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Prevalence of Diabetes Mellitus Comorbidity in Hypertension Patients: Indonesian National Health Insurance Data

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ABSTRACT

Managing hypertension becomes significantly more complex when diabetes mellitus co-occurs, often leading to poorer clinical outcomes and higher healthcare costs. This research investigated the prevalence of diabetes comorbidity among hypertensive patients at advanced referral health facilities and its relationship with patient age. Using a cross-sectional approach, we analyzed 5,505 records from the 2025 Indonesian National Health Insurance (BPJS Kesehatan) sample data for patients presenting with a primary diagnosis of hypertension. The overall prevalence of comorbid diabetes was 9.3% (510 cases). Within this cohort, 57.6% (3,172) were non-elderly (<60 years) and 42.4% (2,333) were elderly (≥60 years). Diabetes prevalence was 9.6% in the elderly group and 9.0% in the younger demographic. The Pearson Chi-Square analysis confirmed no significant association between age category and diabetes ($p = 0.459$). These findings suggest that the risk of comorbid diabetes among referred hypertensive patients remains consistent regardless of age. Therefore, we recommend universal endocrine screening for all hypertensive referrals to prevent delayed diagnosis and improve targeted interventions, rather than relying on age-based screening protocols.

Keywords: Hypertension; Diabetes Mellitus; Comorbidity; Cross-Sectional Studies; National Health Programs

INTRODUCTION

Treating hypertension is a routine clinical challenge, but the situation becomes vastly more complicated when diabetes mellitus (DM) is comorbid, as these conditions frequently co-occur and accelerate microvascular and macrovascular damage. In Indonesia, this comorbidity imposes a heavy economic burden on BPJS Kesehatan, with hypertension and DM accounting for significant claims, such as Rp30.5 trillion in 2024 for 20.5 million hypertension and 7.4 million DM cases (1–3).

The association between hypertension and DM is driven by shared risk factors like advancing age, obesity, sedentary lifestyles, and dyslipidemia. Indonesian studies report high comorbidity rates, such as 37.4% hypertension prevalence among DM patients from 2018 RISKESDAS data and 33.3% DM among hypertension patients in recent cohorts. Globally, over half of type 2 DM patients develop hypertension, amplifying cardiovascular risks (2,4–6).

National surveys show hypertension prevalence at 34.1% (RISKESDAS 2018) and 30.8% (SKI 2023), with DM at 10.9% and 11.7%, respectively, yet control rates remain low (<20%). Hospital-based studies, like one at Universitas Kristen Indonesia (2020-2022) finding 80.4% hypertension incidence in type 2 DM patients, highlight the issue but are limited to single sites. Primary care (Puskesmas) data often underrepresent specialist-level cases due to delayed referrals (7–10).

Most Indonesian research relies on localized Puskesmas or single-hospital records, failing to capture national referral patterns at Advanced Referral Health Facilities (FKRTL). Few studies use BPJS claims for macroscopic analysis, and assumptions of age-driven risk overlook emerging trends in younger adults (e.g., 10.7% hypertension in 18-24 group per SKI 2023) (11–13).

This study uses 2025 BPJS Sample Data to estimate DM comorbidity prevalence in hypertensive FKRTL patients nationwide, testing age associations beyond traditional views. It provides a specialist-level profile to inform referral optimization, addressing gaps in prior localized efforts.

METHODS

This study employed a quantitative, observational, cross-sectional design to evaluate the prevalence of comorbidities at a specific point in time. The research used secondary data extracted from the Indonesian National Health Insurance (BPJS Kesehatan) Sample Data for 2025. The target population comprised all patients utilizing Advanced Referral Health Facilities (FKRTL) across Indonesia. A purposive sampling technique was applied to select records that strictly met the inclusion criteria, specifically patient encounters with a primary diagnosis of hypertension indicated by the ICD-10 code I10. Encounters with missing demographic variables or invalid diagnostic codes were excluded from the dataset. The final sample size eligible for statistical analysis comprised 5,505 patient visits.

The independent variable in this research was the patient's age, which was systematically categorized into two distinct groups: non-elderly (less than 60 years old) and elderly (60 years old and above) in accordance with standard demographic classifications. The dependent variable was the incidence of diabetes mellitus comorbidity, identified by the presence of secondary diagnosis codes E10-E14 according to the ICD-10 classification. The data collection and processing stages involved extracting raw demographic and secondary diagnosis files from the 2025 BPJS Sample Data. The data merging process was executed utilizing unique patient and encounter identifiers. Subsequent data cleaning procedures included identifying and removing duplicate diagnostic records per visit and recoding string variables into numerical dichotomous categories for accurate computational processing.

Data analysis was conducted using the Statistical Package for the Social Sciences (SPSS) software. Univariate analysis was performed to calculate the frequency distribution and percentages of patient demographics and the overall prevalence of diabetes comorbidity. Bivariate analysis was subsequently carried out using the Pearson Chi-Square test to assess the statistical significance of the association between age categories and the presence of diabetes mellitus. A p-value of less than 0.05 was established as the threshold for statistical significance. The fundamental stages of this research are systematically illustrated in the flowchart below.

