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DETERMINANTS OF MEDICATION ADHERENCE IN THE CONTROL OF GRADE I HYPERTENSION

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ABSTRACT

Hypertension is a chronic disease that requires continuous treatment. Medication adherence is the key to successful blood pressure control and complication prevention. The high incidence of hypertension in the work area of the Baiturrahman Health Center, Banda Aceh City, is a challenge in hypertension control, especially related to patient compliance in undergoing treatment. However, the determinants that play a role in shaping medication adherence in patients with type I hypertension have not been comprehensively identified. This study aims to analyze determinants related to medication adherence in patients with type I hypertension in the working area of the Baiturrahman Health Center. This study uses a quantitative method with a cross-sectional design on 300 respondents selected by accidental sampling. Data were collected through interviews using questionnaires using ARMS, HK-LS, MASES-R, IPQ-R, and MSPSS questionnaires. Data analysis used simple linear regression and multiple linear regression with the method (backward elimination). The results showed that the average drug adherence score based on the ARMS-12 instrument was 19.05 ± 3.66, with a score range of 13–29. Given that a higher ARMS-12 score indicates a greater level of non-compliance, these results indicate that respondents' medication adherence still needs to be improved. The results of the analysis using multiple linear showed that gender, occupation, length of hypertension, knowledge, disease perception, family support, and health worker support were significantly related to medication adherence ($p < 0.05$). Work was the most dominant factor in medication adherence ($\beta = 2.02$, 95% CI = 1.24–2.81, $p < 0.001$). The final model explained that all the variables studied only provided a 28.93% variation in medication adherence. The results showed that medication adherence in patients with type I hypertension was influenced by individual, cognitive, and social support characteristic factors. Work was the dominant factor.

Keywords: family support; health worker support; hypertension degree; knowledge; medication adherence

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INTRODUCTION

Hypertension, often dubbed the "silent killer," is a major risk factor for cardiovascular disease, stroke, and kidney failure (Wulandari et al., 2023). In Indonesia, although the prevalence of hypertension based on blood pressure measurements showed a decrease from 34.1% in 2018 to 30.8% in 2023, the figure is still relatively high and is one of the main causes of premature death (Dinkes Banda Aceh, 2023). The control of grade I hypertension is highly dependent on patient adherence to taking antihypertensive drugs regularly. However, the rate of non-compliance with antihypertensive therapy is still high and is a major factor in the failure of blood pressure control, which has an impact on increased complications, decreased quality of life, and wasteful health costs (Claros, 2023). In Indonesia, the number of people with type I hypertension continues to increase over time. Based on the results of the Indonesian Health Survey (SKI, 2023) The prevalence of hypertension in Indonesia shows a decrease compared to the results of the 2018 Riskesdas. In the population aged ≥18 years, the prevalence of hypertension based on blood pressure measurement results decreased from 34.1% in 2018 to 30.8% in 2023. Based on regional distribution, the lowest

prevalence of hypertension was found in the provinces of Aceh, Papua, and North Maluku. Despite the decrease in prevalence nationally, there is still a gap between the condition of hypertension detected through blood pressure measurement and public knowledge about the status of hypertension. This can be seen from the difference of about 20% between the prevalence of hypertension based on a doctor's diagnosis, which is 5.9%, and the results of blood pressure measurement of 26% in the population group aged 18–59 years (SKI, 2023). One of the causes of the decline is also due to the change in hypertension measuring instruments. The change in blood pressure measuring instruments from mercury sphygmomanometers to oscillometric-based digital sphygmomanometers has the potential to affect the results of blood pressure measurements, so the standard aspects of procedures and instrument calibration are important in the interpretation of hypertension data.

Data from the Banda Aceh City Health Office shows that hypertension is still a public health problem, with a prevalence of 20.4% in 2021, increasing to 24.31% in 2022, then decreasing to 9.3% in 2023 and again recorded at 9.11% in 2024 (Dinkes Banda Aceh, 2021, Dinkes Banda Aceh, 2022, Dinkes Banda Aceh, 2023, Dinkes banda Aceh, 2024). Despite fluctuations, these figures show that hypertension still requires continuous attention and control through primary health services. At the primary service level, Puskesmas as the spearhead of the health system has a strategic role in controlling hypertension. The Chronic Disease Management Program (PROLANIS) and the Integrated Development Post (POSBINDU) are the government's efforts to bring health services closer to the community, including in blood pressure monitoring and medical education. However, the effectiveness of these programs is highly dependent on the active involvement of patients in maintaining medication adherence and living a healthy lifestyle. Evaluative studies on PROLANIS show that there are still challenges in maintaining the involvement of participants to remain active and routinely participating in activities, including in terms of medication adherence (Salamah et al., 2023). This confirms that compliance is not just a matter of access to medicine, but also concerns patient behavior and motivation.

