

Evaluating Nutritional Policy Interventions for Managing Diabetes and Hypertension across Selected Health Facilities in Region Three, Guyana: A Mixed-Methods Study

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Abstract *The translation of nutritional policies into routine healthcare and sustainable dietary practices is crucial for the effective management of diabetes and hypertension. The Social Ecological Model (SEM) was employed in this study to evaluate the effect of nutritional policy interventions in some health facilities in Region Three, Guyana. A mixed-methods study was conducted at four public health facilities: the Goed Intent Health Centre (GIHC), the Parfaite Harmonie Health Centre (PHHC), Leonora Cottage Hospital (LCH) and the West Demerara Regional Hospital (WDRH). Quantitative data included 2,745 patients' records, 17 healthcare providers and facility assessments, complemented by qualitative evidence on patient and community experiences. Inferential and descriptive statistics, which included multivariable logistic regression, were integrated with thematic findings across SEM levels. The overall facility implementation was 40.0%; however, provider knowledge ranged from 45.0% to 60.0%, and reported practice ranged from 33.8% to 50.0%. Awareness of Food-Based Dietary Guidelines ranged from 51.7% to 75.6%, compared with 16.9%–48.2% for the Dietary Approaches to Stop Hypertension (DASH). Greater nutritional awareness was independently associated with high reported dietary practice (OR = 1.11, 95% CI: 1.10–1.12; $p < 0.001$). Cost and affordability constituted the predominant patient-level barrier (63.5%), followed by cultural and food norms (19.7%). Qualitative findings reinforced the influence of economic constraints, household food practices, provider capacity limitations and weaknesses in routine implementation. Nutritional policy implementation for diabetes and hypertension in Region Three is shaped by the interplay of patient, provider, organizational, community and policy influences. Strengthening implementation requires coordinated multilevel action that combines provider and facility support with affordable, culturally appropriate, and practical dietary guidance.*

Keywords *Diabetes, Dietary Practices, Guyana, Hypertension, Mixed Methods, Nutrition Policy, Social Ecological Model.*

Introduction

Noncommunicable diseases (NCDs) continue to be a major public health challenge worldwide, responsible for three-quarters of deaths globally not due to pandemics [1]. Cardiovascular diseases and diabetes are major contributors to this burden, especially in low- and middle-income countries [1, 2]. By 2022, diabetes prevalence had reached around 830 million people worldwide [3] and 1.4 billion adults aged 30–79 years were estimated to be living with hypertension in 2024 [4]. These conditions require long-term clinical management and modification of behavioral risk factors, especially unhealthy dietary practices.

Nutrition is central to the prevention and management of diabetes and hypertension. Dietary patterns that limit excessive sodium, free sugars, and unhealthy fats while promoting appropriate intake of whole grains, vegetables, fruits and other nutrient-dense foods contribute to improved cardiometabolic health [5]. Consequently, international NCD strategies increasingly emphasize nutrition interventions as important components of primary healthcare and chronic disease management [2, 6]. But having evidence-based nutrition policies and recommendations in place does not guarantee their consistent implementation. To translate effectively, health care facilities need to have the appropriate systems and resources in place, providers need to be able to incorporate nutritional counselling into routine care, and patients need to be able to apply recommendations in their day-to-day circumstances. Economic conditions, household food practices, cultural preferences, health literacy and food availability may therefore influence whether nutritional guidance results in sustained dietary change. This challenge is particularly relevant in Guyana, where NCDs are a significant component of the disease burden. Cardiovascular disease and diabetes have been identified as major causes of illness and death

through national surveillance, and large proportions of adults have hypertension and diabetes [7, 8].

Guyana has responded through health promotion, dietary guidance and primary healthcare interventions, which are supported by wider regional strategies for NCD prevention and control. Regional priorities similarly emphasize reducing modifiable risk factors and strengthening primary healthcare capacity for NCD management [9]. But the effect of these approaches depends on their translation into routine healthcare delivery and sustained patient behavior. FBDGs provide population-level guidance for healthy eating. DASH provides evidence-based recommendations with particular relevance to blood-pressure management. Translating such guidance into practice may be challenging, where recommended dietary changes compete with food costs, established cultural practices and household preferences. Evaluating nutritional interventions solely in terms of patient knowledge may therefore overlook important interpersonal, organizational and community influences.

The Social Ecological Model (SEM) provides an appropriate framework for examining these interacting factors. The SEM conceptualizes health behavior as being influenced by multiple interconnected levels, including individual, interpersonal, organizational, community and policy environments [10]. Within the present study, the individual level encompassed nutritional awareness, dietary practices, and selected clinical indicators; the interpersonal level included provider and household influences; the organizational level addressed provider capacity, facility readiness, resources, and documentation; the community level incorporated affordability, food access, and cultural practices; and the policy level considered the translation of nutritional guidance into healthcare delivery.

This multilevel perspective is crucial as weaknesses in implementation may occur at different levels simultaneously. A patient may know dietary recommendations but be unable to follow them because healthier options are too expensive or do not align with household practices. Similarly, providers may recognize the importance of nutritional counselling, but lack adequate training, educational material or organizational support. Thus, the availability of policy may have limited impact without mechanisms for implementation in health facilities and communities.

