**Type of article:** Original Article

**Title of your Manuscript**

**Exploring the Effects of Dietary Patterns on Cardiovascular Health: A Cohort Study of Middle-aged Adults**

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***Short Running Title:***

**"Dietary Patterns and Cardiovascular Health" Top of Form**

(*Mandatory after acceptance*)

To which journal category (ies)/topic (s) does your manuscript belong?

*Select, by checking the box, at least “one” or more topics (mandatory)*

1. Food Chemistry, Engineering, Processing and Packaging
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3. Infant, Child, and Adolescent Nutrition
4. Nutrition, Metabolism, and Prevention of NCDs
5. Public Health Nutrition Policy & Economics
6. Nutritional Immunology and Reproduction
7. Food Microbiology, Safety and Toxicology
8. Sport and Exercise Nutrition
9. Functional and Novel Foods
10. Nutrition Education and Dietetics

**Abstract** *(Template to follow)*

**Background:** Childhood malnutrition remains a pressing public health concern in Cameroon particularly in the Far North region, where 5.2% of children under the age of five suffer from severe acute malnutrition (SAM), and 38.2% experience stunted growth. Chronic poverty, household food insecurity, lack of education and inadequate healthcare infrastructure contribute significantly to this alarming prevalence.

**Aims:** This study aims to contribute to the mitigation of malnutrition in the Far North Region of Cameroon by identifying specific risk factors associated with SAM among children aged 6 – 59 months in the Mokolo health district.

**Subjects and Methods:** A cross-sectional descriptive study enrolled 150 participants who met the inclusion criteria, employing consecutive sampling methodology. Data were collected through a face-to-face interview with participants, supplemented by a comprehensive assessment of hygienic practices and food security within the community. Bivariate and multivariate conditional logistic regression analysis were utilized to explore determinants of SAM. Independent variables with p values ≤ 0.05 were considered significantly associated with the nutritional status of children.

**Results:** Gastroenteritis, Adjusted Odd Ration (AOR) = 12.3 (5.5 – 27.5, p < 0.001), malaria AOR = 6.2 (2.8 – 13.8, p < 0.006) and pneumonia AOR = 6.7 (1.3 – 34.4, p = 0.01) emerged as specific comorbidities associated with SAM. Moreover, late introduction of complementary feeding AOR = 2.98 (1.36 – 6.53, p = 0.014), low food diversification AOR = 5.3 (2.5 – 11.8, p < 0.001) and the use of unhygienic traditional concoctions AOR = 2.8 (1.4 – 5.6, p = 0.004) were identified as significant risk factors. Furthermore, 63.3% of the participants reported inadequate access to safe drinking water (e.g., boreholes, wells, and streams) and 46.7% of caretakers had no formal education.

**Conclusions:** In addition to malaria, pneumonia and gastroenteritis, poor nutritional and hygienic practices serve as specific determinants of SAM. Addressing these challenges requires urgent attention to improve the nutritional status of children aged 6 – 59 months emphasizing nutrition education alongside comprehensive multi-sectorial interventions.

**Key-words:** Risk factors, Severe Acute Malnutrition, Children aged 6-59 months, Mokolo, Far-North Cameroon.

1. **Introduction**

Some advice:

* Commencing with a general observation related to the subject matter, it is evident that diet plays a pivotal role in shaping human health and well-being.
* Offering background elucidation serves to contextualize the study, shedding light on the broader landscape within which the research operates.
* Highlighting the significance of the topic underscores its relevance and identifies lacunae necessitating further investigation within the field.
* Conveying the purpose or objectives of the study provides clarity on the specific aims and intentions guiding the research endeavor.
* Presenting a structured overview of the paper delineates the trajectory of discourse, delineating the contents of each section and providing a roadmap for readers.
* Concluding with a transition sentence adeptly segues into the subsequent section of the paper, ensuring seamless continuity of narrative.

**Example:**

Nutrition constitutes a pivotal determinant of human health and well-being, exerting a profound influence on diverse facets encompassing physical vigor, mental acuity, disease mitigation, and overall longevity. In recent epochs, an escalating scholarly intrigue has been witnessed in unraveling the intricate interplay between dietary regimens and health outcomes, particularly within the ambit of chronic maladies such as obesity, diabetes mellitus, and cardiovascular afflictions **1**.

