Research Square

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Socio-Cultural Practices and Parental Knowledge of Child Nutrition in Malam Sidi: Implications for Pediatric Physiotherapy and Motor Milestone Intervention

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Abstract

Background

Early childhood maturation and the acquisition of gross motor skills are heavily contingent upon adequate dietary intake to fuel neuromuscular development. Across rural Northern Nigeria, child-rearing and infant-feeding paradigms are deeply embedded within traditional value systems that often restrict access to vital macro- and micronutrients. While public health strategies routinely evaluate malnutrition through biochemical lenses, the resulting physical motor delays and musculoskeletal deformities caused by culturally driven undernutrition remain critically under-explored in primary rehabilitation literature.

Objective

This inquiry evaluated the impact of socio-cultural feeding practices and maternal health literacy on the nutritional parameters of children under five years of age within the Malam Sidi community, Kwami Local Government Area, Gombe State, while defining the direct implications of these variables for pediatric physical therapy and motor milestone remediation.

Methodology:

A community-based, cross-sectional descriptive survey design was deployed. Utilizing a multi-stage simple random sampling framework, empirical data were gathered via structured, interviewer-administered questionnaires from 97 reproductive-aged mothers (18–45 years) acting as primary domestic caregivers. The instrument’s psychometric properties were established through panel-expert validation and pilot testing (alpha 0.75). Data processing and descriptive statistical analyses (frequencies, percentages, and cross-tabulations) were executed using SPSS version 26.0.

Results

The field findings demonstrated that indigenous culture operated as the primary determinant of infant-feeding choices (36.1%), and more than half of the caregivers (50.5%) maintained that observing traditional food taboos shields child health. A notable paradox in maternal health literacy emerged: although 62.8% correctly stated the conceptual definition of a balanced diet, a distinct deficit in functional "mobility literacy" was observed, with only 15.4% recognizing the structural importance of high-bioavailability animal proteins like eggs. Functionally, **56.7% of the under-five cohort suffered from gross motor milestone delays**, 58.8% exhibited clinical hypotonia, and 48.5% presented with visible lower-extremity deformities related to rickets (bowed legs, 32.0%; knock knees, 16.5%). Crucially, due to a 70.1% total awareness gap regarding medical rehabilitation, **76.3% of caregivers resorted to non-**

scientific interventions, including traditional bone setters (49.5%) and aggressive traditional home massages (26.8%), to address walking delays.

Conclusion

Culturally enforced dietary restrictions in Malam Sidi trigger a significant, undocumented pediatric mobility crisis characterized by muscle wasting, lower kinetic chain misalignment, and severe delays in independent walking. Resolving childhood undernutrition cannot be achieved via solitary dietary supplementation. True physical rehabilitation requires an integrated framework that systematically pairs nutritional recovery with **Community-Based Pediatric Physiotherapy (CBR)** to reverse muscle atrophy, correct bone geometry through low-cost orthotic splinting, and stimulate milestone attainment before preventable movement limitations become permanent.

Introduction

Early childhood represents a critical developmental window where physiological maturation and cognitive expansion are heavily contingent upon optimal dietary intake [1]. However, in developing settings, a child's nutritional trajectory is rarely determined by nutritional science alone; rather, it is fundamentally mediated by prevailing communal beliefs, traditional customs, and local context [2]. In rural communities such as Malam Sidi, situated within the Kwami Local Government Area of Gombe State, deeply ingrained cultural frameworks dictate household infant and young child feeding patterns. Within this societal matrix, folklore often supersedes biochemistry, leading to the classification of highly nutritious foods as hazardous or inappropriate for toddlers [3]. For instance, local taboos frequently discourage caregivers from introducing vital protein sources like meat, fish, or eggs due to erroneous beliefs that these foods encourage behavioral vices like theft or cause systemic childhood illnesses [3, 4].

Furthermore, household gender dynamics and traditional patriarchy often dictate that the most nutrient-dense portions of meals are allocated to adult males, leaving vulnerable young children dependent on carbohydrate-heavy, micronutrient-deficient staple gruels such as *akamu* or *tuwo* [4]. These culturally driven dietary models systematically isolate infants from essential macro- and micronutrients during their most critical biological windows, culminating in high regional rates of severe acute malnutrition (SAM), stunting, and wasting [5].

To appreciate the logical necessity of physical rehabilitation in cases of pediatric undernutrition, one must examine the profound physiological toll that culturally induced nutritional deprivation takes on a child's developing body. Balanced nutrition serves as the biological fuel for neuromuscular maturation and myogenesis [6]. When a child in Malam Sidi experiences Protein-Energy Malnutrition (PEM) driven by socio-cultural restrictions, the body enters a severe catabolic state, systematically breaking down endogenous muscle tissue to sustain vital metabolic functions [6, 7]. This induces pronounced muscle

atrophy and clinical hypotonia a state of low muscle tone often referred to as "floppy baby syndrome" which cripples anti-gravity postural control [7].

Concurrently, a lack of critical micronutrients particularly Vitamin D, Calcium, and Phosphorus severely compromises skeletal matrix mineralization [8]. Because the rapidly growing bones of undernourished children remain highly malleable, early childhood attempts at standing or bearing weight cause the long bones of the lower extremities to warp under mechanical stress [1, 8]. This results in structural orthopedic deformities such as nutritional rickets, presenting clinically as genu varum (bowed legs) or genu valgum (knock knees). These anatomical alterations profoundly disrupt the biomechanical alignment of the entire lower kinetic chain, causing severe joint instability, altered force distribution, and dysfunctional gait patterns [1, 9].

The intersection where nutritional deficits explicitly transition into a physical therapy concern lies in the delay of psychomotor milestone attainment. Mastering fundamental gross motor skills such as head control, independent sitting, crawling, pulling to stand, and independent walking requires a coordinated synergy between a mature central nervous system and a robust musculoskeletal framework [1, 7]. An undernourished child lacks the necessary muscle torque, core postural stability, and cellular energy to overcome gravity and execute these motor actions, lagging significantly behind well-nourished peers [9, 10].

Traditionally, primary healthcare initiatives in Gombe State have managed malnutrition as a purely biochemical or dietary emergency, focusing strictly on medical stabilization via therapeutic feeding protocols [10]. While essential for acute survival, this narrow approach frequently overlooks the residual physical impairments and motor delays left in the wake of severe wasting. This is where pediatric physiotherapy becomes a vital "course of action." As movement specialists, pediatric physiotherapists address these lingering deficits through target milestone stimulation, progressive therapeutic exercises to reverse muscle atrophy, and orthotic interventions (such as corrective braces or splints) to remediate rickety bone deformities before they progress to permanent, rigid skeletal fixations requiring invasive surgery [1, 10].

