.1002/pdi.2330
32. Chen J, Wu C, Jenq C, et al. Association of Glucagon-Like Peptide-1 Receptor Agonist vs Dipeptidyl Peptidase-4 Inhibitor Use With Mortality Among Patients With Type 2 Diabetes and Advanced Chronic Kidney Disease. *JAMA Netw Open*. 2022;5(3):e221169. doi:10.1001/jamanetworkopen.2022.1169
33. Xi-hong L, Shi K, Zhang Y, et al. Contribution of CKD to Mortality in Middle-Aged and Elderly People With Diabetes: The China Health and Retirement Longitudinal Study. *Diabetol Metab Syndr*. 2023;15(1). doi:10.1186/s13098-023-01083-0
34. Ramzan HS. Effect of Severity and Etiology of Chronic Kidney Disease in Patients With Heart Failure With Mildly Reduced Ejection Fraction. *Biological and Clinical Sciences Research Journal*. 2024;2024(1):888. doi:10.54112/bcsrj.v2024i1.888
35. Singh AK. Diabetes, Anemia and CKD: Why TREAT? *Curr Diab Rep*. 2010;10(4):291-296. doi:10.1007/s11892-010-0123-5
36. Roehm B, Weiner DE. Blood Pressure Targets and Kidney and Cardiovascular Disease. *Curr Opin Nephrol Hypertens*. 2019;28(3):245-250. doi:10.1097/mnh.0000000000000492
37. Handayani F, Kurnia Bintang A, Kaelan C. Hubungan Hipertensi, Diabetes Mellitus dan Dislipidemia dengan Luaran Klinis Pasien Iskemik Stroke dengan Hipersomnia. *Healthy Tadulako Journal (Jurnal Kesehatan Tadulako)*. 2020;4(1):1-6. doi:10.22487/htj.v4i1.56
38. H. Situmorang T, Damantalm Y, Januarista A, Sukri S. Faktor-faktor yang berhubungan dengan kejadian preeklamsia pada ibu hamil di Poli KIA RSU Anutapura

Palu. *Healthy Tadulako Journal (Jurnal Kesehatan Tadulako)*. 2016;2(1):34-44. doi:10.22487/htj.v2i1.21

39. Fahira Nur A, Arifuddin A. Faktor risiko kejadian preeklamsia pada ibu hamil di RSU Anutapura Kota Palu. *Healthy Tadulako Journal (Jurnal Kesehatan Tadulako)*. 2020;3(2):69-75. doi:10.22487/htj.v3i2.55
40. Sahlawi MA. Blood Pressure Control Among Patients With Chronic Kidney Disease in Saudi Arabia: A Single-Center Experience. *Arterial Hypertension*. 2023;27(2):73-77. doi:10.5603/ah.a2023.0010
41. Mayeda L, Rivara MB. Nighttime Hypertension in Chronic Kidney Disease—Are We in the Dark Without Ambulatory Blood Pressure Monitoring? *JAMA Netw Open*. 2022;5(5):e2214469. doi:10.1001/jamanetworkopen.2022.14469
42. Mohebi R, Bozorgmanesh M, Sheikholeslami F, Azizi F, Hadaegh F. Contribution of Glomerular Filtration Rate to 10-Year Cardiovascular and Mortality Risk Among Hypertensive Adults: Tehran Lipid and Glucose Study. *J Clin Hypertens*. 2013;15(5):350-358. doi:10.1111/jch.12083
43. Agvall B, Ashfaq A, Bjurström K, et al. Characteristics, Management and Outcomes in Patients With CKD in a Healthcare Region in Sweden: A Population-Based, Observational Study. *BMJ Open*. 2023;13(7):e069313. doi:10.1136/bmjopen-2022-069313
44. Ritchie J, Rainone F, Green D, et al. Extreme Elevations in Blood Pressure and All-Cause Mortality in a Referred CKD Population: Results From the CRISIS Study. *Int J Hypertens*. 2013;2013:1-8. doi:10.1155/2013/597906
45. Lawson J, Jepson R. Feline Comorbidities: The Intermingled Relationship Between Chronic Kidney Disease and Hypertension. *J Feline Med Surg*. 2021;23(9):812-822. doi:10.1177/1098612x211037872
46. Roehm B, Weiner DE. Blood Pressure Targets and Kidney and Cardiovascular Disease. *Curr Opin Nephrol Hypertens*. 2019;28(3):245-250. doi:10.1097/mnh.0000000000000492
47. Khan F, Khan Q, Bhatti JM, et al. AKI and Its Relation With Outcome in Patients With COVID-19. *PJMHS*. 2022;16(12):483-486. doi:10.53350/pjmhs20221612483
48. Zhou D, Xi B, Zhao M, Wang L, Veeranki SP. Uncontrolled Hypertension Increases Risk of All-Cause and Cardiovascular Disease Mortality in US Adults: The NHANES III Linked Mortality Study. *Sci Rep*. 2018;8(1). doi:10.1038/s41598-018-27377-2
49. Lim CC, Teo BW, Ong PG, et al. Chronic Kidney Disease, Cardiovascular Disease and Mortality: A Prospective Cohort Study in a Multi-Ethnic Asian Population. *Eur J Prev Cardiol*. 2014;22(8):1018-1026. doi:10.1177/2047487314536873
50. Long T. H-Type Hypertension Is a Risk Factor for Chronic Kidney Disease: A Case-Control Study. Published online 2024. doi:10.21203/rs.3.rs-3992934/v1
51. Thomas G, Felts J, Brecklin C, et al. Apparent Treatment-Resistant Hypertension Assessed by Office and Ambulatory Blood Pressure in Chronic Kidney Disease—A Report From the Chronic Renal Insufficiency Cohort Study. *Kidney360*. 2020;1(8):810-818. doi:10.34067/kid.0002072020