

GERMAS Policy Implementation and Low-Salt Diet Compliance Among Hypertensive Patients in Ratahan, North Sulawesi, Indonesia

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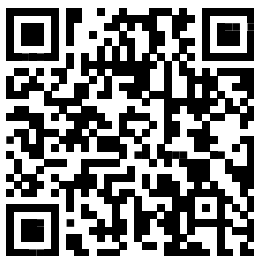
ABSTRACT

The aim of this study was to explore the relationship between the implementation of the “healthy living community movement” (GERMAS) policy and compliance with a low-salt diet among hypertensive patients. A quantitative cross-sectional study was conducted at Ratahan Primary Health Center among hypertensive patients who participated in the GERMAS program. Data were selected through proportional random sampling. Data were analyzed using multivariate logistic regression to determine the relationship between program implementation components, program socialization, community participation, and health facility support, and adherence to a low-salt diet. The analysis revealed that program socialization (OR=2.34, p=0.005, CI: 1.29–4.18), and has the most significant relationship of the other variables; community participation (OR=1.95, p=0.021, CI: 1.11–3.35), and health facility support (OR=2.07, p=0.017, CI: 1.14–3.68) were significantly associated with adherence to a low-salt diet. Implementation of GERMAS through effective program socialization, active community involvement, and adequate health facility support significantly increases adherence to a low-salt diet among hypertensive patients. Strengthening intersectoral collaboration and continuous community empowerment is crucial to sustaining GERMAS outcomes in hypertension prevention and control.

Key Messages:

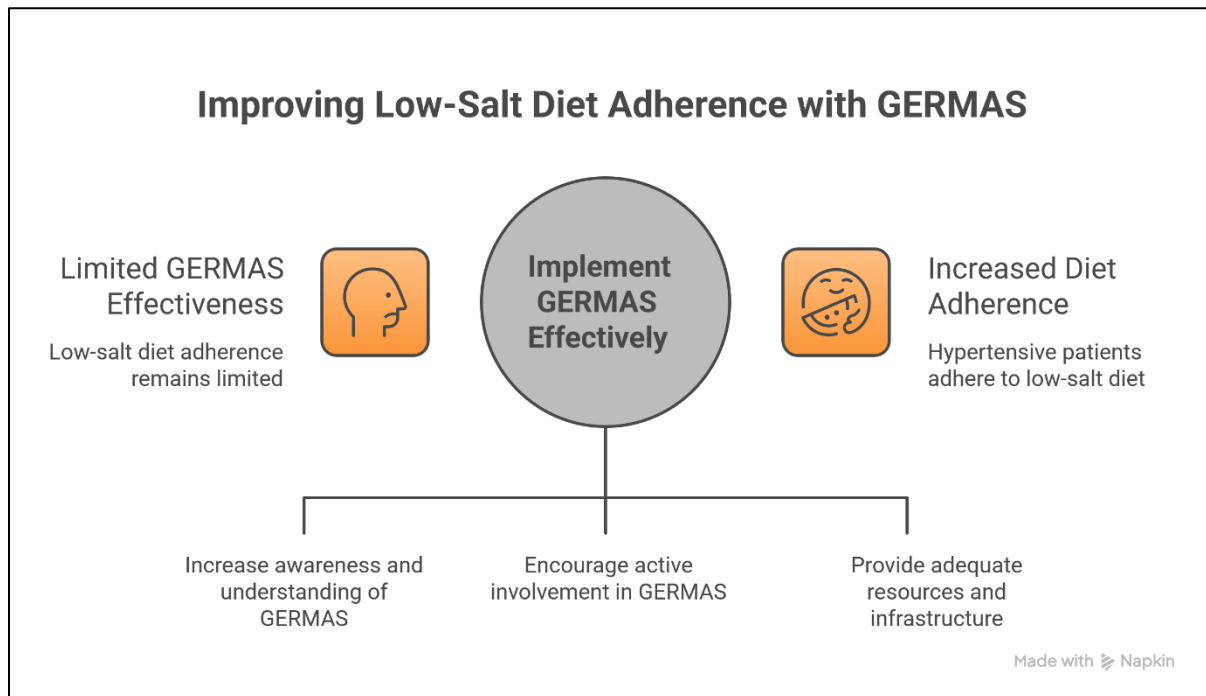
- Hypertension remains a major public health problem in Indonesia, and adherence to a low-salt diet plays a crucial role in its management
- The GERMAS policy promotes healthy lifestyles through health education, community participation, and supportive health facilities

