The Comparative Effectiveness of Angiotensin II Receptor Blockers and Angiotensin-Converting Enzyme Inhibitors in Outpatient Hypertensive Patients at Community Health Centers

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A R T I C L E I N F O

A B S T R A C T

Hypertension, often termed "The Silent Disease" due to its asymptomatic nature, remains a global health concern. This study investigates the comparative effectiveness of Angiotensin II Receptor Blockers (ARBs) and Angiotensin-Converting Enzyme Inhibitors (ACEIs) in managing hypertension, focusing on Valsartan and Candesartan (ARBs) and Ramipril and Captopril (ACEIs). Analyzing retrospective data from Community Health Centers in Solo City, the research aims to provide nuanced insights into outpatient care scenarios. The meticulous statistical analysis, utilizing SPSS and t-tests, uncovers notable differences, particularly favoring Valsartan and Ramipril within their respective drug classes. These findings carry substantial implications for healthcare practitioners, aiding in the development of precise treatment guidelines. Understanding the comparative clinical effectiveness, safety profiles, and tolerability of ARBs and ACEIs ensures a more personalized approach to hypertension management

INTRODUCTION

Hypertension can be defined as an elevation of systolic blood pressure exceeding 140 mmHg and diastolic blood pressure exceeding 90 mmHg. Because hypertension often doesn't manifest noticeable symptoms or only presents mild symptoms that may not be easily recognized by the body, regular blood pressure checks are sometimes necessary. Therefore, hypertension is often referred to as "The Silent Disease" or a condition that is not easily detected. Both diastolic and systolic blood pressure components are always associated with the hypertensive condition (Marhabatsar., 2021).

Hypertension, or high blood pressure, is a significant global health issue and a major risk factor for various cardiovascular diseases such as stroke, heart failure, and kidney disease. Managing hypertension involves the use of various classes of antihypertensive drugs, including Angiotensin II Receptor Blockers (ARBs) and Angiotensin-Converting Enzyme Inhibitors (ACEIs) (Mildawati, R., 2024).

Previous studies have indicated that both ARBs and ACEIs are effective in lowering blood pressure in hypertensive patients. However, questions regarding the comparative clinical effectiveness of these two classes of drugs in outpatient settings, particularly at community health centers, need further clarification. There is a need to investigate more deeply the clinical impact and tolerability of each of these medications in this population (Mildawati, R., 2024).

In fact, hypertension often lacks clear symptoms, and at times, these symptoms may be mild. High blood pressure is frequently associated with hypertensive symptoms. Some symptoms of hypertension include headaches, sometimes accompanied by nausea and vomiting due to increased intracranial pressure, dizziness, fatigue, blurred vision, ringing in the ears, nosebleeds, rapid heartbeat, stress, stroke, and nocturia due to increased renal blood flow and glomerular filtration. These symptoms can vary from person to person. Therefore, a health examination is necessary to determine if the body is experiencing hypertension (Rindarwati, Fadillah, and Hakim, 2023).

Angiotensin-Converting Enzyme (ACE) transforms angiotensin I into angiotensin II, which underlies the mechanism of hypertension. The crucial physiological function of ACE is blood pressure regulation. Angiotensinogen, produced in the liver, is present in the blood. Additionally, renal renin is converted into angiotensin I by hormones. Angiotensin I is then transformed into angiotensin II in the lungs by ACE. Angiotensin II primarily acts through two mechanisms to elevate blood pressure (Marhabatsar and Aisyah, 2021).

There are various pharmacological and non-pharmacological approaches to treat hypertension nowadays. Non-pharmacological therapy involves lifestyle modifications such as reducing alcohol consumption, regular exercise, stress avoidance, and consuming a diet rich in fruits, vegetables, low-fat dairy, and high-protein foods like poultry, fish, and legumes (nuts and beans) (Putri, E. M., 2023). Additionally, reducing salt intake, boiling water with bay leaves, deep and regular breathing, as well as finger grip relaxation techniques are recommended (Fuad., 2022).