Despite the burden of diabetes and hypertension in Guyana, limited empirical evidence has examined how nutritional policy interventions operate simultaneously across facility, provider, patient and community levels within routine healthcare. Existing surveillance data provide valuable information on disease prevalence and behavioral risk factors but offer limited insight into the processes that connect nutritional guidance with clinical practice and patients' everyday experiences.

Accordingly, this study evaluated nutritional policy interventions for the management of diabetes and hypertension across selected health facilities in Region Three, Guyana, using a mixed-methods approach guided by the SEM. The evaluation examined facility implementation, provider knowledge and practice, patient nutritional awareness and reported dietary behavior, selected clinical indicators and economic, cultural and organizational barriers affecting implementation.

Materials and Methods

Study Design and Setting

A mixed-methods study was conducted across four public health facilities in Region

Three (Essequibo Islands–West Demerara), Guyana: Goed Intent Health Centre (GIHC), Parfaite Harmonie Health Centre (PHHC), Leonora Cottage Hospital (LCH), and West Demerara Regional Hospital (WDRH). Quantitative and qualitative evidence was integrated to evaluate nutritional policy implementation for diabetes and hypertension across facility, provider, patient, and community levels.

Conceptual Framework

The assessment was guided by the SEM [10]. The implementation of the nutritional policy was examined across five interconnected levels: individual, interpersonal, organizational, community and policy. Individual-level measures included nutritional awareness, dietary practices and selected clinical indicators; interpersonal measures included provider counselling and household practices; organizational measures included provider capacity, facility readiness, resources and documentation; community measures included affordability, food access and cultural practices; and the policy level considered translation of nutritional guidance into routine healthcare.

The framework describes the interacting levels of policy/system, organizational, interpersonal, community and individual/patient that were used to guide the mixed-methods evaluation. Important areas include policy and guideline support; systems for facility readiness and implementation; provider counselling and influences on household behavior; affordability and cultural food practices; patient awareness; dietary practices and clinical indicators. Arrows indicate interactions between ecological levels, not causal links (Figure 1).

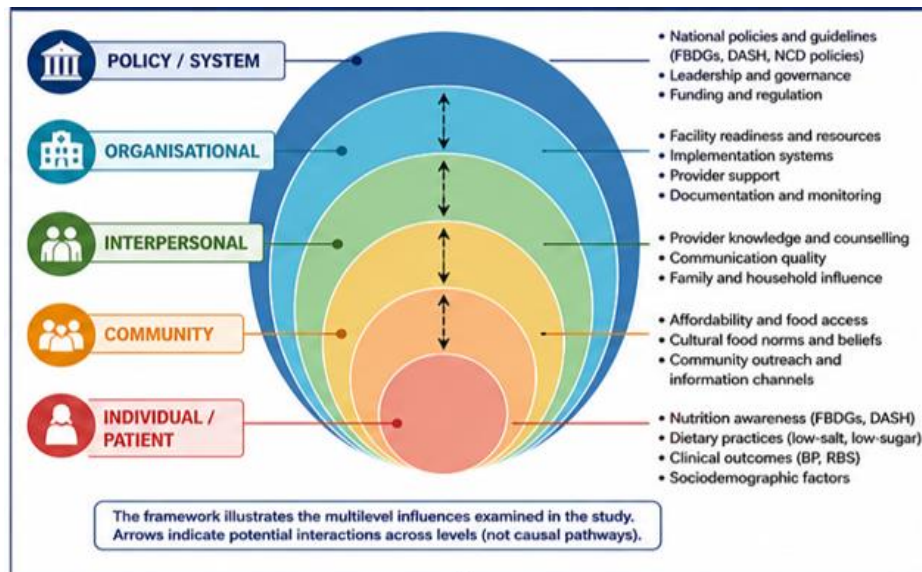


Figure 1. Social Ecological Model framework to evaluate nutritional policy interventions for diabetes and hypertension in Region Three, Guyana

Study Population and Data Sources

The quantitative component included 2,745 patients' records and 17 health care providers across the four facilities. The distribution of providers was as follows: five at GIHC, six at WDRH, four at PHHC and two at LCH. This included physicians, nurses and all other relevant allied health personnel in diabetes and hypertension care.

Patient records were eligible if they pertained to individuals receiving care for diabetes and/or hypertension and contained sufficient information for the variables required by the study. Valid blood-pressure measurements were available for 2,737 of the 2,745 patient records (99.7%). Random blood glucose (RBS) measurements suitable for analysis were available for 2,055 records (74.9%). Clinical analyses were restricted to records containing valid measurements for the corresponding indicator. Missing RBS measurements in patient records (25.1% overall) reflected routine health facility documentation and point-of-care testing gaps—such as unrecorded capillary readings or reagent availability—rather than study-level participant attrition or loss to follow-up.

Facility assessments examined organizational readiness and implementation

conditions. Qualitative evidence from patients, provider and community components explored nutritional knowledge, counselling experiences, household and cultural influences, affordability, information and outreach and barriers to implementation.