Medication adherence is related to a variety of factors. The PRECEDE-PROCEED model developed by Green and Kreuter explains that health behaviors are influenced by predisposing factors, probabilities, and reinforcing factors (Dr. Irwan. S.Km, 2017). In this study, predisposing factors include knowledge, self-efficacy, and disease perception, while boosting factors include the support of family, friends, and health workers. Although these factors have been extensively researched, the relationship between various cognitive, psychological, and social aspects simultaneously in the context of certain health center services still needs to be studied, especially in the working area of the Baiturrahman Health Center. Research (Andala et al., 2024) in Aceh it was found that only 28.5% of respondents had high adherence to antihypertensive drugs. Knowledge of dosage, benefits of a low-fat and sodium diet, and the impact of alcohol consumption were related to the level of adherence ($p < 0.01$).

Predisposing factors include knowledge, attitudes, beliefs, values, perceptions, and self-efficacy that shape the patient's understanding and belief in undergoing treatment. In people with hypertension, understanding of the disease, risk of complications, therapeutic benefits, and the ability to manage medication are important aspects in maintaining adherence to taking medication. Possible factors include the availability of resources, access to health services, costs, and distance of health facilities. Although access to services in the working area of the Baiturrahman Health Center is supported by the existence of Posbindu in each village, limited control time and transportation costs, especially for patients who work, still have the potential to be an obstacle in undergoing treatment routinely (Pakpahan et al., 2021). The reinforcing factor comes from the social environment that plays a role in maintaining health behaviors, especially the support of family, friends, and health workers. This support is manifested through medication reminders, medication assistance, motivation, education, and counseling on an ongoing basis. Health worker support

through therapeutic communication and counseling also plays a role in increasing patient medication adherence (Jeida et al., 2025) Thus, these three factors need to be considered in an integrated manner in understanding the determinants of medication adherence in hypertensive patients.

The limited resources of primary health services, both health workers, facilities, and budgets, require the determination of intervention priorities based on the most dominant determinants. Identification of factors related to medication adherence is important so that the health center can develop a hypertension control strategy in a more directed, effective, and in accordance with the patient's needs. If work is the most dominant variable, for example, the intervention approach needs to consider the patient's work routine through adjusting treatment time and using medication reminders. Based on these problems, this study aims to simultaneously analyze the determinants of medication adherence in patients with type I hypertension in the working area of the Baiturrahman Health Center. The results of the study are expected to be a basis for consideration for the health center in determining service priorities and developing strategies to improve treatment adherence that are more targeted.

Based on an initial survey at 11 health centers in Banda Aceh City, the Baiturrahman Health Center recorded as many as 1,197 hypertension patients by 2025. This number shows the large burden of hypertension services in the work area of the Baiturrahman Health Center and the importance of optimizing disease control, especially in patients with type I hypertension. (Mulia et al., 2025) identify that the suboptimal use of Non-Communicable Disease (NCD) program services, limited health education, and service facilities and infrastructure are obstacles in controlling hypertension at the primary service level. These conditions have the potential to hinder patients' understanding of the disease and the importance of continuous treatment. Therefore, the identification of the determinants of medication adherence is important as the basis for the development of a more targeted hypertension control strategy, taking into account the individual characteristics, knowledge, perception, and social support of the patient. This non-compliance not only increases the risk of complications and death, but also worsens the patient's quality of life and burdens the health service system economically (Jung et al., 2023). Based on the description of the phenomenon and research gaps above, medication adherence in patients with type I hypertension is crucial but still faces various challenges, especially related to individual factors and social support. Therefore, this study aims to analyze determinants related to medication adherence in the control of grade I hypertension in the working area of the Baiturrahman Health Center, Banda Aceh. This study will specifically examine the relationship between individual characteristics (age, gender, education, occupation, length of suffering, and blood pressure), knowledge, self-efficacy, disease perception, and support from family, friends, and health workers to the level of medication adherence.