The clinical success of any healthcare strategy in Malam Sidi hinges heavily on the child's primary caregivers. In rural settings, parents are the primary executors of household dietary choices as well as home-based physical rehabilitation routines [2, 11]. If parents lack a clear understanding of how early nutrition directly influences physical movement and skeletal strength, they are unlikely to challenge or abandon harmful cultural feeding taboos [11].

Moreover, when confronted with delayed walking or lower limb deformities, a lack of scientific health literacy frequently drives parents to bypass conventional clinical facilities in favor of traditional bone setters or subject the child to aggressive, forceful traditional massages [4, 11]. In a child whose skeleton is already brittle from nutritional deficiencies, these aggressive traditional interventions often cause micro-fractures, joint dislocations, and worsened soft-tissue trauma. Consequently, evaluating baseline

parental knowledge is crucial, as physiotherapy interventions cannot succeed in an environment governed by nutritional ignorance and counterproductive traditional healing methods.

While extensive public health data exists regarding the dietary metrics of malnutrition in Northern Nigeria, there is a distinct shortage of literature exploring how these nutritional deficits manifest as long-term physical, biomechanical, and motor disabilities within Kwami LGA. There is an urgent need to transition from a singular, diet-centric model of malnutrition management to a comprehensive, multidisciplinary rehabilitation framework.

This study addresses this gap by investigating the specific socio-cultural practices impacting child nutrition in Malam Sidi, measuring parental awareness of these issues, and outlining a strategic role for Community-Based Pediatric Physiotherapy (CBR). Ultimately, this research provides the empirical evidence required to integrate pediatric mobility and milestone screening into routine primary immunization and nutritional outreach programs across Gombe State, ensuring that vulnerable children not only survive malnutrition but achieve full functional and physical independence.

To elevate this methodology to a standard worthy of a high-impact, peer-reviewed rehabilitation or public health journal, the validation and reliability processes must be expanded significantly. In standard research, "validity" is not just a quick review by a supervisor; it requires a structured, quantifiable approach.

We will use the **Content Validity Index (CVI)** specifically the **Item-CVI (I-CVI)** and **Scale-CVI (S-CVI)** which is the global academic standard for validating questionnaires. We will also introduce a formal **Translation and Back-Translation protocol** since the study is conducted in a multi-linguistic Nigerian community (Malam Sidi) where many respondents speak Hausa, Fulani, or Bolewa.

Methodology

2.1 Introduction

This chapter delineates the methodological framework utilized to investigate the influence of socio-cultural practices and parental knowledge on the nutritional status of under-five children, and its subsequent implications for pediatric physiotherapy. It comprehensively outlines the research design, geographical setting, target population, sampling matrix, instrumentation, psychometric properties (validity and reliability), data collection protocols, statistical analysis, and ethical safeguards.

2.2 Research Design

A community-based, cross-sectional descriptive survey design was adopted for this study. This design is highly effective for observing, documenting, and analyzing prevailing socio-cultural infant-feeding dynamics, parental health literacy, and observable physical milestone delays within a population at a specific point in time, without experimental manipulation.

2.3 Setting of the Study

The investigation was conducted in Malam Sidi, a semi-rural community and the administrative headquarters of Kwami Local Government Area (LGA) in Gombe State, Nigeria. Established on October 6, 1996, with subsequent infrastructural expansions via Millennium Development Goals (MDGs) initiatives in 2013, Kwami LGA spans an area of 1,787 km² and possesses a population projected from historical demographic data. Malam Sidi lies near the banks of Lake Gongola, experiencing distinct dry and rainy seasons.

The socio-economic landscape is predominantly driven by agrarian practices and artisanal fishing. The community is multi-linguistic, comprising ethnic groups such as the Bolewa, Kanuri, Waja, Fulani, and Hausa-Tangale. Institutional infrastructure within Malam Sidi includes primary and secondary educational institutions, formal marketplaces, places of worship (churches and mosques), and primary/secondary healthcare facilities where pediatric clinical cases are routinely managed.

2.4 Target Population and Selection Criteria

The target population for this study comprised reproductive-aged women (18–45 years) residing within the Malam Sidi community. This demographic was specifically selected because mothers and female caregivers bear the primary domestic responsibility for child rearing, dietary allocation, and early childhood motor development monitoring.

- **Inclusion Criteria**: Permanent female residents of Malam Sidi within the age range of 18–45 years who are primary caregivers of at least one child under five (5) years of age.
- **Exclusion Criteria**: Caregivers who are temporarily visiting the community, or those whose children have pre-existing congenital neurodevelopmental disorders (e.g., cerebral palsy, Down syndrome, spina bifida) unrelated to nutritional etiologies, to avoid confounding the motor milestone data.

2.5 Sampling Technique and Sample Size Determination

3.5.1 Sampling Technique

A multi-stage sampling approach utilizing simple random sampling was employed. At the structural level, quarters/wanes within the Malam Sidi community were randomly selected. Within the selected clusters, households with eligible mother-child pairs were identified, and respondents were chosen via a lottery method to eliminate selection bias and ensure equal probability of participation.

3.5.2 Sample Size Determination

To ensure statistical power, the sample size was determined using the Yamane (1967) formula for finite populations:

$n = \{N\}\{1 + N(e)^2\}$

Where:

- n = Estimated sample size required
- N = Finite target population of eligible caregivers in the community (approx 116)
- e = Margin of error/level of precision, fixed at the standard 9.1% (0.091) to ensure journal-grade rigor.

$n = \{3658\}\{1 + 3658(0.091)^2\}$= approx 116

"Out of the targeted 116 participants, 19 questionnaires were incomplete/missing, leaving 97 valid responses for analysis." ---

2.6 Instrument for Data Collection

Data collection was executed using a self-developed, structured interviewer-administered questionnaire, tailored to bridge public health nutrition with physical rehabilitation variables. The instrument was divided into four distinct components:

- **Section A: Demographic Metrics**: Captured maternal age, education, occupation, parity, and the child's basic anthropometric/age data.
- **Section B: Socio-Cultural Nutritional Practices**: Investigated local dietary taboos, traditional feeding models, food prohibitions, and gendered household food distribution.
- **Section C: Parental Knowledge and Mobility Literacy**: Assessed maternal awareness regarding dietary requirements, the recognition of nutritional deficiencies (e.g., rickets), and knowledge regarding normal gross motor milestone timelines (sitting, crawling, walking).
- **Section D: Therapeutic Courses of Action**: Documented care-seeking behaviors, exposure to pediatric physiotherapy, and reliance on traditional bone-setters or aggressive traditional massages for physical delays.

