An Idea Health Journal
ISSN (Online) 2797-0604
Volume 5, Issue 03, 2025

Evectiveness of the DASH Diet for Controling Stage 1-2 Hypertension in Developing Countries : A Scoping Review

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ARTICLE INFO

Article History:
Received :10-01-2026
Revised :20-02-2026
Accepted :20-03-2026

Keywords :
Developing Country, DASS Diet, Hypertension.

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ABSTRACT

Introduction: Hypertension remains a significant public health concern and is a leading risk factor for cardiovascular morbidity and mortality, especially in developing countries where uncontrolled blood pressure rates are elevated. Non-pharmacological interventions, such as dietary modification, are increasingly recognized as cost-effective strategies for hypertension management. Objective: This scoping review aims to map and synthesize the evidence on the role of dietary modification in hypertension management and control. The Dietary Approaches to Stop Hypertension (DASH) diet has shown substantial blood pressure–lowering effects in high-income countries; however, its effectiveness, feasibility, and implementation in developing countries have not been comprehensively reviewed. The objective of this scoping review is to identify, synthesize, and describe the available evidence on the effectiveness of the DASH diet in controlling stage 1–2 hypertension in developing countries. Methods: The review was conducted following the Joanna Briggs Institute (JBI) methodology and reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews (PRISMA-ScR). A scoping literature search was undertaken across multiple electronic databases, including PubMed, Scopus, Web of Science, and Google Scholar. Studies assessing the DASH diet in relation to blood pressure outcomes, dietary adherence, or cardiometabolic indicators were included. Data were charted and synthesized descriptively based on study characteristics, populations, and key outcomes. Results: Adherence to the DASH diet was consistently linked to clinically significant reductions in systolic and diastolic blood pressure among individuals with stage 1–2 hypertension. Several studies also documented improved dietary adherence through community-based and culturally adapted interventions, particularly in low-resource settings. Positive effects on metabolic outcomes, including markers of obesity, metabolic syndrome, and inflammation, were observed across diverse population groups. Conclusion: The findings underscore the importance of dietary adherence, cultural adaptation, and community-based implementation to optimize effectiveness. These results support integrating the DASH dietary pattern into public health strategies and primary care services in resource-limited settings. Future research should prioritize long-term outcomes, culturally adapted DASH models, and large-scale implementation studies to enhance the evidence base and inform policy development.

INTRODUCTION

Hypertension is a cardiovascular condition characterized by a persistent increase in systemic arterial blood pressure. Globally, an estimated 1.4 billion adults aged 30–79 years are affected, representing approximately 33% of the total adult population in this age group (1). Of those with hypertension, about 44% (600 million people) are unaware they have the condition, and another 44% (630 million people) have been diagnosed and are receiving treatment. Nearly two-thirds of adults with hypertension live in low- and middle-income countries. The number of individuals with uncontrolled hypertension is projected to rise by 25% between 2010 and 2025. (2)

Large-scale epidemiological studies underscore the significant burden of hypertension. For example, a 20-year study of 937,249 adults at the Clinical Center of the University of Debrecen in Hungary reported an overall prevalence of 32.2%, with higher rates in men (33%) than in women (29.9%). (3) The prevalence of hypertension increases with age, reaching its highest levels around 80 years in both sexes. In South Korea, 28.0% of adults aged 20 years and older were affected by hypertension in 2021, representing approximately 12.3 million individuals, including 5.3 million (43.5%) aged 65 years and above. (4)

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In order to better understand its clinical implications, hypertension is classified based on blood pressure levels into Stage 1 (systolic blood pressure [SBP] 140–159 mmHg and diastolic blood pressure [DBP] 90–99 mmHg), Stage 2 (SBP 160–179 mmHg and DBP 100–109 mmHg), and Stage 3 (SBP ≥180 mmHg and DBP ≥110 mmHg).(5) This condition is a major risk factor for cardiovascular diseases, including coronary heart disease, stroke, and heart failure, and is associated with increased mortality. In addition, emerging evidence suggests that individuals with hypertension are more likely to experience psychological issues such as stress, emotional distress, and depression. (6,7)