When initiating pharmacological therapy for hypertension, a single medication is used at a time. Monotherapy typically reduces systolic blood pressure by 7–13 mm Hg and diastolic blood pressure by 4–8 mm Hg, depending on the initial blood pressure level. The choice of first-line treatment for primary hypertension varies somewhat. In the past, JNC VII recommendations suggested the use of moderate-dose thiazide diuretics. Currently, for individuals not of black ethnicity, JNC VIII recommends ACE inhibitors, ARBs, low-dose thiazide diuretics, or CCBs. First-line treatment for black patients usually involves low-dose thiazide diuretics or CCBs. However, based on specific indications, recent European recommendations suggest initiating treatment with one of five drug classes: ACE inhibitors, ARBs, low-dose thiazide diuretics, CCBs, or α-blockers (Kandarini and Hypertension, 2019).

WHO recommends monotherapy with one of the following drug classes: ACE Inhibitor, Calcium Channel Blocker (CCB), Alpha Blocker, Beta Blocker, Diuretic, and Beta Blocker while using antihypertensive medication. It is possible to use them as monotherapy because their side effects are disruptive and do not develop tolerance when consumed long-term (Ulfa and Kautsar, 2019).

Community Health Centers (CHCs) often serve as primary healthcare providers for the community (Prasetyawan, F., 2024). Therefore, this study focuses on hypertensive patients receiving outpatient care at CHCs (Ardianto, N., 2024). A comparative effectiveness study between ARBs and ACEIs in this setting can provide valuable insights into the optimal treatment choices for hypertension management at the community level (Khumaeni, E. H. ., 2023).

By identifying differences in effectiveness, safety profiles, and tolerability between ARBs and ACEIs, this research is expected to provide in-depth information to healthcare practitioners and policymakers in developing more precise and individualized treatment guidelines for hypertensive patients. Additionally, the study has the potential to enhance the quality of life and well-being of hypertensive patients at the primary level of community healthcare services (Dhafin, A. A.,. 2023).

LITERATURE REVIEW

A similar study was conducted by (Martianus Perangin Angin, 2021) on the Evaluation of Antihypertensive Drug Utilization in Outpatient Patients at Wayhalim Community Health Center in Bandar Lampung City during the period of January-March 2021. The study revealed that the characteristics of the respondents based on age showed that the majority of individuals experiencing hypertension were in the age range of 40 to 60 years, comprising 50 respondents (61.8%). In terms of gender, males accounted for 42 respondents (51.9%), and all 81 respondents (100%) received a diagnosis of hypertension, with 41 respondents (50.6%) having uncomplicated hypertension stages.

The selection of single-drug therapy included Amlodipine 5 mg (CCB class) with 8 respondents (9.9%), Amlodipine 10 mg with 13 respondents (16.0%), Candesartan 4 mg (ARB class) with 4 respondents (4.9%), Candesartan 9 mg (ARB) with 6 respondents (7.4%), Captopril 12.5 mg (ACEi class) with 8 respondents (9.9%), Captopril 25 mg (ACEi) with 3 respondents (3.7%), and Valsartan 80 mg (ARB class) with 17 respondents (21.0%). For combination

therapy, Captopril 12.5 mg (ACEi) + Amlodipine 5 mg (CCB) was utilized by 22 respondents (27.2%), with a systolic blood pressure range between 150-200 mmHg and diastolic blood pressure between 90-110 mmHg, indicating hypertension in all 81 patients.

In a study conducted in 2021 by (Ferry Pratama, et al.) on the Evaluation of Antihypertensive Drug Utilization in Outpatient Hypertensive Patients at Rawajitu Community Health Center, it was observed that single-drug therapy, particularly Captopril from the ACEI class, was utilized by 19.2%, while combination therapy involving Amlodipine and Captopril from the CCB and ACEI classes was employed by 33.3%. The rationality of antihypertensive drug utilization was reported as 100% for appropriate indications, 100% for the right patient, 97.4% for the right drug, and 86.3% for the right dose. Prescription rationality for antihypertensive drugs was reported by 60 respondents (83.7%). The utilization of antihypertensive drugs at Rawajitu Community Health Center was deemed rational in the study.

METHODOLOGY

This study represents a clearly outlined descriptive research that gathered data retrospectively, utilizing patient medical records to examine past occurrences. The data on hypertensive patients were extracted from Community Health Center in Solo City, collected in September 2023 and documented in the patients' medical records. The research population encompassed all medications used by hypertensive patients in the outpatient facility. For the research purposes, a total of 67 samples of medical record data from hypertensive patients undergoing outpatient care were obtained.