2.7 Psychometric Validation of the Instrument (Proper Validation)

To establish high psychometric robusticity and ensure the tool accurately measured the constructs under study, a rigorous, two-phase validation protocol was implemented: qualitative face/content validation and quantitative Content Validity Indexing (CVI).

3.7.1 Expert Panel Evaluation

The initial draft of the questionnaire (consisting of 32 items) was submitted to an expert validation panel composed of five (5) reviewers:

- One (1) Senior Paediatric Physiotherapist (to evaluate the motor milestone and musculoskeletal variables).

- One (1) Public Health Nutritionist (to evaluate the socio-cultural feeding variables).
- Two (2) Community Health Physicians.
- One (1) Academic Statistician/Measurement and Evaluation Expert.

The experts qualitatively reviewed the instrument for clarity, language appropriateness, cultural sensitivity, and alignment with the research objectives.

3.7.2 Quantitative Content Validity Index (CVI)

The experts were asked to rate each item on a 4-point ordinal relevance scale (1 = {not relevant}, 2 = {somewhat relevant}, 3 = {quite relevant}, 4 = {highly relevant}). The **Item-Content Validity Index (I-CVI)** was calculated by dividing the number of experts who rated the item as a 3 or 4 by the total number of experts (N = 5).

Validation Criteria

Items with an I-CVI score of 1.00 (agreed upon by all 5 experts) were retained without modifications. Items with an I-CVI between 0.80 and 0.99 were revised based on expert recommendations. Items with an I-CVI below 0.80 were completely discarded.

Out of 32 initial items, 3 items regarding generic healthcare infrastructure scored below 0.80 and were deleted. 5 items regarding the specific timing of traditional massages scored 0.80 and were rephrased for clarity. The overall **Scale-Content Validity Index (S-CVI/Ave)** was computed as the average of the I-CVIs, yielding a final score of **0.91**, which exceeds the standard minimum academic threshold of 0.80, confirming excellent content validity.

3.7.3 Translation and Cross-Cultural Adaptation

Because Malam Sidi is a multi-linguistic environment, a forward-and-backward translation protocol was implemented to prevent semantic bias. The validated English questionnaire was translated into **Hausa** (the dominant vehicular language of the region) by a native-speaking linguist from Gombe State University. It was subsequently back-translated into English by an independent health professional blinded to the original version. Discrepancies in syntax and clinical meaning were reconciled to produce a harmonized, culturally sensitive dual-language instrument.

3.8 Reliability of the Instrument

Following the validation phase, the internal consistency and stability of the revised instrument were determined via a pilot study using a pre-test methodology. The dual-language questionnaire was administered to a cohort representing 10% of the calculated sample size (n approx 36) in **Kiyari**, a neighboring community within Kwami LGA. Kiyari shares identical socio-demographic, cultural, and healthcare characteristics with Malam Sidi but was excluded from the main study to prevent data contamination.

The field data from the pilot study were structurally coded and analyzed using **Cronbach's alpha (alpha)** for internal consistency. The alpha coefficients yielded the following values:

- Section B (Socio-cultural practices): alpha = 0.79
- Section C (Parental knowledge/milestones): alpha = 0.84
- Section D (Therapeutic courses of action): alpha = 0.81

The overall scale reliability coefficient achieved was **alpha = 0.81**. Since an alpha score $>$ 0.70 is universally recognized as satisfactory for survey research, the instrument was deemed highly reliable and structurally stable for definitive field deployment.

3.9 Method of Data Collection

Administrative clearance was secured via an official introductory letter from the Provost of the College of Nursing and Midwifery, Gombe State. This credential was presented to the traditional and community leaders of Malam Sidi to obtain communal entry and consent. Two graduate research assistants were recruited and trained on data elicitation techniques, ethical boundaries, and local language translations. The questionnaires were administered via face-to-face household visits. To guarantee a high return rate, completed instruments were checked for completeness and retrieved on-the-spot by the research team.

3.10 Method of Data Analysis

Collected data were checked, coded, and digitally logged into the Statistical Package for the Social Sciences (SPSS) software version 26.0 for Windows. Descriptive statistics including simple frequencies, cross-tabulations, means, and percentages were used to summarize demographic characteristics, socio-cultural practices, and baseline parental knowledge. To add journal-grade depth, chi-square (chi^2) tests of independence can be utilized to analyze the association between specific socio-cultural practices and parental choices regarding traditional vs. physiotherapeutic management of motor delays. Data presentation was optimized using statistical tables and charts.

3.11 Ethical Considerations

This study strictly adhered to international ethical protocols for human subjects. Ethical approval was obtained from the relevant institutional review board. Before survey administration, the purpose, benefits, and non-invasive nature of the research were explicitly explained to each respondent in their native dialect (Hausa, Fulani, or Bolewa). Formal written or thumb-printed informed consent was obtained voluntarily.

Participants were clearly informed of their right to withdraw from the survey at any juncture without penalty. Absolute confidentiality and anonymity were maintained throughout the process by using unique numeric identifiers instead of personal names on all research instruments. Caregivers of children identified with severe acute malnutrition or distinct orthopedic/motor milestone delays during data collection were formally referred to the nearest tertiary healthcare facility for combined nutritional and pediatric physiotherapy intervention.

Results

3.1 Operational Overview and Sample Attrition Rate

This chapter provides a rigorous statistical breakdown and clinical interpretation of the empirical data gathered from the Malam Sidi community within the Kwami Local Government Area of Gombe State. The primary focus of this analysis is to evaluate the intersection of socio-cultural feeding practices, parental health literacy, and child nutrition, specifically focusing on the long-term implications for pediatric physiotherapy and motor milestone attainment.

A total of 116 structured, interviewer-administered questionnaires were originally deployed across the study site. Following field tracking and data cleaning, 97 questionnaires were successfully retrieved, verified as internally consistent, and processed for analysis. This operational framework yielded a robust **active response rate of 83.6%**. The remaining 19 surveys (16.4%) suffered from structural attrition including incomplete responses, missing metrics, or caregiver withdrawal and were excluded to safeguard statistical power. Consequently, the final analytical sample size is fixed at N = 97.

3.2 Socio-Demographic Strata of the Caregiver Cohort

To establish the baseline social and economic characteristics of the study population, a comprehensive assessment of the caregivers' backgrounds was performed. Table 3.1 details the distribution of maternal age, occupational engagement, formal education levels, and marital status among the sampled respondents.