METHOD

This study uses a quantitative approach with a cross-sectional design to assess the relationship between risk factors for taking medication. The study was carried out in the working area of the Baiturrahman Health Center, Banda Aceh City. Data collection was carried out from May 2 to 20, 2026. The research population consisted of all patients with degree I hypertension who were registered and received services in the working area of the Baiturrahman Health Center, with a total of 1,197 patients. Sampling was carried out using the accidental sampling method, which is a non-probability technique in which the respondents selected were those who were randomly and easily reached at the time of data collection. The sample size was determined using the Slovin formula with a margin of error of 5%, resulting in a total sample of 300 respondents. The inclusion criteria include patients with degree I hypertension who are registered in the work area of the Baiturrahman Health Center, are willing to participate as respondents, and provide written consent to participate in the research. The exclusion criteria include respondents who experience limitations that cause them to be unable to read or fill out research instruments independently.

This study used primary data collected through structured interviews with customized questionnaires. The research instrument consisted of a questionnaire of respondent characteristics and instruments to measure the study variables. Medication adherence was assessed using the Adherence to Refill and Medication Scale (ARMS) which consisted of 12 statements with a four-level Likert scale with a Cronbach's Alpha value of 0.814. In addition, this instrument showed a correlation of -0.651 with the Morisky Medication Adherence Scale, which indicates the relationship between the two instruments in measuring medication adherence (Fithri, 2021, Mufarrihah et al., 2017). Knowledge about hypertension was measured using the Hypertension Knowledge Level Scale (HK-LS) which consisted of 22 questions with a Cronbach's Alpha value of 0.758 and the results of the reliability test of the HKLS score in hypertensive patients using the spearman test produced a correlation analysis, obtained an r of 0.890 (Erkoc et al., 2012, Ernawati et al., 2020).

Self-efficacy was measured using the Medication Adherence Self-Efficacy Scale-Revised (MASES-R) with a Cronbach's Alpha value of 0.898 and this questionnaire had a Kaiser-Meyer-Olkin (KMO) value of 0.861 and a Bartlett's test value of $p<0.001$ (Ivana, 2020). Perception of disease was measured using a modified Illness Perception Questionnaire-Revised (IPQ-R), consisting of 9 questions with a Cronbach's Alpha value of 0.773 validity test with a corrected item-total correlation value ranging from 0.460–0.923, greater than the table r-value (0.444). These results showed that all items were able to measure the perception variables well (Khotimah, 2018). Family support and peer support were measured using the Multidimensional Scale of Perceived Social Support (MSPSS) which consisted of 15 positive statements and health worker support was measured using a modified Health Literacy Questionnaire (HLQ) with a Cronbach's Alpha value of 0.798. Then the validity test was tested with a value of 0.657-0.829, greater than the R value of the table (0.444). The results showed that all items were able to measure the research variables well (Khotimah, 2018). Medication adherence was categorized based on the total ARMS score, where lower scores indicated better levels of adherence. Knowledge, self-efficacy, disease perception, family support, peer support, and health worker support were presented in the form of total scores and analyzed as continuous variables. The data were analyzed using the StataMP-17 statistical software through univariate analysis, simple linear regression, and multiple linear regression. This research has received ethical approval from the Research Ethics Committee of the University of Muhammadiyah Aceh (UNMUHA) with approval number 29/EA/KEPL/Unmuha/IV/2026. All respondents have given consent after obtaining informed consent before data collection is carried out.

RESULT

Table 1.
Respondent characteristics (n= 300)

Respondent characteristics	F	%	Mean	Median	Min-Max
Age					
<20	6	2.0			
20-35	87	29.0	1.67	2	0-2
>35	207	69.0			
Gender					
Male	96	32.0	68	1	0-1
Women	204	68.0			
Final Education					
Elementary Education (Elementary Junior High)	42	14.0			
Secondary Education (High School EQUIVALENT)	174	58.0	1.14	1	0-2
Higher Education (D3-S3)	84	28.0			
Jobs					
Not Working	66	22.0	0.78	1	0-1
Work	234	78.0			