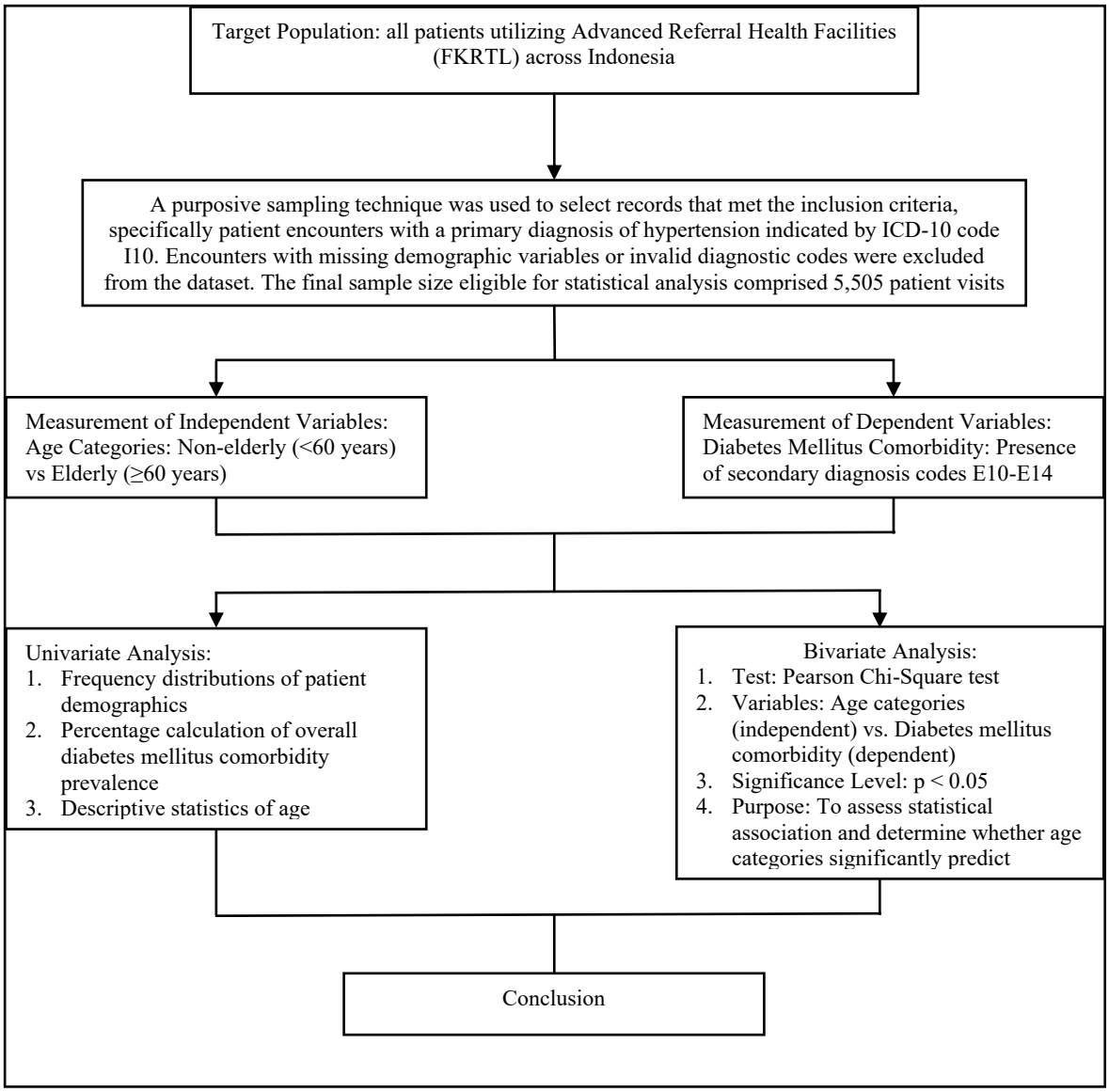

Figure 1. Research Stages Flowchart

RESULTS

The final dataset included 5,505 patient records from advanced referral health facilities, all presenting with a primary diagnosis of hypertension. We categorized these patients by age to establish a demographic baseline. The majority of patients were non-elderly (under 60 years old), comprising 3,172 individuals (57.6% of the total sample). The remaining 2,333 patients (42.4%) were classified as elderly (60 years and older).

During the analysis of secondary diagnoses, we found that 510 patients out of the total sample had a documented comorbidity of diabetes mellitus. This represents an overall comorbidity prevalence of 9.3% within this specific hypertensive population. The detailed frequency distribution of these characteristics is presented in Table 1.