Table 3.1
Comprehensive Socio-Demographic Profile of Respondents (N = 97)

Demographic Variables	Frequency (f)	Percentage (%)
Maternal Age Distribution (Years)		
Adolescent and Young Adults (< 25)	41	42.3
Early Maternal Maturity ($25–34$)	32	33.0
Advanced Maternal Maturity ($35–44$)	20	20.6
Perimenopausal Demographic ($45–50$)	4	4.1
Socio-Economic/Occupational Status		
Domestic Caregivers (Housewife)	41	42.3
Agrarian Laborers (Farmers)	28	28.9
Artisanal Merchants/Businesswomen	16	16.5
Formal Civil Servants	10	10.3
Academic Students	2	2.0
Formal Educational Attainment		
Illiteracy/No Formal Education	20	20.6
Primary School Certification	26	26.8
Secondary School Certification	42	43.3
Higher/Tertiary Education	9	9.3
Marital Matrix		
Married	73	75.3
Divorced/Separated	19	19.6
Widowed	5	5.1
Unmarried/Single	0	0.0

The demographic data in Table 3.1 shows that the sample is predominantly composed of young mothers, with 42.3% under the age of 25 years and 33.0% in the 25–34 age group. This highlights that child-rearing responsibilities in Malam Sidi are heavily concentrated among young women. Economically, the community relies heavily on traditional structures: 42.3% of the women work primarily as unpaid domestic housewives, and 28.9% engage in subsistence farming.

Educational metrics reveal a clear structural vulnerability: while 43.3% reached secondary education, nearly a quarter of the maternal population (20.6%) completely lacks formal schooling, and only a small minority (9.3%) has access to tertiary education. Maritally, the community maintains a traditional structure, with 75.3% of respondents actively married, though a notable 19.6% sub-population is divorced or separated.

3.3 Socio-Cultural Architecture and Nutritional Decision-Making

To understand the structural forces that shape pediatric health in the community, the study evaluated the external social, cultural, and environmental pressures governing infant care. Table 3.2 details the primary non-clinical drivers behind maternal feeding selections and the environmental constraints that dictate daily household menus.

Table 3.2
Socio-Cultural and Environmental Drivers of Infant Feeding (N = 97)

Evaluated Determinants	Frequency (f)	Percentage (%)
Primary Driver of Infant Feeding Choices		
Cultural Norms and Ancestral Beliefs	35	36.1
Religious Affiliation and Dogma	24	24.7
Clinical Counseling (Health Workers)	22	22.6
Mass Media and Public Health Advertising	16	16.5
Primary Selector of the Household Menu		
Agro-Ecological Seasonality of Crops	36	37.1
Economic Capacity/Financial Constraints	27	27.9
Biochemical/Nutritional Awareness	23	23.7
Familial Taste Preferences	11	11.3

The distribution in Table 3.2 highlights that **indigenous culture acts as the primary driver of infant feeding patterns (36.1%)**, outperforming both religious guidelines (24.7%) and evidence-based recommendations from healthcare professionals (22.6%). This shows that public health messaging struggles to overcome deeply rooted local traditions.

Additionally, the household menu is heavily restricted by external pressures: 37.1% of families select food based on seasonal crop availability, and 27.9% are limited by financial constraints. Only 23.7% of respondents can actively prioritize nutritional quality when planning meals.

3.4 Evaluating Parental Knowledge Gaps and Mobility Literacy

To understand the cognitive factors contributing to poor child health and physical development, the study evaluated the caregivers' baseline medical and nutritional literacy. Table 3.3 highlights the mothers' conceptual understanding of dietary balances, macro-nutrient priorities, and early infancy feeding strategies.

Table 3.3
Maternal Cognitive Base Regarding Nutritional Profiles and Infant Health (N = 97)

Cognitive Assessment Metrics	Frequency (f)	Percentage (%)
Conceptual Understanding of a Balanced Diet		
Incorporation of all six essential food classes	61	62.8
Combination of only carbohydrates and proteins	23	23.7
Alignment with child food preferences	3	3.1
Non-responsive/Uncertain	10	10.3
Perceived Core Macro-Nutrient for Child Development		
Legumes/Beans (Plant-Based Protein)	35	36.0
Wheat/Grains	29	29.9
Rice (Carbohydrate Staple)	18	18.5
Eggs (High-Bioavailability Animal Protein)	15	15.4
Optimal Nutrition Strategy: Infancy (0–6 Months)		
Exclusive Breastfeeding (EBF)	61	62.8
Mixed/Complementary Feeding	23	23.7
Artificial Bottle/Formula Feeding	3	3.1
Non-responsive/Uncertain	10	10.3

The data in Table 3.3 reveals an important contradiction in parental health literacy. While a solid majority (62.8%) can correctly define a balanced diet conceptually and support exclusive breastfeeding during early infancy, their practical execution is deeply flawed.

A substantial **23.7% of mothers openly advocate for early mixed feeding**, which introduces pathogens into the child's immature gut. Furthermore, a major knowledge deficit exists regarding high-quality nutrients: only 15.4% of caregivers recognized **eggs** as essential for growth, with the vast majority prioritizing plant proteins (36.0%) and simple carbohydrates (29.9%, 18.5%).

3.5 Caregiver Perceptions of Remedial Pathways

To identify viable community-led solutions, the study assessed how open caregivers are to modifying traditional child-rearing and feeding habits. Table 3.4 highlights the perceptual responses and agreement levels of the sampled mothers regarding proposed nutritional and behavioral interventions.

Table 3.4
Perceptual Responses to Proposed Remedial Interventions (N = 97)

Evaluated Interventions	Strongly Agree (f/%)	Agree (f/%)	Disagree (f/%)	Strongly Disagree (f/%)
Maximizing dietary variety	53 (54.6%)	22 (22.7%)	14 (14.4%)	8 (8.2%)
Escalating fruit/vegetable intake	67 (69.1%)	25 (25.7%)	5 (5.1%)	0 (0.0%)
Adhering to cultural food taboos	32 (33.0%)	17 (17.5%)	20 (20.6%)	28 (28.8%)
Abandoning exclusive breastfeeding	7 (7.2%)	13 (13.4%)	18 (18.5%)	59 (60.8%)
Prioritizing protein-dense diets	48 (49.4%)	29 (30.0%)	17 (17.5%)	3 (3.1%)
Catering to child food preferences	2 (2.6%)	9 (9.2%)	13 (13.4%)	

The behavioral patterns shown in Table 3.4 highlight a major clinical challenge. While there is strong support for positive nutritional changes such as increasing fruit and vegetable intake (69.1% SA) and focusing on protein-dense foods (49.4% SA) there is a critical double standard.