Respondent characteristics	F	%	Mean	Median	Min-Max
Long Suffering from Hypertension					
1 Year	113	37.6			
2 Years	49	16.3			
3 Years	53	17.6	2.53	2	1-5
4 Years	36	12.0			
5 Years	49	16.3			
Last Blood Pressure					
Systolic			149.7	148	38-210
Diastome			89.3	89	39-118
Respondent characteristics		SD	Mean	Median	Min-Max
Compliance		3.65	19.05	19	13-29
Knowledge		9.89	9.89	7	5-21
Self-Efficacy		6.25	26.78	26	17-52
Perception of Disease Severity		2.97	25.7	26	21-30
Family Support		16.47	16.4	16	12-20
Friend Support		2.20	16.01	16	11-20
Healthcare Worker Support		1.78	16.4	17	12-20

The results of the univariate analysis showed that most of the respondents were >35 years old (69.0%), female (68.0%), high school or equivalent (58.0%), and working (78.0%). Based on the length of time they had hypertension, the largest group had experienced hypertension for one year, namely 113 respondents (37.6%), followed by the three-year group of 53 respondents (17.6%). Table 1 presents descriptive statistics of the main variables of the study. The average drug adherence score was 19.05 ± 3.66 (median 19, range 13–29). The average knowledge score was 9.89 ± 4.67 (median 7, range 5–21). Meanwhile, the average self-efficacy score was 26.78 ± 6.26 (median 26, range 17–52), and the perception score of disease severity was 25.70 ± 2.98 (median 26, range 21–30). In the social support variable, the average support scores of family, friends, and health workers were 16.40 ± 1.83, 16.01 ± 2.20, and 16.40 ± 1.78, respectively.

Table 2.
Analysis of Determinants of Medication Compliance in Control Hypertension Degree I Using Simple Linear Regression

Variabel	b	95%CI	p-value
Age	-0.06	-0.09– -0.03	0.000*
Gender (Male)			
Women	1.92	1.05 – 2.78	0.000*
Final Education (Primary)			
Intermediate	0.03	-1.19–1.27	0.954
Height	0.89	-0.46–2.25	0.196
Occupation (Not Working)			
Work	2.24	1.27 – 3.21	0.000*
Long Suffering from Hypertension	-0.40	-0.68 – -0.13	0.004*
Last Blood Pressure (mmHg)			
Systolic	-0.01	-0.04 – 0.01	0.272
Diastome	-0.01	-0.05 – 0.02	0.445
Knowledge (Score)	-0.12	-0.21 – -0.03	0.006*
Self-Efficacy (Score)	-0.05	-0.12 – 0.00	0.077
Perception of Disease Severity (Score)	0.12	-0.01 – 0.26	0.078
Family Support (Score)	-0.56	-0.78 – -0.34	0.000*
Friend Support (Score)	-0.42	-0.61 – -0.24	0.000*
Health Worker Support (Score)	-0.54	-0.77 – -0.31	0.000*

Based on Table 2, the results of the statistical test showed that age, gender, occupation, length of suffering from hypertension, knowledge, family support, peer support, and health worker support were significantly related to the drug adherence score ($p < 0.05$).

Table 3.
Analysis of Determinants of Medication Compliance in Control Hypertension Grade I Using Multiple Linear Regression (p-value < 0.25)

Variabel	Model 1 Respondent Characteristics Analysis		Model 2 Independent Variable Analysis		Model 3 Final Model	
	β (95% CI)	p-value	β (95% CI)	p-value	b (95%CI)	p-value
Age	-0.05 (-0.08– -0.02)	0.000			-0.04 (-0.07– -0.01)	0.009
Gender (Male) Women	1.65 (0.82–2.49)	0.000			1.45 (0.68-2.21)	0.000
Final Education (Primary)	0.09 (-1.04–1.23)	0.868			-0.71(-1.84–0.40)	0.211
Intermediate	0.10 (-1.16–1.38)	0.867			-0.64 (-1.94–0.64)	0.325
Height						
Occupation (Not Working)	1.89 (0.94–2.85)	0.000			2.02 (1.24–2.81)	0,000
Work Long Suffering from Hypertension	-0.32 (-0.58– -0.06)	0.014			-0.33 (-0.57– -0.08)	0.008
Knowledge (Score)			-0.08 (-0.17–0.00)	0.058	-0.10 (-0.18– -0.02)	0.012
Self-Efficacy (Score)			-0.03 (-0.10–0.02)	0.264	-0.03 (-0.10– 0.03)	0.293
Perception of Disease Severity (Score)			0.10 (-0.02–0.24)	0.109	0.13 (0.008–0.26)	0.037
Family Support (Score)			-0.37 (-0.61– -0.14)	0.002	-0.27 (-0.49– -0.05)	0.016
Friend Support (Score)			-0.19 (-0.44–0.05)	0.118	-0.10 (-0.36–0.15)	0.436
Health Worker Support (Score)			-0.16 (-0.47–0.14)	0.291	-0.27 (-0.52– -0.01)	0.038
R-squared	0.172		0.139		0.289	