Notwithstanding the notable strides achieved in the realm of nutritional science, a plethora of enigmas persist and warrant further scholarly scrutiny **2, 3**. One such domain meriting meticulous inquiry pertains to the nexus between dietary paradigms and cardiovascular well-being. While meticulous scrutiny has been accorded to individual nutritional constituents, mounting evidence underscores the pivotal role of overarching dietary patterns in shaping cardiovascular vulnerability **4-6**.

The primary aim underpinning this investigation is to meticulously scrutinize the interrelationship between dietary patterns and cardiovascular health indices within a demographically heterogeneous cohort of middle-aged individuals. Specifically, our endeavor is predicated upon elucidating the differential impact of disparate dietary schemas, including but not limited to the Mediterranean regimen, Dietary Approaches to Stop Hypertension (DASH) protocol, and Western dietary framework, on the propensity for cardiovascular morbidities.

This treatise is poised to unfurl in a methodically structured manner. Initially, we shall proffer a comprehensive synthesis of extant scholarly discourse pertaining to dietary patterns vis-à-vis cardiovascular health. Subsequently, meticulous delineation of the methodological underpinnings characterizing our investigation, encompassing participant recruitment modalities, dietary evaluation methodologies, and outcome metric adjudication, shall ensue. Consequent to this, the exposition of our empirical findings will be expounded upon, with an emphasis on their interpretative implications vis-à-vis extant scholarship. Concluding remarks shall be marshaled to underscore the exigency for future research trajectories and public health imperatives, oriented towards the amelioration of cardiovascular health outcomes through judicious dietary interventions.

It is our fervent aspiration that the outcomes engendered by this inquiry shall furnish invaluable insights into the intricate interplay between dietary patterns and cardiovascular health, thereby furnishing a cogent evidentiary substrate underpinning preventive and therapeutic modalities tailored towards cardiovascular disease mitigation within the populace.

1. **Subjects / Material and Methods (Please select one)**

**2.1 Study design and population**

The study employed a prospective cohort design to investigate the association between dietary patterns and cardiovascular health outcomes. Participants were recruited from the general population residing in urban and suburban areas of a metropolitan region.

Inclusion criteria encompassed individuals aged 40-65 years, with no known history of cardiovascular disease at baseline. Exclusion criteria comprised individuals with pre-existing cardiovascular conditions, such as coronary artery disease, stroke, or heart failure, as well as those with severe comorbidities or cognitive impairments that could affect dietary assessment or follow-up.

A total of 2,000 participants were recruited through community outreach programs, advertisements in local newspapers, and electronic mailing lists of healthcare facilities. Each participant underwent a comprehensive baseline assessment, including demographic data collection, medical history review, physical examination, and dietary assessment using validated food frequency questionnaires.

Follow-up evaluations were conducted annually over a period of 10 years to ascertain incident cardiovascular events, including myocardial infarction, stroke, and cardiovascular-related mortality. Additional data on dietary intake, lifestyle factors, medication use, and clinical outcomes were collected at each follow-up visit.

Ethical approval was obtained from the Institutional Review Board of the participating institutions, and all participants provided written informed consent prior to enrollment in the study.

**2.2 Sample collection and preparation**

Blood samples were collected from participants following an overnight fast of at least 8 hours. Venous blood was drawn by trained phlebotomists using standardized procedures to minimize variability. Samples were collected into vacutainer tubes containing ethylenediaminetetraacetic acid (EDTA) as an anticoagulant for plasma isolation.

Upon collection, blood samples were immediately centrifuged at 3000 rpm for 15 minutes at 4°C to separate plasma from cellular components. Plasma aliquots were then transferred into labeled cryovials and stored at -80°C until further analysis.

For urine collection, participants were provided with sterile containers and instructed to collect their first morning void urine samples. Urine samples were stored at 4°C immediately after collection and processed within 2 hours to minimize degradation of analytes.

Upon arrival at the laboratory, urine samples were aliquoted into sterile tubes and centrifuged at 2000 rpm for 10 minutes at room temperature to remove any particulate matter. Supernatants were then transferred into labeled cryovials and stored at -20°C until biochemical analysis.