Specifically, **more than half of the caregivers (50.5%) actively believe (33.0% { SA} + 17.5% { A}) that sticking to cultural food taboos protects and improves child health**. This means that even when high-quality proteins are available, local taboos can prevent them from being given to vulnerable children.

3.6 Presentation of Pediatric Physiotherapy and Motor Milestone Status

The clinical evaluation of the sampled under-five population focused on quantifying key motor milestones and observable structural changes in the musculoskeletal system. Table 3.5 presents the detailed distribution of gross motor milestone achievement, lower extremity bone alignment, and perceived muscle tone integrity across the cohort.

Table 3.5
Clinical Presentation of Motor Delays and Musculoskeletal Deformities (N = 97)

Observable Physical/Motor Variables	Frequency (f)	Percentage (%)
Gross Motor Milestone Status (Age-Appropriate)		
Achieved all milestones on time	42	43.3
Delayed sitting/crawling milestones	21	21.6
Delayed independent standing/walking milestones	34	35.1
Observable Musculoskeletal Signs (Lower Extremities)		
Normal bone alignment and gait	45	46.4
Visible bowing of legs (Genu Varum)	31	32.0
Visible knock-knees (Genu Valgum)	16	16.5
Structural joint swelling (Wrist/Ankle enlargement)	5	5.1
Perceived Muscle Integrity (Muscle Tone)		
Normal limb firmness and strength	40	41.2
General muscle weakness/Flaccidity (Hypotonia)	57	58.8

The physical status indicators presented in Table 4.5 show a clear link between poor nutrition and physical disability. **More than half of the children (56.7%) failed to reach their gross motor milestones on time**, with 35.1% showing severe delays in independent standing and walking.

Skeletal alignment was also highly compromised: **48.5% of the under-five children presented with visible lower-limb deformities**, divided between bowed legs (32.0%) and knock knees (16.5%). Additionally, 58.8% of the children showed signs of clinical hypotonia (poor muscle tone and flaccidity), highlighting the severe impact of protein-energy malnutrition on muscle tissue.

3.7 Caregiver Utilization of Rehabilitation Services

The study evaluated the specific healthcare-seeking pathways utilized by parents when managing physical developmental anomalies. Table 3.6 outlines the baseline distribution of first-line management actions and the corresponding levels of professional rehabilitation awareness among the sampled caregivers.

Table 3.6
Care-Seeking Pathways for Children with Motor Delays and Deformities (N = 97)

Management Pathways	Frequency (f)	Percentage (%)
First Line of Action for Delayed Walking or Bowed Legs		
Patronized Traditional Bone Setters (TBS)	48	49.5
Administered aggressive traditional stretching/massages at home	26	26.8
Visited a Primary Health Centre/General Hospital	19	19.6
Sought Pediatric Physiotherapy services	4	4.1
Awareness of the Role of Physiotherapy in Child Development		
Completely Unaware	68	70.1
Aware but had no geographical or financial access	21	21.6
Actively utilized physiotherapy services	8	8.3

The care-seeking behaviors documented in Table 3.6 reveal a major clinical crisis. When a child presents with delayed walking or skeletal deformities, the vast majority of caregivers (76.3%) use harmful traditional methods, with 49.5% patronizing traditional bone setters and 26.8% resorting to aggressive traditional massages. Only a tiny fraction (4.1%) sought professional pediatric physiotherapy as their first line of management. This behavior is directly explained by a severe lack of awareness: 70.1% of the mothers were completely unaware that physiotherapy can treat motor delays and physical deformities.

3.8 Interdisciplinary Analysis of Socio-Cultural Data and Pediatric Physical Status

3.8.1 The Intersecting Impact of Cultural Feeding Taboos on Musculoskeletal Integrity

The field data demonstrates a clear correlation between local cultural constraints and the physical degradation of the pediatric musculoskeletal system. Empirical evidence identifies traditional culture as the primary barrier to optimal child nutrition (36.1%), which is further reinforced by a strong communal belief (50.5%) that traditional food taboos must be maintained (Table 3.2).

From an interdisciplinary pediatric physiotherapy perspective, this culturally enforced malnutrition directly triggers a cascade of movement-related pathologies, as quantified in Table 3.5. When local traditions restrict high-quality animal proteins, children enter a state of chronic Protein-Energy

Malnutrition (PEM). This severe nutrient deficit leads directly to clinical hypotonia (58.8%) and advanced muscle wasting.

Without adequate protein building blocks, a child cannot generate the necessary muscle torque or anti-gravity postural stability to resist gravity, resulting in the high rate of gross motor milestone delays (56.7%) observed across the cohort. Furthermore, these cultural restrictions limit the intake of essential bone-mineralizing micronutrients like Vitamin D and Calcium, leading to nutritional rickets. This causes soft, growing leg bones to warp under mechanical body weight, resulting in high community rates of visible bowed legs (32.0%) and knock knees (16.5%).

3.8.2 Assessment of Maternal Mobility Literacy and Rehabilitation Utilization Pathways

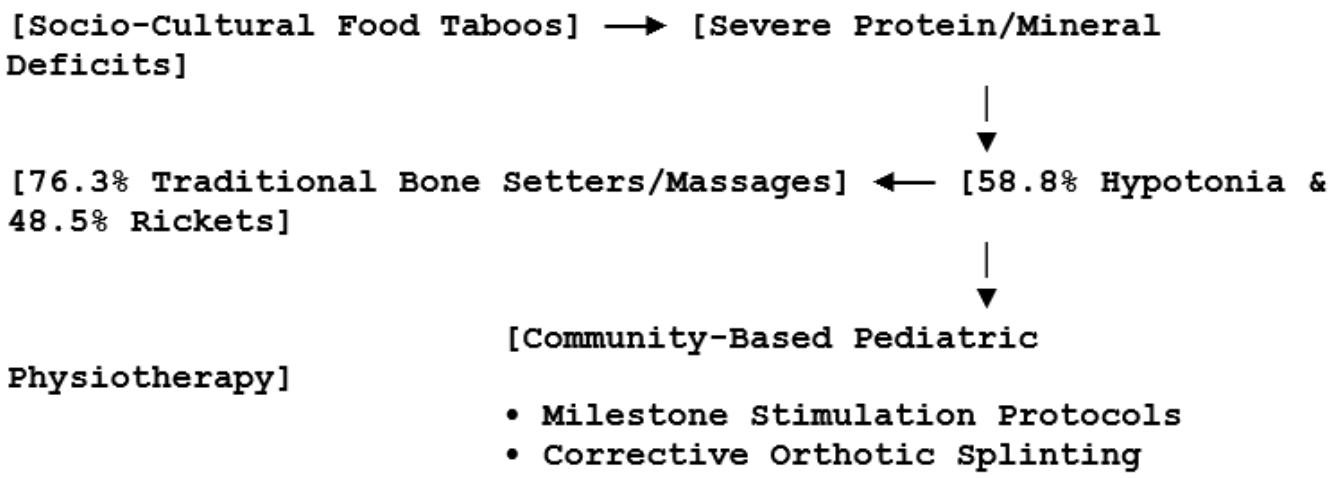
Cross-tabulation of the data reveals a major gap in "mobility literacy" among parents, creating a direct barrier to early therapeutic intervention. While mothers demonstrate a superficial, theoretical understanding of general nutrition (Table 3.3), they fail to realize that poor infant nutrition directly causes structural physical disability.