Given the high global prevalence and substantial proportion of uncontrolled cases described above, particularly in resource-limited settings, effective and accessible management strategies are urgently needed. Among the options available, non-pharmacological interventions, especially dietary approaches such as the Dietary Approaches to Stop Hypertension (DASH) diet, have shown promise for reducing blood pressure. (8,9)

A scoping review is appropriate for this study because the existing evidence on dietary interventions for hypertension is heterogeneous, with variations in study design, population characteristics, and outcome measures. This approach allows for a comprehensive mapping of the available literature and identification of key research gaps. Therefore, this study aims to evaluate and synthesize evidence on the effectiveness of the DASH diet in controlling Stage 1 and Stage 2 hypertension. (10,11)

METHODS

This scoping review followed Joanna Briggs Institute (JBI) guidance and adhered to PRISMA-ScR for transparency and reproducibility. The review was guided by the question: What is the evidence on the effectiveness of the DASH diet in controlling hypertension? The PCC framework structured the review: adults (≥18) with Stage 1–2 hypertension as the population, the DASH diet as the concept, and clinical or community settings, especially in low- and middle-income countries, as the context. Studies were included if they involved adult hypertensive populations, examined the DASH diet or similar interventions, reported blood pressure outcomes, and were published in peer-reviewed English-language journals. Studies focusing on secondary hypertension, pediatric populations, non-dietary interventions, or lacking full text were excluded. A comprehensive search was conducted in PubMed, Scopus, and ScienceDirect for articles published from 2010 to 2025, using terms such as ("hypertension" OR "high blood pressure") AND ("DASH diet" OR "dietary approaches to stop hypertension") AND ("blood pressure control" OR "management"). All records were imported into a reference manager, duplicates removed, and screening conducted in two stages (title/abstract and full-text) by two independent reviewers, with disagreements settled by discussion or a third reviewer. Data were extracted using a standardized charting form including study characteristics, population details, intervention components, duration, and key blood pressure outcomes. Findings were synthesized descriptively and grouped by study characteristics and outcomes. In line with JBI guidance, no critical appraisal was performed, as the aim was to map the breadth of the evidence rather than assess study quality. The study selection process is shown in a PRISMA-ScR flow diagram (Figure 1), detailing records identified, screened, excluded, and included, with reasons for exclusion at the full-text stage.

RESULT AND DISCUSSION

RESULT

The Arksey and O'Malley framework outlines five essential stages for conducting a scoping review. First, identifying the research question involved refining the central inquiry into the effectiveness of the Dietary Approaches to Stop Hypertension (DASH) diet in managing Stage 1–2 hypertension in developing countries. Second, relevant studies are identified through a structured, iterative search across international databases and other sources to ensure comprehensive evidence coverage. Third, selecting the studies, which included two independent screening phases (title–abstract and full-text screening) using predefined inclusion and exclusion criteria to ensure methodological rigor and reduce selection bias. Fourth, charting the data involves systematically extracting key information from each study, including study design, population characteristics, intervention details, outcome measurements, and principal findings. Finally, fifth, collating, summarizing, and reporting the results, undertaken through descriptive and thematic synthesis to map patterns, highlight emerging insights, and identify gaps requiring further investigation.