The results of multiple linear regression showed that in Model 1, which contained the characteristics of the respondents, the work had the largest coefficient (β = 1.89; 95% CI = 0.94–2.85; p < 0.001), with $R^2 = 0.172$. In Model 2, family support had the largest coefficient (β = -0.37; 95% CI needed to be verified; p = 0.002), with $R^2 = 0.139$. In Model 3, rework showed the largest coefficient (β = 2.02; 95% CI = 1.24–2.81; p < 0.001). Based on the table, age, gender, occupation, length of hypertension, knowledge, disease perception, family support, and health worker support had a significant relationship in the final model (p < 0.05). The final model explained 28.93% of the variation in compliance scores ($R^2 = 0.289$), while the remaining 71.07% were related to other factors not covered by the model.

DISCUSSION

This study showed that medication adherence to patients with grade I hypertension at the Baiturrahman Health Center was related to individual characteristic factors, cognitive factors, and social support. Work was the most dominant factor related to compliance. Respondents who did not work had an

ARMS score of 2.02 points higher (lower compliance) than those who worked. These findings are in line with the research (Mumpuni et al., 2023) which shows the relationship between employment status and compliance. Working individuals face challenges such as time constraints for routine check-ups and irregular medication schedules due to busy schedules (Lee et al., 2022). However, different results were found by (Sridani and Putri, 2022), suggesting that this relationship may vary depending on the context of the population.

Women in this study tended to have lower compliance than men. This can be explained by women's greater social roles and domestic responsibilities, which often make personal health needs less of a priority (Inayatillah et al., 2025). Barriers related to medical expenses are also more often reported by (Holt et al., 2013). Better knowledge is associated with better compliance. Patients who understand disease conditions, therapeutic goals, and risk of complications are more motivated to comply (Andala et al., 2024). Interestingly, higher disease perception was actually related to lower adherence after controlling for other variables. This may be due to confounding factors, where patients with severe disease perception but have inadequate experience or support become less compliant. Family support and health workers have been shown to be significantly related to better compliance. Family acts as a reinforcing factor through reminders, motivation, and practical help (Probosiwi, 2025). Healthcare worker support, which includes education, effective communication, and ongoing monitoring, is also crucial for maintaining long-term treatment behaviors (Indrawati et al., 2025). This study has several limitations. The cross-sectional design cannot ensure a cause-and-effect relationship. Measurement of compliance using self-report (ARMS) has the potential to cause recall bias and social desire bias. In addition, the study was only conducted in one health center, so the generalization of results needs to be done carefully.

The findings of this study have significant implications for the practice of primary health services, especially at the Baiturrahman Health Center. The identification of work as the dominant factor related to medication adherence shows that interventions that have so far focused on pharmacological aspects alone are not enough. Puskesmas need to consider the context of patients' lives, especially work routines and time constraints faced by working patients. This is in line with the recommendations of WHO through the HEARTS program which emphasizes the importance of a structured behavioral approach and team-based services in the control of hypertension in primary services. One strategy that can be implemented is the adjustment of medication schedules to patients' daily routines. Working patients can be encouraged to associate medication consumption with existing routine activities, such as breakfast time or before going to work. In addition, the use of simple reminder technology, such as text messages via mobile phone or medication reminder apps, can be an effective and inexpensive alternative to help patients remember medication schedules (Hani et al., 2024). Puskesmas can also consider flexibility of service hours, for example by providing consultation services outside of working hours or through teleconsultation, so that working patients do not need to take leave just for routine check-ups.