Measures and Data Collection

Quantitative measures included facility implementation, policy preparedness, provider knowledge and reported nutrition practice. Additionally, Patient awareness and reported dietary behaviors, clinical indicators and barriers to nutritional recommendations. Patient awareness measures included familiarity with FBDGs and DASH. Dietary-practice measures included reported low-salt and low-sugar behaviors, as well as a composite measure of overall dietary practice. Provider knowledge and practice scores were expressed as percentages.

Clinical indicators pulled from patient records included blood pressure and RBS. The operational definition of elevated blood pressure was diastolic blood pressure ≥ 90 mmHg and systolic blood pressure > 140 mmHg. RBS ≥ 200 mg/dL was used as a clinical operational flag for elevated glucose and was not interpreted independently to establish a new

diagnosis. The documentation of nutritional counselling was also reviewed.

Patient-level barriers were categorized as cost/affordability, cultural and food norms, lack of knowledge, time/workload, and availability/access. Qualitative data provided contextual information regarding these barriers and other influences on implementation. Standardized procedures and predefined variables were used across participating facilities.

Data Analysis

IBM SPSS Statistics version 29.0 was used for all quantitative data analyses. The data were checked for completeness, consistency and plausibility before analysis. Descriptive statistics were presented as frequencies, percentages and summary statistics as appropriate.

Chi-square tests were performed to assess differences in categorical clinical indicators among facilities, with Cramer's V used to assess effect size where appropriate. We also explored differences in availability of RBS measurements.

Factors associated with high reported dietary practice were determined using multivariable logistic regression. Predictors included age, health facility, percentage of nutritional awareness, and barrier category. Reported odds ratios (ORs), 95% confidence intervals (CIs) and p-values.

Qualitative data were analyzed thematically. Responses were coded and organized around

recurring themes including nutritional knowledge, household and cultural food practices, affordability, information and outreach, implementation barriers and recommended support. Themes were mapped to relevant SEM levels.

Mixed-Methods Integration and Rigor

The quantitative and qualitative findings were combined and interpreted. Quantitative data were used to determine the distribution and size of implementation patterns, and qualitative data provided context-specific explanations. The areas of convergence and complementarity were organized across the levels of SEM and displayed in an integrated joint display.

Quantitative data were verified for completeness and implausible values; invalid clinical measurements were removed only from the respective analyses. Standardized coding was used in all facilities. Interpretation was bolstered by methodological triangulation across patient records, providers, facility assessments and qualitative evidence.

Results

Overview of the Evaluation

The mixed-methods evaluation was conducted at four public health facilities in Region Three. Quantitative data were collected from the records of 2,745 patients and 17 health care providers, as well as facility assessments and qualitative evidence. Table 1 details the components of the study and their connection with the SEM.

Table 1. Study Components and Contribution to the Mixed-Methods Evaluation

Component	Data source	Main measures	Primary SEM level
Patient clinical	2,745 patient records	Blood pressure, RBS, nutrition documentation	Individual/organisational
Patient nutrition	Patient-level data	FBDG/DASH awareness, dietary practices	Individual
Provider	17 healthcare providers	Knowledge, practice, implementation barriers	Interpersonal/organisational
Facility	Four health facilities	Readiness, resources, implementation	Organisational/policy

Contextual	Qualitative/community data	Affordability, culture, household practices, outreach	Interpersonal/community
Integration	Combined evidence	Convergence across implementation levels	Multilevel

Multilevel Implementation of Nutritional Policy

Providers' knowledge ranged from 45.0% to 60.0%, and reported provider practice ranged from 33.8% to 50.0%. However, given the small provider sample ($n = 17$), provider findings were interpreted descriptively. Training and limited educational materials were

identified as important provider-level constraints. At the patient level, awareness of the FBDG ranged from 51.7% to 75.6%, while awareness of DASH was lower (16.9–48.2%). Reported low-salt practice ranged from 47.4% to 85.2% and low-sugar practice from 39.6% to 70.9%. However, cost/affordability (63.5%) and cultural/food norms (19.7%) were the dominant patient-level barriers (Table 2).

Table 2. Integrated Evaluation of Nutritional Policy Interventions across SEM Levels

SEM level	Domain	Key finding	Implementation issue
Individual	Awareness	FBDG: 51.7–75.6%; DASH: 16.9–48.2%	Uneven awareness
Individual	Dietary behaviour	Low-salt: 47.4–85.2%; low-sugar: 39.6–70.9%	Inconsistent dietary practices
Interpersonal	Counselling/household	Provider and household influences identified	Advice interacts with household practices
Organisational	Provider capacity	Knowledge: 45.0–60.0%; practice: 33.8–50.0%	Knowledge-practice gap
Organisational	Implementation	Overall: 40.0%	Limited operationalisation
Community	Affordability	63.5% of patient barriers	Economic constraints
Community	Cultural/food norms	19.7% of patient barriers	Established food practices
Policy	Readiness	60.0%	Readiness exceeds implementation

The figure summarizes key quantitative findings across the evaluated policy-to-practice pathway, from policy readiness and facility implementation through provider capacity, patient awareness and reported dietary practices to selected clinical indicators. Affordability and

cultural/food norms are presented as contextual influences. Values represent ranges across participating facilities where applicable. The pathway represents levels of evaluation and should not be interpreted as demonstrating causal relationships (Figure 2).