All sample handling and processing procedures were conducted following Good Laboratory Practice guidelines to ensure the integrity and reproducibility of results. Quality control measures, including the use of standardized protocols and regular calibration of equipment, were implemented throughout the sample collection and preparation process to minimize variability and ensure the accuracy of analytical measurements.

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**2.3** **Sample analysis**

Plasma samples were analyzed for lipid profile parameters, including total cholesterol, triglycerides, high-density lipoprotein cholesterol (HDL-C), and low-density lipoprotein cholesterol (LDL-C), using enzymatic colorimetric assays following standardized protocols (e.g., kits from ABC Diagnostics, Inc.).

For total cholesterol measurement, plasma samples were treated with cholesterol esterase and cholesterol oxidase enzymes to produce a colorimetric product proportional to the cholesterol concentration, which was then quantified spectrophotometrically at 500 nm.

Triglycerides were measured using a similar enzymatic colorimetric assay, where triglycerides were hydrolyzed to produce glycerol and fatty acids by lipoprotein lipase and glycerol kinase enzymes. The resulting glycerol was then oxidized to generate a colorimetric product measured at 540 nm.

HDL-C was quantified using a direct method, where non-HDL lipoproteins were precipitated using a polyethylene glycol solution. The remaining HDL particles were then reacted with cholesterol esterase and cholesterol oxidase enzymes to produce a colorimetric product measured at 500 nm.

LDL-C levels were estimated using the Friedewald equation, which calculates LDL-C concentration indirectly using measurements of total cholesterol, HDL-C, and triglycerides. This method is commonly employed when plasma triglyceride levels are below 400 mg/dL.

All analyses were performed in duplicate, and the mean values were used for data interpretation. Quality control measures, including the use of commercial control sera and regular calibration of equipment, were implemented to ensure the accuracy and precision of analytical measurements.

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 **2.4 Statistical analysis**

Data analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 25.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were used to summarize demographic characteristics and baseline clinical parameters of the study participants. Continuous variables were presented as means ± standard deviations (SD), while categorical variables were expressed as frequencies and percentages.

To assess the impact of the intervention on lipid profiles and oxidant/antioxidant stress biomarkers, repeated measures analysis of variance (ANOVA) was conducted. The between-subject factor was the treatment group (experimental vs. control), and the within-subject factor was time (baseline vs. post-intervention). Post-hoc pairwise comparisons with Bonferroni correction were performed to identify specific differences between time points within each group.

Additionally, Pearson correlation analysis was conducted to explore the relationship between changes in lipid profiles and oxidant/antioxidant stress biomarkers. Covariates such as age, sex, and baseline lipid levels were adjusted for in regression models to account for potential confounding effects.

All statistical tests were two-tailed, and a p-value < 0.05 was considered statistically significant. Data are presented as adjusted means or correlation coefficients with corresponding 95% confidence intervals (CI) where applicable.

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1. **Results**

**3.1 Characteristics of the study participants**

A total of 120 participants (60 males and 60 females) aged between 40 and 60 years were enrolled in the study. The mean age of the participants was 51.3 ± 4.2 years. The majority of the participants were married (80%), while 15% were single and 5% were divorced or widowed. Regarding educational status, 40% of the participants had completed secondary education, 35% had a bachelor's degree, and 25% had a master's or doctoral degree.

In terms of occupation, 45% of the participants were employed in white-collar jobs, such as office work or management, while 30% were engaged in blue-collar occupations, including skilled or unskilled labor. The remaining 25% were unemployed or retired. The average household income ranged from $30,000 to $70,000 annually, with a median income of $50,000.

The majority of the participants reported a sedentary lifestyle, with only 20% engaging in regular physical activity for at least 30 minutes per day, three times a week. Regarding smoking status, 25% of the participants were current smokers, 40% were former smokers, and 35% had never smoked.

Overall, the study population was representative of the middle-aged adult population in the urban area, with a diverse socioeconomic background and lifestyle habits.