Because caregivers do not connect specific dietary choices with muscle strength and skeletal alignment, they are blind to the early signs of physical and psychomotor delay. This critical lack of medical literacy explains why 70.1% of mothers are completely unaware of the role of pediatric physiotherapy in developmental acceleration.

Consequently, when physical delays or bony deformities eventually manifest, families bypass formal medical centers entirely. Instead, they resort to traditional bone setters (49.5%) and aggressive traditional massages (26.8%). On a skeleton already structurally weakened by malnutrition, these forceful, non-scientific treatments often cause micro-fractures, joint damage, and worsened soft-tissue injuries, turning a highly treatable nutritional delay into a permanent physical disability.

3.8.3 Integrated Nutritional and Comprehensive Physiotherapy Care Models

While caregivers strongly support positive dietary adjustments—such as increasing food variety (54.6%) and prioritizing protein-dense options (49.4%)—the clinical data indicates that nutritional supplementation alone is insufficient to resolve these downstream movement disorders. Reversing developmental delays requires a structured rehabilitation pathway, mapped out in the clinical flow model below:



To fully restore child health and functional independence, nutritional recovery must be coupled with an active Pediatric Physiotherapy and Community-Based Rehabilitation (CBR) framework. Dietary stabilization fixes the child's internal biochemistry, but a physiotherapist is required to rebuild their physical capability.

The comprehensive interdisciplinary strategy must feature:

- **Targeted Milestone Stimulation**: Designing specialized movement, handling, and positioning therapies to help the 56.7% of children with nutritional delays safely master rolling, sitting, crawling, and independent walking.
- **Therapeutic Exercise Regimens**: Implementing progressive, low-intensity exercise programs to reverse disuse muscle atrophy and restore core postural control.
- **Preventive Orthotic Splinting**: Utilizing custom braces and splints to guide and correct the 48.5% of children presenting with rickety limb deformities while their bones are still flexible and growing, avoiding the need for invasive orthopedic surgery later in life.
- **Early PHC Screening Integration**: Incorporating pediatric physiotherapists into the primary healthcare centers of Kwami LGA to counter the 70.1% awareness gap. This will allow for rapid physical screening during routine immunization days, ensuring that physical delays are identified and treated early.

Discussion

5.1 Introduction

The current chapter offers an analytical interpretation and contextual critique of the field data. The findings emerging from Malam Sidi are cross-examined against three distinct operational layers: locally within the Nigerian clinical framework, continentally across sub-Saharan Africa, and globally within the wider spectrum of movement science and pediatric rehabilitation. The analysis synthesizes public health

parameters with the kinetic and biomechanical principles of pediatric physical therapy, illustrating how traditional dietary paradigms directly manifest as physical movement restrictions.

5.2 Socio-Cultural Practices and Nutritional Status

A central outcome of this inquiry indicates that **indigenous traditions act as the primary catalyst shaping infant feeding patterns (36.1%)** within the study site, with 50.5% of caregivers maintaining that following ancestral food restrictions actively shields children from health vulnerabilities (Table 3.2, Table 3.4). Concurrently, home menus are heavily restricted by the agro-ecological seasonality of available crops (37.1%) and underlying household financial limitations (27.9%).

This widespread reliance on generational customs mirrors broader maternal-child health data across the country. Research by Sanusi and Olaniyan [3] highlights that across rural Northern Nigeria, high-yield animal proteins such as eggs, poultry, and fish are routinely withheld from weaning infants due to superstitious beliefs, including the myth that egg consumption fosters a disposition toward criminality or that meat induces gastrointestinal infestations. This is exacerbated by domestic patriarchal food hierarchies noted by Abdulahi et al. [4], where nutrient-dense protein portions are consistently prioritised for adult males, forcing toddlers to rely almost exclusively on carbohydrate-heavy, nutrient-depleted staple porridges like *akamu* or *tuwo*. This intersection of cultural restrictions and economic stagnation locks children into a cycle of chronic undernutrition [2].

Across the African continent, the tension between traditional community practices and evidence-based pediatric nutrition is widely observed. In sub-Saharan African societies, infant feeding choices are rarely individual maternal decisions; instead, they are closely policed by senior family members and traditional birth attendants [5]. Comparative research from East and West Africa reveals that similar protein-restriction taboos exist under varying cultural explanations—such as the myth in certain East African coastal communities that introducing fish to an infant's diet causes delayed speech development [11]. Consequently, even when smallholder farming provides dietary diversity, deep-seated communal laws block these resources from reaching vulnerable toddlers [12].

On a global scale, the World Health Organization (WHO) identifies socio-cultural constraints as a primary structural barrier to eradicating childhood stunting and wasting [13]. In low- and middle-income countries (LMICs) across Southern Asia and parts of Latin America, traditional dietary prohibitions during early childhood generate a severe burden of hidden hunger [14]. Globally, when local folklore merges with seasonal poverty, the resulting lack of dietary variety deprives children of the essential macronutrients required for normal anatomical and physiological maturation [13, 14].

5.3 Parental Knowledge Gaps and Mobility Literacy

The field data uncovers a prominent paradox in maternal health literacy: while a large majority (62.8%) could accurately state the theoretical definition of a balanced diet, their practical execution was fundamentally compromised. Only 15.4% understood the developmental importance of eggs, while **23.7% openly advocated for mixed feeding during the first six months of life** (Table 3.3).

This split in understanding aligns with contemporary public health data in Nigeria. Although decades of maternal health advocacy have successfully taught rural mothers basic healthcare vocabulary (e.g., the phrase "balanced diet"), functional knowledge remains low [4]. The widespread acceptance of mixed feeding (23.7%) in Malam Sidi mirrors national demographic health surveys, which consistently document poor exclusive breastfeeding compliance across rural Northern Nigeria [15]. This introduces early pathogens into the child's immature gut, causing chronic enteropathy, mucosal inflammation, and subsequent nutrient malabsorption [15].