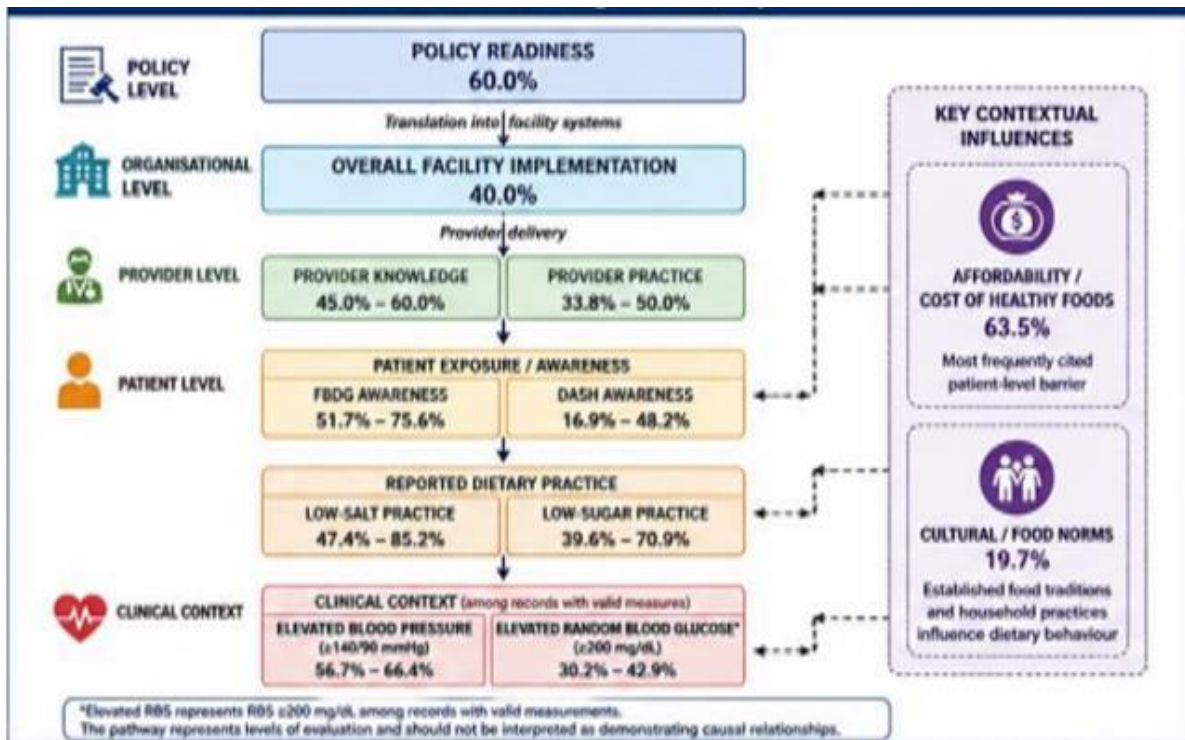


Figure 2. Multilevel Evaluation of Nutritional Policy Implementation across Selected Health Facilities in Region Three, Guyana

Factors Associated with Reported Dietary Practice

Of note, greater nutritional awareness was independently associated with higher reported dietary practice. However, for each 1-percentage-point increase in awareness was associated with approximately 11% higher adjusted odds for high dietary practice (OR = 1.11, 95% CI: 1.10–1.12; $p < 0.001$).

Facility was also independently associated with the outcome. Relative to GIHC, higher

odds were observed at PHHC, WDRH and LCH (Table 3). The particularly large estimate for LCH should be interpreted with caution because of the high prevalence of the outcome and the distribution of observations across categories. Age was not statistically significant ($p = 0.170$). Culture/food norms were associated with lower adjusted odds of high dietary practice compared with availability/access (OR = 0.54, 95% CI: 0.29–0.99; $p = 0.047$).

Table 3. Multivariable Logistic Regression for High Reported Dietary Practice

Predictor	Adjusted OR	95% CI	p-value
Age	0.99	0.98–1.00	0.170
PHHC vs GIHC	3.40	2.33–4.94	<0.001
WDRH vs GIHC	10.12	6.85–14.95	<0.001
LCH vs GIHC	145.53	64.88–326.43	<0.001
Awareness (%)	1.11	1.10–1.12	<0.001
Culture/food norms vs availability/access	0.54	0.29–0.99	0.047

The substantial odds ratio observed for LCH relative to GIHC (OR = **145.53**, 95% CI: **64.88 – 326.43**; $p < 0.001$) reflects sparse cell counts and quasi-complete separation within the cross-tabulation of facility type and reported dietary practices. Specifically, an exceptionally high proportion of patient records at LCH reported optimal dietary behaviors alongside near-zero occurrences of the reference category. While this confirms a strong directional trend toward higher reported compliance at LCH, the exact point estimate should be interpreted as a statistical artifact of category distribution rather than a true fold-increase in effect size.

Clinical Context

Valid blood pressure measurements were available in 2,737 (99.7%) patients' records. Elevated blood pressure ($\geq 140/90$ mmHg) ranged from 56.7% to 66.4% across facilities but differed significantly by facility ($\chi^2 = 22.32$, $df = 3$, $p < 0.001$); although the effect size was small (Cramer's $V = 0.090$).