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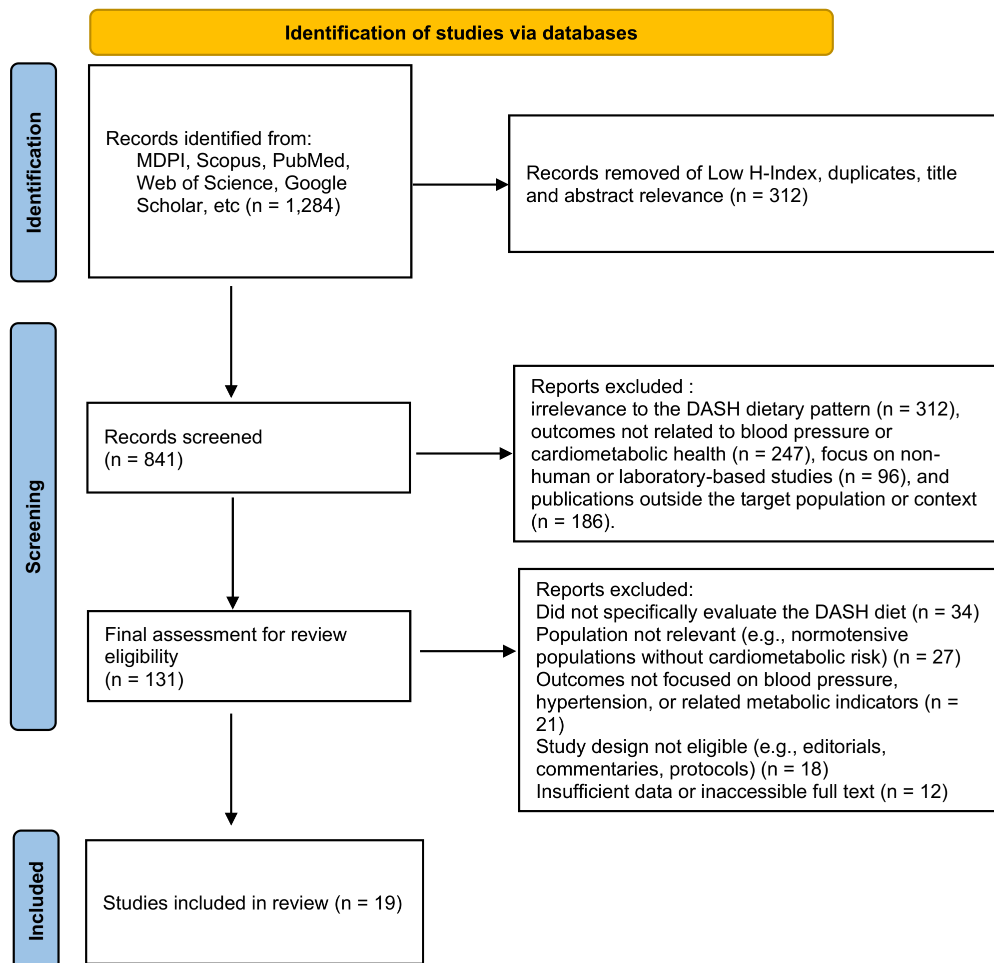

Figure 1. PRISMA Flow Chart

Overview of Included Studies

Nineteen relevant studies published between 2015 and 2025 met the inclusion criteria for this scoping review and are summarized in Table 1. The evidence base includes randomized controlled trials, quasi-experimental studies, cross-sectional and case–control studies, and systematic reviews and meta-analyses. These studies were conducted in both high-income and low- and middle-income countries, with many situated in contexts that share structural, cultural, and economic features with developing nations. Collectively, the studies offer a comprehensive overview of the clinical effectiveness of the DASH diet, adherence patterns, community-based implementation strategies, and metabolic effects across diverse population groups.

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Table 1. Summary of Included Studies in the Scoping Review

No	Author (Year)	Country/Region	Study Design	Population/Sample	Focus of Study	Key Findings Relevant to DASH
1	Baker et al. (2016)[12]	United States (Rural African American communities)	Community-based intervention	African American adults	Adaptation of modified DASH diet in low-resource rural settings	Modified DASH diet was culturally acceptable and led to significant improvements in blood pressure and diet quality when adapted to local food availability.
2	Dai et al. (2022)[13]	China (ethnic minority regions)	Cross-sectional	Adults in less-developed regions	DASH and Mediterranean diets and blood pressure	Higher adherence to DASH was associated with lower systolic and diastolic blood pressure across underserved populations.
3	Filippou et al. (2020)[14]	Multiple countries	Systematic review & meta-analysis of RCTs	Adults with and without hypertension	DASH diet and blood pressure reduction	DASH diet significantly reduced systolic and diastolic blood pressure, with stronger effects among hypertensive individuals.
4	Guo et al. (2021)[15]	Global	Systematic review & meta-analysis	Adults with elevated BP or hypertension	Modified DASH diet	Modified DASH interventions demonstrated clinically meaningful reductions in blood pressure compared with control diets.
5	Navarro-Prado et al. (2020)[16]	Spain	Cross-sectional	University students	DASH adherence and anthropometric indicators	Higher DASH adherence was associated with lower blood pressure, waist circumference, and visceral fat.
6	Steinberg et al. (2020)[17]	United States	Randomized controlled feasibility trial	Women with high blood pressure	Digital DASH-based dietary intervention	Digital health intervention improved diet quality and DASH adherence, indicating feasibility for scalable implementation.
7	Ojangba et al. (2023)[18]	Global	Narrative review	Adults with hypertension	Lifestyle reform and DASH adherence	DASH diet adherence consistently contributed to improved hypertension control when combined with lifestyle modification.
8	Theodoridis et al. (2023)[19]	Global	Systematic review & meta-analysis	Adults	Level of DASH adherence and BP	Dose–response relationship observed; higher adherence to DASH resulted in greater blood pressure reductions.