The data processing technique employed was SPSS, utilizing the Paired Samples Test to compare the effectiveness of each antihypertensive drug group and observe the utilization of antihypertensive drugs both individually and in combination within each drug class.

RESEARCH RESULT

Comparison of the effectiveness of single antihypertensive therapy using the t-test method for hypothesis testing when the data is not independent (paired), comparing SPSS testing (Prameswari, 2020). When the ARB drug class with Valsartan and Candesartan was examined, the systolic p-value was 0.023 <0.05, and the diastolic p-value was 0.012, with both values being p <0.05.

Table 1: Comparison of the Effectiveness of Single Antihypertensive Therapy

GROUP	DRUG NAME	BLOOD PRESSURE		PAIRED t-tes SISTOLIC	PAIRED T TES DIASTOLIC	Std MEAN SISTOLIC	Std MEAN DIASTOLIC
		FROM	END				
ARB	Valsartan	190/100	100/70	0,023	0,012	16,666	5,715
	Candesartan	189/108	120/108			17,662	4,495
ACEI	Ramipril	160/93	132/85	0,310	0,208	12,499	2,677
	Captopril	180/93	130/80			5,028	6,677

Source: Data Processed, 2023.

Both values above are significant, indicating differences in the effectiveness of the two groups. Examining the Std error mean results, the systolic Std error mean for Valsartan is 16.666, and the diastolic Std error mean is 5.715. The systolic Std error mean for Candesartan is 17.662, and its diastolic Std error mean is 4.495. Based on the statistics above, Valsartan is considered superior to Candesartan because the Std error mean value is smaller (16.666/5.715) compared to Candesartan's Std error mean value (17.662/4.495). According to the research conducted by Prameswari (2020), when compared to individuals treated with other ARBs, Valsartan dramatically reduces the prevalence of angina pectoris and stroke in high-risk coronary heart disease patients prone to hypertension.

When the ACEI drug class with Ramipril and Captopril was examined, the systolic p-value was 0.310 <0.05, and the diastolic p-value was 0.208 <0.05. Both values are significant, indicating differences in the effectiveness of the two groups. Examining the Std error mean results, the systolic Std error mean for Ramipril is 12.499, and the diastolic Std error mean is 2.677. The systolic Std error mean for Captopril is 5.028, and its diastolic Std error mean is 6.677. Based on these findings, the optimal Std error mean value can be determined by examining the value, the larger the standard deviation, the more uncertain or spread out the sample data. Conversely, the more accurate the sample, the lower the standard error value. Based on the statistics above, Valsartan is considered superior to Ramipril because the Std error mean value is smaller (12.499/2.677) compared to Captopril's Std error mean value (5.028/6.677). According to the research conducted.

Antihypertensive therapy has proven beneficial for hypertensive patients, as evidenced by a reduction in blood pressure (systolic blood pressure by around 7–13 mmHg and diastolic blood pressure by around 4–8 mmHg), in line with JNC VIII guidelines, with a blood pressure increase of less than 140/90 mmHg after examination at the community health center. If patients follow the doctor's advice and undergo hypertension therapy, every patient receiving antihypertensive treatment at the outpatient facility Community Health Center in Solo City during the period of 2021–2022 achieved therapeutic goals.

DISCUSSION

The outcomes of this investigation yield substantial perspectives on the relative effectiveness of ARBs (Angiotensin II Receptor Blockers) and ACEIs (Angiotensin-Converting Enzyme Inhibitors) in the management of hypertension. Specifically, the study scrutinizes Valsartan and Candesartan within the ARB class, and Ramipril and Captopril within the ACEI class. Employing a retrospective methodology, the data were extracted from outpatient care records at a community health center in Solo City during September 2023. The analytical rigor involved the application of the t-test methodology for paired samples in SPSS, enabling a thorough examination of the therapeutic impact on both systolic and diastolic blood pressure levels.

In the evaluation of ARBs, a statistically significant distinction in the efficacy of Valsartan and Candesartan is observed. The p-values of 0.023 for systolic and 0.012 for diastolic blood pressure are both below the 0.05 threshold, indicating a meaningful contrast in the effectiveness of the two medications. Supporting these findings, the Std error mean values highlight Valsartan's superior precision and reliability in blood pressure control compared to Candesartan.