RBS measurements suitable for analysis were available for 2,055 (74.9%) 'patients' records. Of these, 750 (36.5%) had RBS ≥ 200 mg/dL. Facility-specific proportions ranged from 30.2% to 42.9%, but differed significantly across facilities ($\chi^2 = 14.95$, $df = 3$, $p = 0.002$; Cramer's $V = 0.085$).

Notably, the availability of RBS measurements varied significantly across all facilities ($\chi^2 = 118.12$, $df = 3$, $p < 0.001$). The proportion of records that were without an analyzable RBS measurement ranged from 8.4% at LCH to 39.0% at PHHC. Consequently, RBS findings were interpreted from records with available measurements and in the clinical

context, rather than as direct evidence of the effectiveness of nutritional intervention. This facility-level variation in analyzable glucose records represents operational testing and documentation differences across primary care settings, rather than study attrition.

Contextual and Qualitative Findings

Affordability was noted to be the most frequently identified patient-level barrier (63.5%; $n = 1,743$), followed by cultural/food norms (19.7%; $n = 540$), lack of knowledge (6.6%; $n = 180$), time/workload (5.9%; $n = 161$) and availability/access (4.4%; $n = 121$).

Qualitative findings complemented these patterns. Cultural and household food practices represented 20.3% of the broader focus-group coded responses, while information and outreach channels accounted for 18.1%. An analysis of the community outreach data showed that acceptability and learning accounted for 23.7% of coded responses, indicating some receptiveness to nutrition education. However, training limitations, inadequate educational materials and weak documentation of nutritional counselling further emerged as organizational constraints.

Mixed-Methods Integration

The integration showed that the implementation of nutritional policy was influenced by interacting factors across SEM levels (Table 4). Increased awareness of dietary practice was reported, but implementation was influenced by affordability and household food practices. Provider knowledge was also limited in areas where training, resources and organizational systems did not support consistent counselling (Figure 3).

Table 4. Mixed-Methods Joint Display of Nutritional Policy Implementation

Issue	Quantitative evidence	Qualitative/contextual evidence	Integrated interpretation
Awareness	FBDG 51.7–75.6%; DASH 16.9–48.2%	Importance of information/outreach	Nutrition messages reach patients unevenly

Awareness and practice	OR = 1.11 (95% CI: 1.10–1.12)	Participants valued nutrition learning	Education supports behaviour but is insufficient alone
Affordability	63.5%	Economic constraints	Financial feasibility limits implementation
Culture/household	19.7%; OR = 0.54	Established food practices	Counselling requires cultural adaptation
Provider capacity	Knowledge 45.0–60.0%; practice 33.8–50.0%	Training/material gaps	Organisational support is required
Facility systems	Implementation 40.0%	Documentation/resource weaknesses	Routine implementation remains limited
Community outreach	23.7% outreach acceptability/learning	Receptiveness to education	Community delivery offers an implementation opportunity
Clinical context	Elevated BP 56.7–66.4%; RBS 30.2–42.9%*	—	Persistent clinical risk supports stronger intervention

*RBS ≥ 200 mg/dL among records with valid measurements.

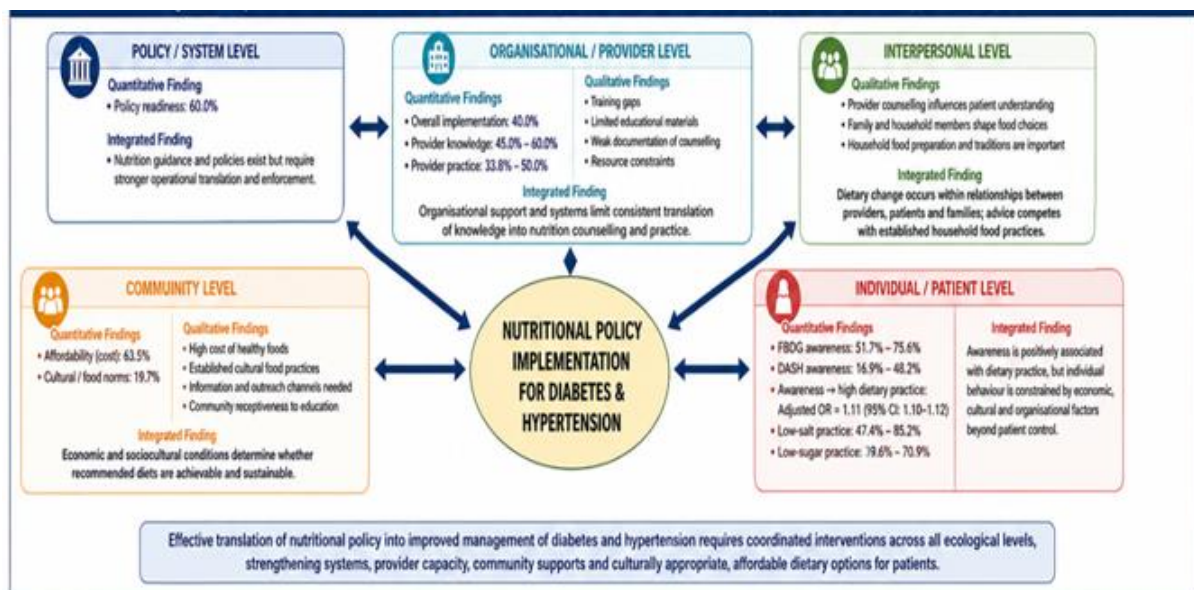


Figure 3. Integrated mixed-methods evaluation of nutritional policy interventions across Social Ecological Model levels in Region Three, Guyana