9	Quan et al. (2024)[20]	Global	Systematic review & dose-response meta-analysis	Adults	DASH adherence and diabetes risk	Greater adherence to DASH diet was associated with a significantly reduced risk of type 2 diabetes mellitus.
10	White et al. (2024)[21]	United States	Integrative review	Low-income African Americans	Economic and cultural feasibility of DASH	Economic and cultural barriers affected adherence; localized and low-cost adaptations improved feasibility.
11	Gedefa et al. (2025)[22]	Ethiopia	Cross-sectional	Hypertensive patients in public hospitals	DASH adherence and associated factors	Low-to-moderate adherence to DASH; education level and nutrition counseling were key determinants.
12	Isnaini et al. (2025)[23]	Global	Systematic review & meta-analysis	Hypertensive adults	DASH dietary practices and BP outcomes	DASH diet significantly reduced systolic and diastolic blood pressure across diverse populations.
13	Rasaei et al. (2025)[24]	Iran	Triple-blind RCT	Overweight and obese children	DASH diet and BP biomarkers	DASH intervention significantly improved blood pressure indices and urinary metabolic profiles.
14	Liu et al. (2025)[25]	United States	Cross-sectional	US adults	DASH adherence and metabolic syndrome	Higher DASH adherence was inversely associated with metabolic syndrome prevalence.
15	Valenzuela-Fuenzalida et al. (2024)[26]	Global	Systematic review & meta-analysis	Adults with metabolic syndrome	DASH vs other dietary modalities	DASH diet showed superior or comparable effectiveness in improving cardiometabolic outcomes.
16	Singh et al. (2023)[27]	Global (Black communities)	Systematic review	Adults with CVD, diabetes, hypertension	Community-based culturally tailored education	Culturally tailored, community-based education programs improved dietary behaviors and hypertension management, supporting adaptable DASH implementation in minority populations.
17	Zavira et al. (2025)[28]	Indonesia	Quasi-experimental	Hypertension patients	DASH diet education and adherence	DASH-based nutrition education significantly improved dietary compliance and blood pressure control, highlighting feasibility in Indonesian healthcare settings.

18	Heidari et al. (2024)[29]	Iran	Cross-sectional	Overweight and obese adolescents	DASH adherence and metabolic health	Higher adherence to DASH was associated with better metabolic health profiles among adolescents, extending evidence beyond adult populations.
19	Behrooz et al. (2025)[30]	Iran	Case–control	Obese adolescents	DASH adherence, metabolic syndrome, and inflammation	Greater adherence to DASH was associated with lower prevalence of metabolic syndrome and reduced inflammatory biomarkers, providing mechanistic insights into cardiometabolic protection.

Consistent findings across the reviewed literature indicate that adherence to the DASH diet is associated with significant reductions in both systolic and diastolic blood pressure among individuals with elevated blood pressure or hypertension. Intervention studies and meta-analyses have reported average reductions in systolic blood pressure ranging from moderate to clinically meaningful levels, accompanied by parallel decreases in diastolic blood pressure. (19,31) These effects have been observed in both hypertensive and non-hypertensive populations, as well as across various age groups and baseline cardiovascular risk profiles, as reported (32,33). Studies conducted in less developed or minority regions found that the blood pressure–lowering benefits of the DASH diet persist despite variations in habitual dietary patterns, socioeconomic status, and food availability.