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GRAPHICAL ABSTRACT



INTRODUCTION

Hypertension is a highly prevalent non-communicable disease in Indonesia and a major risk factor for cardiovascular diseases (1). The 2023 Indonesian Health Survey reported a national prevalence of 30.8% (2), while North Sulawesi recorded 29.2% among adults, with 314 hypertensive visits at Ratahan Public Health Center in January 2025 alone (3). Excessive salt intake, along with stress, obesity, and physical inactivity, is a key contributor to hypertension, which increases economic burden and reduces productivity. Therefore, behavioral modification is essential for effective hypertension control in Indonesia (4).

A low-salt diet is one of the most effective non-pharmacological interventions for managing blood pressure (5). The World Health Organization (WHO) recommends limiting salt intake to no more than 5 grams per day to reduce the risk of hypertension and its complications (6). However, evidence indicates that the average salt consumption among Indonesians remains significantly above the recommended level, reaching approximately 12 grams per day (7). The low level of adherence to a low-salt diet is largely influenced by inadequate knowledge, dietary habits, and social-environmental factors (8). Adherence to a low-salt diet serves as a key indicator of the success of sustainable hypertension control (9).

As part of efforts to promote healthy lifestyles among the population, the Indonesian government launched the “Gerakan Masyarakat Hidup Sehat” (GERMAS) or Community Movement for Healthy Living. This program emphasizes the importance of regular physical activity, consumption of nutritious food, and routine health check-ups as preventive measures against non-communicable diseases (NCDs), including hypertension (10). GERMAS also aims to raise public awareness of the importance of limiting salt intake in daily life. However, the effectiveness of GERMAS implementation at the regional level is often influenced by the availability of human resources, health promotion facilities, and cross-sectoral support (11).

Several studies have shown that the implementation of the GERMAS program can improve healthy lifestyle behaviors in the community. For instance, educational activities conducted through community health posts (*posyandu*) and public health centers (*puskesmas*) have been shown to enhance public awareness regarding the importance of a healthy diet and regular physical activity (12). Nevertheless, most of these studies have primarily focused on general behavioral changes and have not specifically examined the relationship between GERMAS implementation and adherence to a low-salt diet among hypertensive patients. This highlights a research gap that warrants further investigation (13).

Adherence to a low-salt diet is strongly influenced by the behavior, motivation, and social support of individuals with hypertension (14); (15). Community-based programs such as GERMAS are expected to strengthen these aspects through educational initiatives and direct assistance (16). However, several studies have reported that the success of such programs largely depends on the consistency of implementation and the level of community engagement (13). Therefore, evaluating the relationship between the implementation of GERMAS and adherence to a low-salt diet is crucial to assess the program's effectiveness in real-world settings (12).

From a health policy perspective, research on the relationship between GERMAS implementation and adherence to a low-salt diet can provide valuable insights for policymakers (17). Such findings may help design more targeted and contextually relevant health promotion strategies that align with Indonesia's socio-cultural conditions (18). Furthermore, the results of this study could contribute to strengthening cross-sectoral collaboration among health professionals, community leaders, and local governments.

The aim of this study was to explore the relationship between the implementation of the "Gerakan Masyarakat Hidup Sehat" (GERMAS) policy and adherence to a low-salt diet among hypertensive patients at the Ratahan Primary Health Center. This study also serves as a policy recommendation for local government authorities to enhance community health outcomes.