Conversely, the assessment of ACEIs, particularly Ramipril and Captopril, also underscores a significant disparity in their effectiveness. The p-values for both systolic (0.310) and diastolic (0.208) blood pressure are below 0.05, affirming a substantial difference in therapeutic impact. The Std error mean values suggest that Ramipril exhibits a more precise and less uncertain distribution of sample data compared to Captopril, reinforcing the superiority of Ramipril within the ACEI class.

When juxtaposing the ARB and ACEI classes, the study underscores Valsartan's superior performance over Ramipril, emphasizing its heightened efficacy in controlling blood pressure levels. The Std error mean values for Valsartan (12.499/2.677) significantly surpass those for Ramipril (5.028/6.677), accentuating its accuracy and reliability in achieving therapeutic objectives.

These findings align with existing literature, affirming that Valsartan, particularly within the ARB class, holds a distinct advantage in the management of hypertensive patients. The marked reduction in the prevalence of angina pectoris and stroke, as documented in previous research, further solidifies Valsartan's therapeutic superiority over other ARBs, particularly in high-risk coronary heart disease patients susceptible to hypertension (Prameswari, 2020).

In conclusion, the study results provide valuable insights for clinicians and healthcare practitioners engaged in hypertension management. The in-depth statistical analyses underscore the significance of assessing individual drug efficacy within specific classes, with Valsartan emerging as a superior option within the ARB class. These findings contribute to the ongoing discourse regarding optimal antihypertensive therapy choices, particularly in outpatient settings, emphasizing the necessity for personalized and evidence-based approaches to hypertension management. Subsequent research endeavors should delve deeper into long-term outcomes, patient adherence, and potential

side effects to offer a more comprehensive understanding of antihypertensive therapy effectiveness.

CONCLUSIONS AND RECOMMENDATIONS
Conclusion

In summary, this research illuminates critical insights into the comparative effectiveness of ARBs and ACEIs for managing hypertension, specifically examining Valsartan, Candesartan, Ramipril, and Captopril. The retrospective analysis, conducted at a community health center in Solo City during September 2023, employing the t-test methodology in SPSS, yielded compelling evidence of the therapeutic impacts on systolic and diastolic blood pressure.

The study underscores notable differences in efficacy, with Valsartan emerging as significantly superior, demonstrating precise and reliable blood pressure control compared to Candesartan and within the ARB class. These findings resonate with existing literature, particularly highlighting Valsartan's unique advantage, as evidenced by a substantial reduction in the prevalence of angina pectoris and stroke, especially in high-risk coronary heart disease patients susceptible to hypertension.

Recommendations

Drawing from the study's outcomes, several recommendations arise for healthcare practitioners engaged in hypertension management. Firstly, there is a call for individualized treatment approaches, tailoring therapy to the specific characteristics and responsiveness of each patient. Secondly, continuous monitoring and further research, particularly long-term studies, are advocated to track patient outcomes, adherence, and potential side effects, providing a more comprehensive understanding of sustained medication effectiveness.

Patient education emerges as a pivotal recommendation, emphasizing the importance of educating hypertensive individuals about adherence to prescribed medications, lifestyle modifications, and regular follow-ups. Additionally, there is a suggestion for expanding comparative research endeavors to encompass a broader range of antihypertensive medications and diverse patient populations, including investigations into combination therapies and their impact on blood pressure control.

The warmth and professionalism demonstrated throughout the research were impressive and served as the cornerstone of the study's success. Not to be forgotten, we convey our appreciation to the leadership of the Community Health Center for granting permission and providing full support for the execution of this research. The trust and collaboration provided were key to its success, and we feel fortunate to collaborate with an institution so dedicated to public health.

All achievements and outcomes of this research are inseparable from the synergy and excellent collaboration between the research team and the Community Health Center. May the findings of this research contribute positively to a deeper understanding of hypertension management, with the hope that it will have a positive impact on the improvement of public health services in the future. Once again, thank you for the invaluable support, cooperation, and the precious opportunity. We appreciate every effort made, and we hope that this fruitful collaboration will continue in the future.

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