Table 1. Characteristics of Hypertension Patients

Num.	Category	Frequency (n)	Percentage (%)
1	**Age Group**		
	Non-elderly (<60 years)	3,172	57.6
	Elderly (≥60 years)	2,333	42.4
2	**Diabetes Mellitus Status**		
	Yes (Comorbid)	510	9.3
	No	4,995	90.7
	Total	**5,505**	**100.0**

We then performed a cross-tabulation combined with a Pearson Chi-Square test to evaluate whether a patient's age category is statistically associated with the presence of diabetes mellitus comorbidity. The cross-tabulation revealed that diabetes mellitus was present in 9.6% of the elderly group (224 out of 2,333 patients). In the non-elderly group, the prevalence was slightly lower at 9.0% (286 out of 3,172 patients). Despite this slight percentage difference, the statistical test yielded a p-value of 0.459. Because this value is greater than the standard 0.05 significance level, the difference in comorbidity rates between the two age groups is not statistically significant. Table 2 details these bivariate analysis results.

Table 2. Association Between Age Category and Diabetes Mellitus Comorbidity (n=5,505)

No.	Age Category	DM: Yes (n, %)	DM: No (n, %)	Total (n, %)	p-value
1	Non-elderly (<60 years)	286 (9.0%)	2,886 (91.0%)	3,172 (100%)	0.459
2	Elderly (≥60 years)	224 (9.6%)	2,109 (90.4%)	2,333 (100%)	
Total		**510 (9.3%)**	**4,995 (90.7%)**	**5,505 (100%)**	**0.459**

DISCUSSION

This study demonstrated an overall diabetes mellitus comorbidity prevalence of 9.3% among hypertensive patients at advanced referral health facilities (FKRTL) in Indonesia. Strikingly, our analysis revealed no statistically significant difference in the proportion of diabetes comorbidity between elderly and non-elderly patients ($p = 0.459$). This finding challenges the conventional epidemiological paradigm, which traditionally positions advancing chronological age as the primary independent predictor for the accumulation of cardiometabolic comorbidities (14,15). At the advanced referral level, the risk profile appears to equalize, indicating that younger hypertensive patients requiring specialist care possess a cardiometabolic burden as severe as their older counterparts.

These results contrast with community-based surveys and primary care studies, which frequently report a steep age-dependent gradient in diabetes prevalence among hypertensive cohorts (16,17). The observed risk equalization in our FKRTL dataset is primarily due to referral bias and the clinical phenotype of early-onset metabolic disease. Younger patients referred to advanced facilities often present with resistant hypertension, early-onset metabolic syndrome, or rapid target organ damage (18,19). Recent global literature highlights a concerning epidemiological shift where sedentary lifestyles, ultra-processed diets, and

escalating obesity rates accelerate the onset of dual hypertension-diabetes diagnoses in adults under the age of 60(20–22). Consequently, younger individuals reaching tertiary care already exhibit advanced metabolic dysregulation that mirrors the profile of older patients.

The lack of age disparity in our findings underscores the aggressive nature of the shared pathophysiological mechanisms linking these two conditions. Hypertension and diabetes are not merely coincidental; they are tethered by a bidirectional physiological relationship involving chronic insulin resistance, systemic low-grade inflammation, and the hyperactivity of the renin-angiotensin-aldosterone system (RAAS) (23,24). In younger patients, hyperinsulinemia directly promotes sodium retention and sympathetic nervous system overactivity, rapidly precipitating elevated blood pressure even before a formal type 2 diabetes diagnosis is established (25,26). This synergistic vascular damage occurs irrespective of chronological aging, driven instead by the duration, intensity, and clustering of metabolic dysfunctions (27).

The clinical and systemic implications of these findings are substantial, particularly for the National Health Insurance (BPJS Kesehatan) framework. The traditional reliance on age-based risk stratification for endocrine screening may lead to massive underdiagnosis in the younger hypertensive population (28). Given that the double burden of disease translates to exponential increases in healthcare costs and cardiovascular mortality, our findings advocate for a clinical paradigm shift (29). Universal screening for fasting blood glucose and HbA1c should be mandated for all hypertensive patients entering the FKRTL system, regardless of their age. Early identification and aggressive, integrated management of both conditions in the non-elderly demographic are critical to averting premature macrovascular complications and optimizing national healthcare expenditures.

CONCLUSION

In conclusion, this study demonstrates that the prevalence of diabetes mellitus comorbidity among hypertensive patients referred to advanced healthcare facilities is evenly distributed across age groups, indicating that younger patients face a cardiometabolic burden as severe as that of the elderly. The primary limitation of this research is its reliance on secondary administrative claims data and a cross-sectional design, which restricts the ability to establish causal timelines or account for unrecorded clinical confounders such as body mass index, lifestyle factors, and exact disease duration. Therefore, it is strongly recommended that clinical guidelines shift toward universal, age-independent endocrine screening for all hypertensive referrals. Future research should prioritize prospective cohort designs that integrate electronic medical records to better track the longitudinal progression of these overlapping conditions.

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