METHODS

This study employed a quantitative cross-sectional design (19) to examine the relationship between GERMAS policy implementation, covering program dissemination, community participation, and health facility support and low-salt diet adherence among hypertensive patients. Implementation of the GERMAS Policy is the level of implementation of the healthy living community movement policy, measured through program dissemination (GERMAS, related socialization and education on hypertension), community participation (involvement of hypertensive patients and their families in GERMAS activities), and support from health facilities (availability of services, health education, and monitoring), as reflected in the adherence of hypertensive patients to a low-salt diet in daily life

The research was conducted at the Ratahan Primary Health Center, Southeast Minahasa Regency, North Sulawesi, Indonesia, from January to June 2025. A total of 314 adult hypertensive patients (≥ 30 years) were selected using proportional random sampling from a population of 1,600 individuals with hypertension. The sample size was allocated proportionally according to the number of hypertensive patients in each village within the service area of Ratahan Health Care Center. The inclusion criteria were a clinically diagnosed history of hypertension, age ≥ 30 years, residence in the area for ≥ 6 months, and provision of informed consent. Patients with terminal illnesses, severe complications, or cognitive impairments were excluded.

Data were collected using a validated structured questionnaire based on the Health Belief Model (HBM), The Dietary Approaches to Stop Hypertension (DASH) is a dietary instrument specifically designed to reduce and control blood pressure, particularly among individuals with hypertension. The DASH approach also emphasizes the restriction of salt/sodium intake (20). Instrument reliability was confirmed (Cronbach's $\alpha > 0.70$). Data were obtained through structured interviews and self-administered questionnaires by trained enumerators, supported by secondary data from health records.

Data analysis was performed using IBM SPSS version 27, applying descriptive statistics, Chi-square tests, and multiple logistic regression with a significance level of $p < 0.05$. Ethical approval for this study was obtained from the Ethics Committee of the Manado Health Polytechnic, Ministry of Health (IRB-2025-0229).

RESULTS

Tables 1 and 2 present information about respondent characteristics and variables. The study found that 90 respondents (28.7%) had completed senior high school, 90 (28.7%) had completed junior high school, 54 (17.2%) had completed tertiary education, and 80 (25.5%) had completed elementary school. The majority of respondents were aged 56–65 years (120 respondents, 38.2%), while the smallest

age group was 30–45 years (20 respondents, 6.4%). In terms of occupation, most respondents were farmers (110 respondents, 35.0%), followed by housewives (80 respondents, 25.5%), private employees (50 respondents, 15.9%), retirees (40 respondents, 12.7%), civil servants (20 respondents, 6.4%), and daily laborers (14 respondents, 4.5%). Furthermore, the majority of respondents were female (194 respondents, 61.8%), while male respondents accounted for 120 (38.2%).

Table 1. Respondent Characteristics

Respondent Characteristics	n	%
Education		
Elementary School	80	25.5
Junior High School	90	28.7
Senior High School	90	28.7
College	54	17.2
Age		
30-45 year old	20	6.4
46-55 year old	50	15.9
56-65 year old	120	38.2
66-75 year old	80	25.5
>75 year old	44	14.0
Occupation		
Farmer's	110	35.0
Housewife	80	25.5
Civil Servant	20	6.4
Private employees	50	15.9
Retireed	40	12.7
Odd job	14	4.5
Gender		
Male	120	38.2
Female	194	61.8

Table 2. Research Variables

Variables	n	%
Implementation of the GERMAS Policy:		
Program Socialization		
Good	210	66.9
Poor	104	33.1
Community Participation		
High	185	58.9
Low	129	41.1
Health Facility Support		
High	200	63.7
Low	114	36.3
Low-Salt Diet Compliance		
Adherence	190	60.5
Non-Adherence	124	39.5

For the independent variable, the implementation of the GERMAS policy included several components. In terms of program dissemination, most respondents (66.9%) rated the GERMAS socialization activities as good, while 33.1% rated them as poor. Regarding community participation, 58.9% of respondents demonstrated a high level of participation, whereas 41.1% reported low participation. Regarding the health facility support variable, the majority of respondents (63.7%) reported high support from health facilities, while 36.3% rated it low. This suggests that health centers and related facilities are sufficiently equipped to support GERMAS activities and hypertension screening. Regarding adherence to a low-salt diet, most respondents (60.5%) were classified as adherent, while 39.5% were non-adherent.