Quantitative and qualitative findings are integrated across individual, interpersonal, organizational, community and policy/system levels. Patient awareness was positively associated with high reported dietary practice (adjusted OR = 1.11, 95% CI: 1.10–1.12). Affordability, cultural and household food

practices, provider capacity limitations and organizational weaknesses constrained implementation. The integrated findings demonstrated that effective translation of nutritional policy into diabetes and hypertension management requires coordinated

interventions across ecological levels, rather than reliance on patient education alone.

Discussion

Principal Findings

This mixed-methods study identified critical operational gaps in the implementation of nutritional policy interventions for diabetes and hypertension across selected health facilities in Region Three, Guyana. The findings indicate that implementation is shaped by complex, interacting factors across the Social Ecological Model (SEM) rather than by patient knowledge or individual behavioral choices alone. Notably, policy readiness exceeded facility-level execution; healthcare provider knowledge was moderate but insufficiently translated into clinical practice; patient awareness demonstrated a positive association with reported dietary behaviors; and socio-economic constraints—principally affordability and cultural food norms—profoundly influenced the feasibility of dietary modification. Among patients with available diagnostic records, this implementation gap was accompanied by a high prevalence of elevated blood pressure and variable glycemic control. Collectively, these empirical observations underscore that optimizing the nutritional management of chronic noncommunicable diseases requires coordinated strategies spanning individual, interpersonal, organizational, community, and policy domains.

Policy, Facility, and Provider Implementation

The observed disparity between national policy readiness (60.0%) and overall facility implementation (40.0%) demonstrates that the formulation and dissemination of nutritional guidelines do not automatically guarantee their integration into routine primary healthcare delivery. Sustainable policy translation requires robust organizational infrastructure, structured provider training, standardized counselling tools, workflow compatibility, and routine

monitoring mechanisms. These findings align with implementation science literature, which consistently demonstrates that organizational readiness and structural capacity govern the degree to which evidence-based interventions become embedded in clinical practice [11, 12].

Findings at the provider level further illustrate this translation gap. While provider knowledge scores ranged from 45.0% to 60.0%, reported clinical practice lagged at 33.8% to 50.0%. Although the modest provider sample size ($n = 17$) necessitates cautious interpretation, qualitative evidence corroborated these quantitative trends by identifying systemic constraints, particularly the lack of structured professional training and a shortage of patient educational materials. Consequently, expanding provider knowledge is necessary but insufficient unless accompanied by practical counseling resources and institutional support systems.

Furthermore, documentation of nutritional counselling was exceptionally sparse across participating facilities. Patient accounts indicated that oral dietary guidance was delivered more frequently than was recorded in formal clinical charts. Inconsistent documentation undermines continuity of care and impedes systematic auditing of preventive health services. This finding aligns with broader regional literature highlighting deficiencies in lifestyle counselling documentation within Caribbean health systems; for example, a multi-country survey of 1,661 patients with diabetes reported that only 32% had documented dietary counselling in their medical records over a 12-month period [17]. Addressing this documentation gap in Region Three will require standardized, low-burden recording tools embedded within routine clinical workflows.

Patient Awareness and Dietary Behavior

Multivariable regression analysis demonstrated that patient nutritional awareness was an independent positive predictor of high

reported dietary practice (OR = 1.11, 95% CI: 1.10 – 1.12; $p < 0.001$). Each percentage-point increase in awareness was associated with an 11% increase in the adjusted odds of adopting favorable dietary behaviors, confirming the continued value of patient-centered health education in diabetes and hypertension management.

However, patient familiarity differed significantly depending on the type of nutritional guidelines. Awareness of general Food-Based Dietary Guidelines (FBDGs) ranged from 51.7% to 75.6%, whereas awareness of the condition-specific Dietary Approaches to Stop Hypertension (DASH) model was markedly lower (16.9%–48.2%). This discrepancy suggests that broad healthy-eating communication reaches the patient population more effectively than therapeutic dietary strategies. Structured dietary patterns, particularly sodium reduction and the DASH diet, possess a strong evidentiary base for blood pressure attenuation [13, 14], just as tailored medical nutrition therapy remains fundamental to glycemic control [15].

Nevertheless, the statistical association between awareness and reported behavior must be contextualized within patients' broader socio-ecological reality. While health literacy provides a foundational prerequisite for behavioral change, patients cannot successfully operationalize dietary knowledge without enabling economic and social conditions.