Here is an example of how you can summarize the characteristics of study participants in Table 1:

**Table 1.** Characteristics of Study Participants

|  |  |  |  |
| --- | --- | --- | --- |
| **Characteristic** | **Total (n=120)** | **Male (n=60)** | **Female (n=60)** |
| **Age (years), Mean ± SD** | 51.3 ± 4.2 | 52.1 ± 3.9 | 50.5 ± 4.5 |
| **Marital Status** |  |  |  |
| - Married | 96 (80%) | 48 (80%) | 48 (80%) |
| - Single | 18 (15%) | 10 (16.7%) | 8 (13.3%) |
| - Divorced/Widowed | 6 (5%) | 2 (3.3%) | 4 (6.7%) |
| **Education Level** |  |  |  |
| - Secondary | 48 (40%) | 25 (41.7%) | 23 (38.3%) |
| - Bachelor's Degree | 42 (35%) | 20 (33.3%) | 22 (36.7%) |
| - Master's/Doctoral | 30 (25%) | 15 (25%) | 15 (25%) |
| **Occupation** |  |  |  |
| - White-collar | 54 (45%) | 30 (50%) | 24 (40%) |
| - Blue-collar | 36 (30%) | 18 (30%) | 18 (30%) |
| - Unemployed/Retired | 30 (25%) | 12 (20%) | 18 (30%) |
| **Physical Activity** |  |  |  |
| - Sedentary | 96 (80%) | 45 (75%) | 51 (85%) |
| - Active | 24 (20%) | 15 (25%) | 9 (15%) |
| **Smoking Status** |  |  |  |
| - Current Smoker | 30 (25%) | 20 (33.3%) | 10 (16.7%) |
| - Former Smoker | 48 (40%) | 25 (41.7%) | 23 (38.3%) |
| - Never Smoked | 42 (35%) | 15 (25%) | 27 (45%) |

*Please read carefully the instructions for authors to know the number of tables allowed.*

Table 1 provides a summary of the demographic and lifestyle characteristics of the study participants, including age, marital status, education level, occupation, physical activity, and smoking status, stratified by gender.

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**Figure 1.** Title of Figure 1(with high resolution) please see the instructions for authors

*Please read carefully the instructions for authors to know the number of figures allowed and figures characteristics.*

 Figure 1 shows the distribution of Body Mass Index (BMI) among study participants. The x-axis represents BMI categories (Underweight, Normal weight, Overweight, and Obese), while the y-axis represents the percentage of participants in each category. The bar graph illustrates that the majority of participants fall within the normal weight category, followed by overweight and obese categories, with a smaller proportion classified as underweight.

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**3.2 Dietary Patterns**

Principal component analysis identified three major dietary patterns: Mediterranean, Western, and prudent. The Mediterranean pattern was characterized by high intake of fruits, vegetables, whole grains, fish, and olive oil, while the Western pattern was characterized by high consumption of red and processed meats, sugary snacks, and fried foods. The prudent pattern was characterized by high consumption of fruits, vegetables, whole grains, and lean proteins.

**3.3 Association with Cardiovascular Risk**

Participants with high adherence to the Mediterranean diet had a significantly lower risk of developing cardiovascular disease compared to those with low adherence (HR = 0.65, 95% CI 0.50-0.85, p < 0.001). In contrast, participants with high adherence to the Western diet had a significantly higher risk of cardiovascular disease (HR = 1.45, 95% CI 1.10-1.90, p = 0.005). The prudent diet showed a trend towards lower cardiovascular risk, although this association did not reach statistical significance (HR = 0.80, 95% CI 0.60-1.05, p = 0.12).

**3.4 Subgroup Analysis**

Subgroup analysis stratified by age and sex revealed consistent associations between dietary patterns and cardiovascular risk across different demographic groups. However, there was a stronger protective effect of the Mediterranean diet observed in older adults (HR = 0.50, 95% CI 0.35-0.70, p < 0.001) compared to younger adults (HR = 0.75, 95% CI 0.55-1.00, p = 0.05).

**Table 2.** Title………

|  |  |  |  |  |  |
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1. **Discussion**

The findings of this study shed light on the complex relationship between dietary patterns and cardiovascular health outcomes. Our analysis revealed several key insights that warrant discussion.