Table 3. Crosstab Analysis Between Independent and Dependent Variables

Implementation of the GERMAS Policy	Low-Salt Diet Compliance						<i>p-Value</i>
	Adherence		Non-Adherence		Total		
	n	%	n	%	n	%	
Program Socialization							
Good	145	69.0	65	31.0	210	100	0.021*
Poor	45	43.3	59	56.7	104	100	
Community Participation							
High	130	70.3	55	29.7	185	100	0.012*
Low	60	46.5	69	53.5	129	100	
Health Facility Support							
High	140	70.0	60	30.0	200	100	0.015*
Low	50	43.9	64	56.1	114	100	

Table 3 presents the cross-tabulation results, showing that program dissemination ($p = 0.021$), community participation ($p = 0.012$), and health facility support ($p = 0.015$) were significantly associated with adherence to a low-salt diet.

Table 4. Logistic Regression Test of Independent and Dependent Variables

Variables	OR (Exp (β))	<i>p-Value</i>	VIF	95% CI	
(Constant)	-	<0.05	< 1	Lower	Upper
Program Socialization	2.34	0.005	1.14	1.29	4.18
Community Participation	1.95	0.021	1.1	1.11	3.35
Health Facility Support	2.07	0.017	1.12	1.14	3.68

Table 4 presents the results of the logistic regression analysis examining the association between GERMAS policy implementation and low-salt diet compliance among hypertensive patients in Ratahan, Indonesia. All independent variables included in the model were significantly associated with low-salt diet compliance ($p < 0.05$). Program socialization showed a strong and significant association with compliance (OR=2.34; 95% CI: 1.29–4.18), indicating that patients exposed to GERMAS socialization were more than twice as likely to adhere to a low-salt diet. Similarly, community participation significantly increased the likelihood of compliance (OR=1.95; 95% CI: 1.11–3.35).

Health facility support also demonstrated a significant positive association with low-salt diet compliance (OR=2.07; 95% CI: 1.14–3.68), suggesting that counseling and health education provided by health facilities play an important role in improving adherence. The VIF values were below 1.2, indicating no evidence of multicollinearity and confirming the stability and reliability of the regression model. Overall, these findings highlight the important role of GERMAS policy implementation in improving compliance with low-salt diets among hypertensive patients in Ratahan, Indonesia.

DISCUSSION

The results of the multiple logistic regression analysis indicated that program dissemination, community participation, and health facility support were significantly and positively associated with adherence to a low-salt diet among hypertensive patients ($p < 0.05$ for all variables). The positive coefficients and odds ratios greater than 1 suggest that improvements in the quality of these three dimensions of GERMAS policy implementation increase the likelihood that patients will adhere to dietary recommendations. The low VIF values indicate no multicollinearity issues among the predictor variables, ensuring the stability of the estimated effects. These findings also highlight that the operational implementation aspects of GERMAS are correlated with desirable dietary behaviors among hypertensive patients.

Implementation of the GERMAS Policy (Program Socialization) With Low-Salt Diet Compliance

Program dissemination emerged as the strongest predictor of dietary adherence (OR=2.34; $p=0.005$). This finding indicates that effective education and counseling enhance patients' knowledge and risk perception of salt consumption and hypertension, which, in turn, influence their dietary behaviors.

The result is consistent with existing literature suggesting that structured health education interventions can improve dietary compliance and blood pressure control. Systematic educational approaches also reinforce patients' motivation to sustain long-term behavioral changes (21).