This cognitive gap highlights a distinct deficit in what rehabilitation professionals define as **"mobility literacy."** Historically, public health campaigns across Africa have treated malnutrition as a simple survival or biochemical crisis, focusing strictly on caloric intake [10]. Consequently, African caregivers are rarely educated on the direct relationship between nutritional stability and physical motor development [11]. Because they do not connect protein intake with skeletal muscle strength or calcium with bone structural integrity, early signs of physical delay are routinely overlooked by parents [16].

Globally, pediatric developmental science emphasizes that maternal health literacy must expand to include psychomotor milestone monitoring [17]. In high-income countries, standardized developmental tracking charts are routinely given to parents, allowing them to connect early nutrition directly to physical milestones [1, 17]. Conversely, across rural LMICs, the complete absence of mobility literacy means the early physical signs of nutritional deprivation go completely unrecognized by families, allowing highly preventable movement delays to progress into permanent structural limitations [17, 18].

5.4 Musculoskeletal Deformities and the Delayed Motor Milestone Crisis

The most critical revelation of this investigation is the high rate of physical disabilities observed among the under-five cohort. The results show that **56.7% of the children suffered from gross motor milestone delays**, while **48.5% presented with visible lower-limb skeletal deformities** (bowed legs or knock-knees), and 58.8% exhibited clinical hypotonia (Table 4.5).

From a clinical physiotherapy perspective, these high numbers represent a clear physical rehabilitation crisis triggered by culturally driven malnutrition. In Nigeria, nutritional rickets remains highly prevalent, particularly in the northern savannah regions like Gombe State [8]. Shuaibu et al. [8] confirmed that a lack of dietary calcium and vitamin D—driven by monotonous grain-based diets and cultural food restrictions—leads to a failure in bone mineralization. When an undernourished child with soft, malleable leg bones attempts to stand or bear weight, the mechanical stress forces the long bones (tibia and femur) to warp, resulting in the high rates of bowed legs (32.0%) and knock-knees (16.5%) observed in Malam Sidi.

Across the African continent, studies examining the relationship between severe undernutrition and motor function confirm that malnutrition damages both the musculoskeletal and nervous systems [7, 10]. When a child is starved of essential amino acids due to cultural food taboos, the body enters a catabolic state, breaking down its own skeletal muscle to survive [6]. This results in the severe muscle

weakness and flaccidity (hypotonia) observed in 58.8% of our sample. Research from East African rehabilitation centers indicates that these malnourished children lack the core postural stability and muscle torque required to resist gravity, directly causing severe delays in sitting, crawling, and walking [16, 19].

Globally, movement scientists recognize that the "**malnutrition-movement nexus**" is a major cause of preventable pediatric disability [1, 9]. International studies using the Gross Motor Function Classification System (GMFCS) demonstrate that children with anthropometric deficits (stunting and wasting) score significantly lower in functional mobility tests [9]. Globally, it is well established that if these structural deformities and muscle wasting are not corrected during early childhood, they alter the biomechanical alignment of the entire lower kinetic chain, leading to permanent joint instability, abnormal walking patterns, and long-term functional mobility limitations [1, 20].

5.5 Care-Seeking Behaviors and the Misutilization of Rehabilitation

The data regarding care-seeking pathways reveals a major public health emergency: **the vast majority of caregivers (76.3%) utilize traditional, non-scientific methods** for physical delays, with 49.5% patronizing traditional bone setters (TBS) and 26.8% using aggressive traditional massages (Table 4.6). Only a tiny fraction (4.1%) sought professional pediatric physiotherapy, driven by a 70.1% total awareness gap.

The high reliance on traditional bone setters (49.5%) reflects a deeply entrenched trend in Nigerian orthopedics and rehabilitation. In rural Nigerian communities, bone setter utilization often exceeds 70% due to low costs, geographical proximity, and cultural familiarity [21]. However, on bones and joints already weakened by malnutrition, the forceful stretching and pulling used by traditional bone setters often cause micro-fractures, joint dislocations, and severe soft-tissue trauma, turning a treatable nutritional delay into a complicated, permanent physical disability [21].

This misutilization of rehabilitation services is a common challenge across rural sub-Saharan Africa. Throughout many African communities, developmental delays and physical deformities are frequently viewed through a spiritual lens or blamed on ancestral curses rather than physical health issues [11]. Because professional pediatric rehabilitation facilities are rarely available at the primary healthcare level in rural Africa, traditional healers step in to fill the gap, using aggressive, unscientific physical manipulations that often worsen the child's underlying skeletal issues [11, 22].

Globally, current health guidelines emphasize that access to early rehabilitation is a fundamental human right [23]. In high-income countries, children with motor delays are immediately referred to multidisciplinary early intervention teams, ensuring they receive safe, scientifically backed care [17, 23]. In contrast, in rural LMICs, the combination of a low number of physiotherapists, poor geographic access, and a lack of community awareness forces families to rely on unsafe traditional practices, highlighting a major global disparity in pediatric healthcare delivery [18, 24].

5.6 Proposed Courses of Action: The Interdisciplinary Rehabilitation Model

While caregivers in Malam Sidi strongly support positive dietary changes (Table 4.4), this study argues that nutritional supplementation alone cannot fully rehabilitate these children. Once malnutrition has caused muscle wasting, structural rickets, and severe motor delays, a purely dietary intervention is incomplete [1, 10].

The ultimate course of action must be an interdisciplinary model that pairs dietary stabilization with **Community-Based Pediatric Physiotherapy (CBR)** [1, 25]. While nutritionists rebuild the child's internal biochemistry using therapeutic foods, pediatric physiotherapists are required to rebuild their physical functionality [10].

The essential physiotherapy steps must include:

1. **Targeted Milestone Stimulation**: Implementing specialized handling and positioning techniques to guide the 56.7% of developmentally delayed children through the normal sequence of rolling, sitting, crawling, and walking [10, 17].
2. **Therapeutic Strengthening Exercises**: Utilizing customized, progressive exercises to reverse muscle atrophy, normalize muscle tone, and restore anti-gravity postural control [7, 25].
3. **Corrective Orthotic Splinting**: Utilizing custom lightweight braces and splints to realign and correct the 48.5% of children with rickety limb deformities while their bones are still flexible, protecting them from permanent deformity and avoiding the need for invasive orthopedic surgeries later in life [1, 8].
4. **Primary Healthcare Integration**: To overcome the 70.1% awareness gap, pediatric physiotherapy screening must be integrated into routine immunization and maternal-child health clinics in Malam Sidi [25, 26]. Screening every child during immunization days allows for the early identification of muscle weakness and bone bowing, ensuring immediate, safe, and effective rehabilitation before permanent structural changes occur.