Affordability and Sociocultural Influences

Financial constraints constituted the single most prevalent patient-level barrier, accounting for 63.5% of reported obstacles. This finding demonstrates that non-adherence to dietary recommendations is largely driven by structural economic realities rather than a lack of patient motivation or health literacy. Global evidence corroborates that food affordability remains a primary determinant of healthy diet acquisition

[16], a challenge well-documented across the Caribbean. Empirical studies in the Eastern Caribbean have established a direct link between perceived food costs and reduced fruit and vegetable consumption [19], while health economics research among low-income Caribbean households indicates that securing a nutritionally adequate diet can absorb a disproportionate share of total household income [20].

These economic realities have direct operational implications for clinical nutrition counselling in Region Three. Standardized recommendations featuring unaffordable foods offer limited therapeutic value to patients facing financial strain. Clinical guidance must therefore pivot toward affordable, locally sourced nutrient-dense foods, practical portion management, and cost-neutral adaptations of traditional meals.

Cultural and food norms emerged as the second most prominent barrier (19.7%). Patients identifying cultural norms as their primary constraint exhibited lower adjusted odds of high dietary practice compared to those citing physical availability or access (OR = 0.54, 95% CI: 0.29 – 0.99; $p = 0.047$). Qualitative data reinforced these quantitative observations, underscoring that household food preparation patterns and deep-seated culinary traditions exert a strong influence on dietary behavior. These findings closely parallel qualitative evidence from Montserrat, where food economics, family dynamics, cultural habits, and taste preferences collectively governed adherence to the DASH diet among adults with hypertension [18].

These observations emphasize the interpersonal and community constructs of the SEM. Because food purchasing and preparation decisions typically occur at the household level rather than in isolation, culturally sensitive counselling should emphasize modifying familiar recipes rather than imposing alienating dietary shifts. Incorporating family members into nutrition education sessions represents a

strategic approach to fostering sustained household-level dietary change.

Additionally, community outreach represents an underutilized implementation mechanism. Qualitative findings indicated substantial patient receptivity to community-based educational channels (23.7% acceptability). Expanding community outreach can effectively extend clinical counselling into non-formal spaces, provided that educational content prioritizes practical culinary adaptations and budget-conscious food selection over abstract dietary guidelines.

Clinical Context and Interpretation

Clinical record audits revealed a substantial burden of uncontrolled risk factors across participating facilities, with elevated blood pressure ($\geq 140/90$ mmHg) ranging from 56.7% to 66.4% and elevated random blood glucose (≥ 200 mg/dL) ranging from 30.2% to 42.9% among valid measurements. While these metrics illustrate the heavy cardiometabolic disease burden in the study population, they should not be interpreted as direct measures of nutritional policy efficacy. Blood pressure and glycemic parameters are confounded by disease duration, pharmacotherapy adherence, comorbid conditions, physical activity, and broader healthcare access factors that fell outside the scope of this evaluation.

Furthermore, substantial variance in the availability of analyzable glucose records across facilities (missingness ranging from 8.4% to 39.0%) highlights underlying data collection and documentation gaps in primary care settings. Consequently, these clinical findings serve to illustrate the urgent health context requiring intervention rather than establishing a direct causal effect of policy implementation on biological endpoints. Because missing glucose data were attributable to systemic primary care documentation gaps rather than participant dropouts, clinical findings reflect the subset of records with

complete diagnostic entries under real-world service conditions.

Integrated SEM and Mixed-Methods Interpretation

The integration of quantitative and qualitative data demonstrates that nutritional policy implementation operates as a dynamic, multi-tiered process across the SEM. At the individual level, nutritional awareness positively predicts reported dietary practice. At the interpersonal level, provider communication and household dynamics govern daily dietary choices. At the organizational level, delivery is constrained by provider capacity gaps, resource deficits, and sub-optimal clinical documentation. At the community level, financial limitations and cultural norms define the boundaries of practical dietary compliance. Finally, at the policy level, structural gaps persist between administrative formulation and facility-level execution.

Crucially, these ecological tiers interact continuously. Enhancing patient literacy yields diminishing returns if healthy food options remain economically unattainable. Upskilling clinicians without supplying educational tools or structural support fails to translate into routine counselling practice. Likewise, establishing policy guidelines without operational infrastructure deepens the divide between intended strategy and clinical reality.

The mixed-methods approach proved essential for capturing these multi-level interactions: quantitative metrics established the magnitude and distribution of implementation gaps, while qualitative findings provided explanatory context regarding the structural mechanisms driving those gaps. Ultimately, improving nutritional policy implementation in Region Three requires moving beyond isolated patient education toward a synchronized, multi-level framework that aligns facility infrastructure, provider

capacity, and community support with the socio-economic realities of the population.

Implications for Policy and Practice

The findings have important implications for strengthening nutritional interventions in the management of diabetes and hypertension in Region Three. Nutritional policy implementation should extend beyond the dissemination of guidelines to include mechanisms that support their consistent translation into routine clinical practice. The observed difference between policy readiness and facility implementation indicates a need for stronger operational systems, including standardized counselling procedures, appropriate educational resources, routine documentation and monitoring of nutrition-related care.

At the provider level, continuing professional development should strengthen practical competencies in dietary counselling for diabetes and hypertension. Training should emphasize the communication of FBDGs, DASH principles, salt and sugar reduction and the adaptation of recommendations to patients' economic and cultural circumstances. Simple documentation tools incorporated into existing patient records may improve continuity and monitoring without creating unnecessarily complex administrative requirements.