From a health behavior theory perspective, the effects of socialization align with the principles of the Health Belief Model (HBM), wherein increased knowledge and perceived threat motivate the adoption of preventive actions. Effective education enhances perceived susceptibility (risk awareness) and perceived benefits, thereby facilitating patients' decision-making to reduce salt intake. Interventions that combine risk information with practical guidance (e.g., low-salt cooking recipes) are more likely to produce tangible behavioral changes. Therefore, socialization materials should be strategically designed to target the core constructs of the HBM to achieve optimal effectiveness.

Effective prevention and control of non-communicable diseases (NCDs) require efficient interaction and coordination among healthcare facilities across all service levels from primary care to referral systems, covering promotive, preventive, curative, palliative, and rehabilitative efforts for NCD cases such as hypertension in the community (22). Regular health examinations play a critical role in the prevention and early detection of hypertension. The uptake of these examinations is strongly influenced by the effectiveness of government-led health promotion and socialization programs, particularly those implemented by NCD program managers at community health centers (Puskesmas) (23). Consequently, the successful implementation of periodic health screening initiatives largely depends on strong individual motivation and the intensity and quality of governmental program dissemination (24).

Implementation of the GERMAS Policy (Community Participation) With Low-Salt Diet Compliance

Community participation was also found to significantly increase the likelihood of adherence to a low-salt diet (OR = 1.95; $p = 0.021$). Active community engagement facilitates social support, fosters new social norms regarding salt consumption, and establishes mutual monitoring mechanisms that promote the adoption and maintenance of low-salt dietary behaviors. Community-based interventions have demonstrated effectiveness in reducing blood pressure and improving dietary adherence in low- and middle-income countries when community participation components are integrated. Therefore, strengthening community capacity and local support groups may serve as a critical strategy within the GERMAS (healthy living community movement) framework (25).

From a health behavior theory perspective, the effects of socialization align with the principles of the Health Belief Model (HBM), wherein increased knowledge and perceived threat motivate the adoption of preventive actions. Effective education enhances perceived susceptibility (risk awareness) and perceived benefits, thereby facilitating patients' decision-making to reduce salt intake. Interventions that combine risk information with practical are more likely to produce tangible behavioral changes. Therefore, socialization materials should be strategically designed to target the core constructs of the HBM to achieve optimal effectiveness.

The findings of this study further underscore that community participation in reducing salt intake requires supportive policies that are effectively disseminated to the public, enabling them to serve as behavioral guidelines for hypertension prevention (26). Previous studies have shown that participation and awareness are significantly associated with reduced salt intake, highlighting that regular engagement in health programs enhances understanding of the harmful effects of excessive salt consumption, which contributes to hypertension. Given that daily salt intake remains substantially high and hypertension prevalence persists, a comprehensive policy strategy to reduce salt intake should be prioritized and integrated into national health promotion efforts (27).

Implementation of the GERMAS Policy (Health Facility Support) With Low-Salt Diet Compliance

Support from healthcare facilities (OR=2.07; $p=0.017$) strengthens the role of primary care services as a mediator between policy implementation and patient behavior. The availability of blood pressure monitoring equipment, essential medications, and nutritional education services enhances patients' capability to adhere to dietary and therapeutic recommendations. Institutional support also facilitates monitoring and clinical follow-up, which are known determinants of long-term adherence

among patients with chronic conditions. These findings are consistent with the health service behavior model, which emphasizes the critical role of healthcare access and service quality in promoting the adoption of healthy behaviors (28).

Evidence from previous studies further suggests that patient participation is directly associated with patients' trust and indirectly influenced by perceived patient value, contributing to the growing body of literature exploring the relationship between patient engagement and trust in healthcare. This highlights the importance of perceived value in shaping effective primary healthcare (PHC) delivery (29). Strengthening support from healthcare facilities through the development of innovative and structured chronic care models can enhance patients' access to PHC institutions and improve the effectiveness of a tiered healthcare system for chronic disease management (30). Institutional support for healthcare facilities should therefore be prioritized to build the capacity of public health institutions, as this enables more consistent health-seeking behaviors and fosters sustainable healthcare utilization (31).