Firstly, our results indicate that adherence to a Mediterranean diet was associated with a significantly lower risk of cardiovascular disease (CVD) incidence. This finding is consistent with previous research highlighting the cardioprotective effects of the Mediterranean diet, characterized by high consumption of fruits, vegetables, whole grains, fish, and olive oil, and low intake of red meat and processed foods. The abundance of antioxidants, omega-3 fatty acids, and fiber in this diet may contribute to its beneficial effects on cardiovascular health.

Secondly, we observed a positive association between adherence to a Western dietary pattern and increased risk of CVD. The Western diet, characterized by high consumption of red and processed meats, sugary snacks, refined grains, and fried foods, has been consistently linked to adverse cardiovascular outcomes. The high levels of saturated fats, cholesterol, and added sugars in this diet may contribute to inflammation, oxidative stress, and endothelial dysfunction, predisposing individuals to CVD.

Furthermore, our study highlights the importance of considering dietary patterns as a whole rather than focusing solely on individual nutrients. While nutrients such as saturated fats and cholesterol have traditionally been targeted for CVD prevention, our findings suggest that overall dietary patterns may have a more significant impact on cardiovascular risk. This underscores the importance of promoting healthy dietary patterns, such as the Mediterranean diet, as a primary prevention strategy for reducing CVD burden.

It is worth noting that our study has several limitations. Firstly, dietary assessment methods, such as food frequency questionnaires, are subject to recall bias and may not capture true dietary intake accurately. Additionally, the observational nature of our study precludes establishing causality, and residual confounding factors may have influenced our results.

In conclusion, our findings support the cardioprotective effects of the Mediterranean diet and underscore the detrimental impact of a Western dietary pattern on cardiovascular health. Future research should focus on elucidating the underlying mechanisms linking dietary patterns to CVD risk and exploring strategies for promoting healthy dietary behaviors at the population level.

This example highlights key findings, discusses their implications, acknowledges limitations, and suggests directions for future research.

**Limitations of the study:** **Selection Bias**: The study sample consisted of predominantly middle-aged adults from urban areas, which may limit the generalizability of the findings to other populations, such as rural or elderly individuals.

**Self-Reported Data**: Dietary intake was assessed using self-reported food frequency questionnaires, which are subject to recall bias and may not accurately capture actual dietary habits. Additionally, participants may have provided socially desirable responses, leading to overestimation or underestimation of certain food groups.

**Confounding Variables:** Despite adjusting for various potential confounders, such as age, sex, and physical activity, residual confounding may still exist due to unmeasured or unknown factors that influence both dietary patterns and cardiovascular outcomes.

**Limited Follow-Up Period:** The study had a relatively short follow-up period of 5 years, which may not capture the long-term effects of dietary patterns on cardiovascular risk. Longer-term studies are needed to assess the sustained impact of dietary interventions on health outcomes.

**Statistical Power:** The sample size may have been insufficient to detect small or moderate associations between dietary patterns and cardiovascular risk, particularly in subgroup analyses or stratified analyses by demographic factors.

These limitations should be considered when interpreting the findings of the study and designing future research studies to address these shortcomings.

1. **Conclusions**

In conclusion, our study provides valuable insights into the relationship between dietary patterns and cardiovascular health outcomes in middle-aged adults. We found that adherence to a Mediterranean diet was associated with a lower risk of developing cardiovascular disease, while a Western diet was associated with an increased risk. These findings highlight the importance of promoting healthy dietary patterns, such as the Mediterranean diet, for the prevention of cardiovascular disease.

However, it is essential to acknowledge the limitations of our study, including the reliance on self-reported dietary data and the potential for residual confounding. Future research should focus on conducting longitudinal studies with larger sample sizes and longer follow-up periods to confirm these findings and explore potential mechanisms underlying the observed associations.

Overall, our study contributes to the growing body of evidence supporting the role of diet in cardiovascular health and underscores the importance of public health interventions aimed at promoting healthy dietary patterns. By adopting a Mediterranean-style diet rich in fruits, vegetables, whole grains, and healthy fats, individuals can reduce their risk of cardiovascular disease and improve their overall health and well-being.

**References**

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