At the patient and community levels, the strong association between nutritional awareness and reported dietary practice supports continued nutrition education. However, the predominance of affordability and cultural food norms as barriers has demonstrated that education alone is insufficient. Dietary counselling should prioritize affordable, locally available foods and culturally acceptable modifications of commonly consumed meals. Wherever feasible, household members should be included in the planning processes, since food purchasing, preparation and consumption often occur within family settings.

Community outreach provides an additional opportunity to reinforce facility-based counselling. Collaboration among healthcare facilities, community health workers, and other relevant stakeholders could support practical nutrition education that is tailored to local circumstances. Overall, the implementation of nutritional policy should be approached as a coordinated, multilevel process that links policy guidance to facility systems, provider capacity, household realities and community support.

Strengths and Limitations

A major strength of this study was its mixed-methods design, which integrated patient-record, provider, facility and qualitative evidence to evaluate the implementation of nutritional policies across multiple SEM levels. The inclusion of 2,745 patient records across four health facilities provided a substantial quantitative basis for examining nutritional practices and clinical indicators. Integration of quantitative and qualitative findings also enabled the interpretation of implementation gaps within their organizational, economic, cultural, and community contexts.

Several limitations should be considered. Dietary practices were primarily self-reported and may therefore have been affected by recall and social-desirability bias. The provider sample was small ($n = 17$), limiting the precision and generalizability of provider-level comparisons. Causal conclusions about relationships among policy implementation, dietary practices and clinical indicators are precluded by the observational nature of the study. The very large facility-specific odds ratio observed for high dietary practice at LCH should therefore be interpreted with caution.

RBS measurements suitable for analysis were available in 74.9% of patient records and availability varied significantly across facilities. Glucose findings therefore represent patients with analyzable measurements and may not reflect the entire study population.

Clinical outcomes may also have been influenced by medication adherence, disease duration, comorbidities, and other factors not fully assessed. Finally, the study involved selected public health facilities in Region Three; findings may therefore not be directly generalizable to all healthcare facilities in Guyana.

Recommendations

1. **Strengthen facility-level implementation systems.** Health facilities should establish standardized procedures for delivering, documenting and monitoring nutritional counselling as part of the routine diabetes and hypertension care.
2. **Enhance healthcare-provider capacity.** Continuing professional development should strengthen one's practical competencies in the FBDGs, DASH principles, salt and sugar reduction, culturally responsive counselling and the communication of affordable dietary options.
3. **Provide practical and culturally appropriate patient education.** Nutritional guidelines should emphasize locally available foods, affordable meal choices and realistic modifications of commonly consumed foods rather than relying primarily on generic dietary messages.
4. **Expand community and household engagement.** Nutrition outreach should complement facility-based counselling and, where appropriate, should involve family members, who influence food purchasing and preparation.
5. **Strengthen monitoring and evaluation.** Routine assessment of counselling delivery, nutritional documentation, patient awareness, dietary practices and relevant clinical indicators should be incorporated into quality-improvement processes. Future research should evaluate the effectiveness and cost-effectiveness of

multilevel nutritional interventions, as well as their longer-term influence on dietary and clinical outcomes.

In summary, these measures should be implemented as complementary components of a coordinated approach, rather than interventions in isolation.

Conclusion

This mixed-methods study demonstrated that implementation of nutritional policy interventions for diabetes and hypertension across selected health facilities in Region Three, Guyana, is influenced by many interacting factors at multiple levels of the SEM. Although nutritional policy guidelines and patient education were evident, gaps remained in facility implementation, provider practice, counselling documentation and awareness of specific dietary approaches. Greater patient awareness was associated with better-reported dietary practices; however, affordability, cultural food norms and household practices influenced the feasibility of sustained dietary change.

Improving nutritional management therefore requires more than increasing patient knowledge. Effective policy translation depends on strengthening facility systems and providers' capacity while ensuring that dietary recommendations are affordable, culturally appropriate and practical within patients' everyday environments. Coordinated action across policy, organizational, provider, household, community, and individual levels is essential to strengthen nutritional interventions and support the management of diabetes and hypertension in Region Three.

Conflict of Interest

The authors declare no conflict of interest.

Consent for Publication

Not applicable. No individually identifiable participant information is presented in this manuscript.

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Ethics Approval

The study was approved by the Ministry of Health, Guyana Institutional Review Board (IRB) (Approval Reference 029/2026). Administrative permission was obtained from the respective health facilities. Participation in the primary data-collection components was voluntary, and informed consent was obtained in accordance with the approved research protocol. Confidentiality and privacy were maintained during the data collection, analysis and reporting

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Author Contributions

Selese Melanee Shepherd-Holder: Conceptualization, Methodology, Investigation, Formal Analysis, Writing – Original Draft and Final. Michael Olabode Tomori: Supervision, Project Administration, Writing – Review & Editing.

Data Availability

The datasets used and analyzed in this current study are not publicly available due to ethical and institutional restrictions on health service and participant information. De-identified data are available from the corresponding author on reasonable request and approval from the respective institutional and ethical authorities.

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