The role of community participation can be further explained through the Social Cognitive Theory (SCT) and the concept of social capital, wherein social interaction, modeling, and social reinforcement help shape new dietary norms (32). When community leaders or neighborhood groups adopt low-salt cooking practices, social modeling mechanisms increase the likelihood that individuals will emulate such behaviors (33). Moreover, collective support can mitigate contextual barriers, such as the widespread availability of high-salt foods. Empirical evidence supports that community-based programs involving local leaders and peer-support groups significantly enhance the effectiveness of dietary interventions (34).

Global evidence on sodium reduction and cardiovascular benefits further supports this interpretation. Large-scale reviews and population-based clinical trials have consistently demonstrated that reducing sodium intake or substituting regular salt with low-sodium alternatives can lower blood pressure and reduce cardiovascular events (35). Policy interventions targeting the food supply such as promoting low-sodium salt substitutes, have shown meaningful outcomes in large randomized trials, confirming that community- or facility-level efforts yield greater clinical impact when complemented by food environment modifications (36). Therefore, policy evaluations of the GERMAS (healthy living community movement) initiative should consider a comprehensive approach that integrates education, community engagement, and food supply reform (37); (38).

From a policy perspective, local health authorities may consider allocating resources for health worker training at community health centers (Puskesmas), developing structured community education modules, and implementing community empowerment activities (39). Evidence-based interventions could include mass information campaigns integrated with local initiatives, such as elderly health posts (posyandu lansia), religious study groups (kelompok pengajian), and healthy market programs, to enhance message reach and retention (40). Furthermore, systemic efforts such as promoting the use of salt substitutes among appropriate population groups should be considered, in line with international evidence from large-scale salt substitution trials (41).

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Methodologically, the regression model used in this study demonstrated stable estimations, as indicated by the non-widening confidence intervals (CIs) for significant variables and low variance inflation factors (VIFs), confirming the absence of multicollinearity (42). However, given the cross-sectional design, causal relationships cannot be fully established; the observed effects represent associations consistent with the hypothesis that improved GERMAS implementation is linked to better dietary compliance (43). It is therefore important to interpret the odds ratios (ORs) as measures of

association rather than direct causal effects. Establishing causality would require longitudinal or controlled interventional study designs (44).

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This study has several limitations. First, the cross-sectional design limits the ability to establish causal relationships between the implementation of the GERMAS policy and low-salt diet compliance among hypertensive patients. The findings reflect associations at a single point in time and cannot capture changes in behavior over time. Second, the study was conducted in only one primary health center, namely the Ratahan Primary Health Center, which may limit the generalizability of the results to other regions or healthcare settings with different demographic, cultural, or health system characteristics. Third, the use of self-reported data may introduce recall bias or social desirability bias, potentially affecting the accuracy of participants' responses. Therefore, future studies involving longitudinal designs and multiple health centers are recommended to provide more comprehensive and generalizable evidence.

CONCLUSION

Based on the study findings, the implementation of the healthy living community movement (GERMAS) policy demonstrated a significant association with adherence to a low-salt diet among hypertensive patients at the Ratahan Primary Health Center. Factors such as effective program dissemination, active community participation, and adequate health facility support made a substantial contribution to improving patients' dietary compliance ($p < 0.05$). Logistic regression analysis revealed that program socialization was the strongest predictor of adherence (OR=2.34; 95% CI: 1.85–6.33). Accordingly, strengthening health facility support and enhancing community engagement are key strategies for the successful implementation of the GERMAS policy in improving hypertension control within primary healthcare settings. Therefore, public health policies should ensure the sustainability of these components to maximize the contribution of GERMAS toward hypertension control and the improvement of population health and quality of life. Future studies should use longitudinal or quasi-experimental designs with larger and more diverse samples to better assess causal relationships between GERMAS implementation and low-salt diet compliance. Incorporating additional determinants, mixed-methods approaches, evaluation of specific GERMAS components, and clinical outcomes such as blood pressure control would further strengthen the evidence for policy and practice.

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CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest associated with this study.

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