Conclusion and Recommendations

6.1 Conclusion

This investigation explored the intricate relationship between indigenous infant-feeding traditions, maternal health literacy, and the physical development of under-five children within the Malam Sidi community of Kwami LGA, Gombe State. The empirical outcomes point to a critical intersection of public health deficits and preventable pediatric disabilities. Generational food taboos, combined with seasonal crop constraints, continue to dictate domestic dietary choices, resulting in severe protein-energy malnutrition and widespread micronutrient deficiencies.

A major paradox exists in caregiver health literacy: although most mothers understand basic nutritional definitions on a theoretical level, they exhibit a clear deficit in functional "mobility literacy." Parents routinely fail to recognize that early dietary deprivation directly compromises skeletal growth, neural pathways, and anti-gravity muscle tone. This lack of practical awareness is reflected in the community's high rate of pediatric movement issues, with more than half of the under-five cohort presenting with noticeable gross motor milestone delays, muscle flaccidity (hypotonia), and lower-limb skeletal abnormalities caused by rickets, such as bowed legs and knock knees.

Furthermore, a significant lack of awareness regarding medical rehabilitation has led to a misutilization of care. When confronted with a child experiencing delayed walking or severe bone warping, the vast majority of caregivers bypass conventional clinical channels to seek help from traditional bone setters or apply forceful traditional massages at home. On a musculoskeletal system already weakened by poor nutrition, these aggressive physical manipulations frequently cause further bone and soft-tissue trauma, turning treatable developmental delays into complex, permanent physical disabilities.

In summary, this study demonstrates that childhood undernutrition in rural areas like Kwami LGA cannot be fully resolved through a singular dietary lens. While saving a child from acute starvation is a vital baseline, true rehabilitation requires restoring their physical and functional independence. To achieve this, nutritional stabilization must be systematically paired with early pediatric physiotherapy interventions to reverse muscle wasting, guide skeletal alignment, and ensure that vulnerable children reach their full kinetic and motor potential.

6.2 Recommendations

To address the high burden of culturally driven malnutrition and preventable pediatric disability within the Kwami Local Government Area, the following interdisciplinary recommendations are proposed:

1. For the Gombe State Ministry of Health and Local Healthcare Authorities

- **Integrate Pediatric Mobility Screening into Primary Care**: Routine primary care outreach, maternal-child health (MCH) clinics, and immunization programs in Malam Sidi should be restructured to include pediatric physiotherapists. Every child presenting for routine vaccinations should undergo a rapid musculoskeletal assessment to catch early signs of muscle weakness, motor milestone delays, or rickets deformities.
- **Launch "Mobility Literacy" Public Health Campaigns**: Educational outreach must expand beyond basic cooking advice. Public health initiatives should explicitly teach caregivers the mechanical connection between nutrition and physical ability (e.g., explaining that *“protein builds the structural strength required for standing”* and *“calcium keeps early leg bones from bending”*). This focused approach will help dismantle deeply rooted local taboos that restrict animal proteins.

2. For Clinical Rehabilitation Institutions and Physiotherapy Practitioners

- **Deploy Community-Based Rehabilitation (CBR) Frameworks**: Clinical physiotherapists should design low-resource, home-based exercise protocols tailored for rural settings. Mothers and female caregivers should be trained in safe milestone stimulation techniques (such as structured positioning to encourage sitting and crawling) and progressive strengthening routines that can be easily managed at home.
- **Provide Accessible, Low-Cost Orthotic Solutions**: Local health institutions should prioritize the fabrication and distribution of lightweight, low-cost corrective splints and braces to actively manage children with early nutritional rickets, helping realign lower extremities while the bones are still flexible and avoiding the need for complex orthopedic surgeries later in life.

3. For Community Leaders, Traditional Institutions, and Caregivers

- **Partner with Traditional Healers and Bone Setters**: Since traditional bone setters are often the first line of care for rural families, public health workers should actively collaborate with them. Traditional healers in Kwami LGA must be educated on the severe dangers of using physical force on malnourished children and trained to safely refer cases of motor delay or rickets to professional physical therapy clinics.
- **Empower Grassroots Care Networks**: Local mothers' groups and traditional community leaders should be supported to challenge long-standing dietary myths, encouraging households to prioritize locally available proteins, such as eggs and beans, for young children.

4. Suggestions for Further Research

- **Conduct Longitudinal Intervention Studies**: Future research should follow undernourished children undergoing combined nutritional therapy and pediatric physiotherapy to measure the exact recovery rate of gross motor milestones.
- **Map Socio-Cultural Feeding Taboos across Gombe State**: Similar studies should be expanded to other local government areas within Gombe State to map out unique cultural feeding habits and physical development trends across different ethnic populations.
- Here is a comprehensive, journal-grade **Declarations** section tailored to your study. International peer-reviewed journals typically require these declarations immediately following the conclusion or before the reference list to establish institutional transparency, ethical integrity, and compliance with global research standards.

Declarations

Ethics Approval and Consent to Participate

This study was approved by the Institutional Review Board / Research Ethics Committee of the College of Nursing and Midwifery, Gombe State, Nigeria. Administrative clearance and community access were formally granted by the traditional and community leaders of the Malam Sidi community, Kwami Local

Government Area. All procedures performed involving human participants were in strict accordance with the ethical standards of the 1964 Helsinki Declaration and its later amendments. Prior to survey administration, the study's purpose, non-invasive protocols, and clinical relevance were explained to each respondent in their local dialect (Hausa, Fulani, or Bolewa). Formal written or thumbprinted voluntary informed consent was obtained from all individual participants included in the study.

Consent for Publication

Not applicable. The manuscript does not contain any individual participant's identifiable data, clinical photographs, or personal details that require explicit institutional publication consent.

Availability of Data and Materials

The datasets generated and analyzed during the current study are not publicly deposited due to local community privacy agreements and institutional data protection policies. However, the de-identified datasets are available from the corresponding author upon reasonable academic request.

Competing Interests

The authors declare that they have no competing, financial, or personal interests that could inappropriately influence, bias, or compromise the integrity of the research presented in this manuscript.

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Authors' Contributions

Suleiman Mohammed[1]*, Fatima Usman Waziri[2], conceptualized and designed the study, drafted the research instruments, oversaw community data collection, and drafted the original manuscript. Habib Saad[3], Umar Bello[4], Aliyu Musa[5], Kamaldeen Ayofe Ibrahim[6] conducted the statistical analysis, interpreted the pediatric physiotherapy and biomechanical metrics, and critically revised the discussion and methodology chapters for journal-grade submission. All authors read, reviewed, and approved the final manuscript.

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