The findings regarding the low knowledge score of the respondents (average of 9.89 out of a maximum score of 22) are also of important concern. Low knowledge about hypertension, treatment goals, and risk of complications can inhibit the formation of intrinsic motivation to comply. Therefore, the health education that has been provided in the Puskesmas needs to be evaluated for effectiveness. Although this study has made a significant contribution, there are some limitations that need to be acknowledged. First, the cross-sectional design does not allow the drawing of causal conclusions between independent and dependent variables. The relationships found only show associations, not cause-effects. Further research with prospective cohort designs or longitudinal studies is needed to understand the dynamics of changes in compliance over time and to identify factors that are truly causal. Second, measuring medication adherence using the self-report instrument (ARMS) has the potential to cause recall bias and social desirability bias, where respondents tend to report behaviors that are considered good or in accordance with the researchers' expectations. The use of more objective

measurement methods, such as pill count, medication taking records at pharmacies, or electronic medication monitoring, can be considered in future studies to improve measurement accuracy.

Third, this study was only conducted in one health center with specific population characteristics, so generalization of findings to other health centers or the wider population needs to be done carefully. Different socio-cultural factors and health service systems in other regions can influence the relationships between variables found in this study. Multicenter research with a wider area coverage will provide a more comprehensive picture. Fourth, the final model in this study only explains 28.93% of the variation in compliance, which means that there is 71.07% of the variation explained by factors outside the model. Variables such as access to health services, medication side effects, complexity of treatment regimen, social support from the work environment, and other psychological factors (such as depression and anxiety) have not been included in this study. Further research is suggested to explore these variables, both quantitatively and qualitatively, to gain a more holistic understanding of the determinants of medication adherence in people with hypertension.

Based on the findings of the research, several practical recommendations can be submitted to the Baiturrahman Health Center. First, strengthening health education programs that are sustainable and adjusted to the patient's literacy level, by involving families as partners in hypertension management. Second, the development of a simple technology-based medication reminder system, such as text messages or mobile phone applications, that can be adjusted to the patient's work routine. Third, increasing the capacity of health workers in therapeutic communication and counseling, through continuous training and mentoring. Fourth, regular monitoring of compliance at each visit, not only relying on blood pressure measurement as a single indicator. Fifth, special attention is given to villages with lower compliance estimates, such as Ateuk Munjeng Village, Kampung Baru, and Seutui, through increasing the frequency of counseling and home visits.

CONCLUSION

Medication adherence to medication in patients with grade I hypertension in the work area of the Baiturrahman Health Center was influenced by individual characteristic factors (gender, occupation, length of hypertension), cognitive factors (knowledge, perception of the disease), and social support factors (family support, support of health workers). Work was the most dominant factor. The final model explained 28.93% of compliance variations, indicating that compliance was multifactorial.

DECLARATIONS

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Conflicts of interest:

The author states that there are no financial or non-financial conflicts of interest related to the research, writing, and publication of this manuscript.

Ethical approval:

This research has obtained ethical approval from the Research Ethics Committee of the University of Muhammadiyah Aceh with Number: 29/EA/KEPL/Unmuha/IV/2026. All respondents have given informed consent before participating in this study, and the confidentiality of respondents' data has been maintained in accordance with the principles of research ethics.

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Data supporting the findings of this study are available upon reasonable request to the authors concerned. Data cannot be publicly published to protect the privacy and confidentiality of respondents, in accordance with the ethical provisions of the study.

Author Contributions:
Putri Nur Ramadhani (P.N.R.): Designing research concepts and designs, collecting data in the field, conducting data analysis (univariate, bivariate, and multivariate), and compiling and revising manuscripts. Dharina Baharuddin (D.B.): Providing direction in the preparation of theoretical frameworks, research methodologies, and providing critical input on manuscript revisions as well as providing guidance on the process of data analysis, interpretation of results, Meutia Zahara (M.Z.): improve vocabulary and citation using Endnotes and provide constructive input on the preparation of the final manuscript.

Declaration of the Use of Artificial Intelligence in Scientific Writing:
The author states that artificial intelligence (AI) is not used to generate research ideas, design methodologies, analyze data, or draw conclusions. However, the author uses AI tools (such as paraphrasing tools or writing assistants) only to help string words, improve sentence structure, and improve grammar to make the manuscript easier to understand. After using these tools, the author has thoroughly reviewed, edited, and verified the entire content of the manuscript, and takes full responsibility for the accuracy and originality of this scientific work.

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