In addition to clinical blood pressure outcomes, several studies identified adherence and implementation as central factors influencing the effectiveness of the DASH diet. Community-based and culturally tailored interventions have been shown to improve dietary compliance, particularly among underserved and minority populations, as demonstrated by (34,35). Educational approaches delivered through healthcare facilities or community settings have also produced positive effects on DASH adherence and lifestyle modification, including in low- and middle-income contexts such as Ethiopia and Indonesia. 36,37 These findings indicate that adapting DASH principles to incorporate locally available foods and culturally relevant education strategies is critical for facilitating sustained dietary behavior change.

Furthermore, the evidence base extends to metabolic outcomes and specific populations. Studies *(*38,39*)* involving adolescents with overweight or obesity found that greater adherence to the DASH dietary pattern was associated with more favorable metabolic health profiles, including a lower prevalence of metabolic syndrome and improved cardiometabolic indicators. Research incorporating inflammatory and metabolic biomarkers further supports the potential mechanistic pathways through which the DASH diet confers cardiovascular and metabolic benefits. *(*30,40*)*

DISCUSSION

The Effectiveness of the DASH Diet on Hypertension Control in Developing Countries

The evidence reviewed demonstrates that the DASH diet exerts a consistent and clinically significant effect on controlling Stage 1–2 hypertension in developing countries, as multiple studies report reductions in both systolic and diastolic blood pressure. Nevertheless, these results warrant cautious interpretation, since dietary interventions are best regarded as adjuncts rather than substitutes for pharmacological therapies. The studies included in this review exhibit substantial heterogeneity in design, participant characteristics, intervention duration, and adherence, which may limit the generalizability of the findings. Potential sources of bias, such as small sample sizes and reliance on self-reported data, must also be considered. Theoretically, the effectiveness of the DASH diet can be understood through the Health Belief Model, which emphasizes the influence of individual perceptions on behavior change, and the socio-ecological model, which underscores the impact of social, environmental, and economic factors. In developing countries, barriers such as restricted access to healthy foods and prevailing cultural dietary practices may impede adherence. In summary, while the DASH diet represents a promising non-pharmacological approach, its implementation should be tailored to contextual and systemic factors to maximize its effectiveness in hypertension control.(41,42)

The benefits of the DASH diet extend beyond blood pressure reduction to include improvements in cardiometabolic parameters, such as lipid profiles and glycemic control, which are particularly relevant given the prevalence of comorbidities in developing countries.(31,43) The consistency of findings across studies conducted in both developing and developed countries suggests that the effectiveness of the DASH diet is broadly applicable. However, the success of its implementation is heavily influenced by local socioeconomic and cultural factors.

Adherence emerged as the most important determinant of the DASH Diet's effectiveness. Studies with high adherence showed greater and more consistent reductions in blood pressure than those with low adherence. Factors that hinder compliance in developing countries include relatively high prices for healthy foods, traditional food preferences that tend to be high in salt, lack of nutritional literacy, and insufficient environmental support from families, communities, and health workers. In addition, limited access to fresh fruits, vegetables, and low-fat protein sources is often a practical obstacle. (45,46) Therefore, the adaptation of the DASH Diet should be undertaken with a local, food-based approach. For example, replacing expensive protein sources such as salmon with freshwater fish, or replacing imported fruit with seasonal local fruit. Nutrition cadre-based community approaches, school-

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based interventions, and health center involvement can also improve the consistency of behavior change and the long-term sustainability of compliance.

The mechanistic analysis reinforces the empirical findings about the role of the DASH Diet in lowering blood pressure. The high content of potassium, magnesium, calcium, fiber, and antioxidants in this diet contributes to decreased vascular resistance, improved endothelial function, and reduced oxidative stress. The restriction of sodium, a core component of DASH, directly reduces intravascular volume, thereby lowering blood pressure physiologically. (47) This effect is particularly relevant in developing countries that have a high prevalence of abdominal obesity, metabolic syndrome, and excessive sodium consumption due to the dominance of cheap processed foods and the habit of excessive salt use in cooking. Thus, the biological mechanisms of DASH are well-suited to the metabolic risk profile of societies in developing countries.(25,30) However, the results of this review also highlight that most existing studies focus solely on blood pressure and have not adequately evaluated long-term effects on cardiovascular complications, quality of life, or clinical outcomes.

Research Gaps and Implications for Future Intervention Development

The findings of this review carry significant implications for public health, particularly for hypertension control, which remains one of the leading causes of morbidity and mortality in developing countries. The demonstrated effectiveness of the DASH diet indicates that structured dietary interventions can be an essential component of national strategies to prevent and control non-communicable diseases (NCDs). (48,49) Widespread implementation of DASH may reduce reliance on pharmacological therapies, strengthen promotive and preventive programs within primary healthcare facilities, and support progress toward global health targets articulated in various international initiatives.(42,43) Improvements in clinical outcomes provide a strong foundation for community-based interventions, large-scale nutrition education, and the engagement of schools and workplaces in healthy dietary campaigns. More broadly, these findings underscore the need for food policy reforms, including promoting low-cost, nutritious foods, incentivizing local fruit and vegetable production, and strengthening regulation to reduce salt consumption in processed foods.

While the evidence is strong, some research gaps remain that need to be addressed to strengthen the scientific basis for applying the DASH Diet in developing countries. First, the number of long-term randomized controlled clinical trials (RCTs) remains limited, especially those evaluating the effectiveness of DASH over six or twelve months. Second, research is still concentrated in a few regions, while Southeast Asia, Sub-Saharan Africa, and the Pacific regions have distinct eating culture characteristics and environmental challenges that require specialized adaptations. Third, there have been few studies that have explored the DASH implementation model integrated with public health programs such as Posyandu, health centers, or national non-communicable disease control programs. Fourth, studies on local food-based DASH variations remain limited, even though local adaptation is crucial for this intervention to be acceptable and cost-effective for low-income groups.

Recommendations for Future Research

Based on the findings of this review, several directions for future research emerge. Subsequent investigations should prioritize long-term clinical trials to assess the effects of the DASH diet on complex clinical outcomes, such as cardiovascular events, quality of life, and national healthcare costs. Additionally, culturally adapted versions of the DASH diet should be empirically evaluated to determine their effectiveness, feasibility, and acceptability across different socioeconomic populations.(15,50) The development of community-based intervention models, the utilization of telehealth or digital diet-tracking applications, and the integration of DASH within existing government programs (such as Posbindu PTM or Puskesmas) represent promising areas for innovation.

Multicenter studies across diverse developing-country settings would provide more comprehensive perspectives and enhance the external validity of findings. Therefore, collaborative efforts across disciplines will be critical to deepening global understanding of the role of the DASH diet in hypertension control. Overall, these findings emphasize the need for a more comprehensive research approach that integrates nutrition interventions with behavioral, psychosocial, and household economic approaches. The use of digital technologies, such as diet-tracking applications or telehealth, can also increase compliance, but it is still rarely tested in the context of developing countries.

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CONCLUSION

This Scoping review shows that the DASH Diet is an effective nonpharmacological intervention to control grade 1–2 hypertension in populations in developing countries. The majority of studies reported significant reductions in systolic and diastolic blood pressure, along with additional metabolic benefits. The effectiveness of the DASH Diet is strongly influenced by adherence level, which in turn is determined by economic, cultural, and food availability factors. With local food-based adaptation and support for sustainable nutrition education, the DASH Diet has the potential to become a key strategy for the management of hypertension in low- and middle-income countries. Further research, especially long-term RCTs and community-based implementation studies, is needed to strengthen the scientific evidence and ensure the sustainability of this diet's application in public health practice.

ACKNOWLEDGEMENTS

Thanks to supported by the Institute for Higher Education Services (LLDIKTI) under the Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia.

AUTHOR’S CONTRIBUTION STATEMENT

RH conceptualized the study, formulated the research questions, developed the review protocol, conducted literature searches, screened articles according to criteria, extracted data, and drafted the manuscript. R developed the methodology, verified the selected articles, analyzed and synthesized data, prepared tables and figures, and reviewed and edited the manuscript. AS supervised the research, validated the methodology and results, critically reviewed the manuscript, provided guidance, and approved the final version.

CONFLICT OF INTEREST

No. conflict of interest to declare in study

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

No AI Tools

FUNDING

This research was funded by the Institute for Higher Education Services (LLDIKTI), Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia. The funder did not participate in the study design, data collection, analysis, data interpretation, or manuscript preparation.

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