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RESEARCH ARTICLE OPEN ACCESS

The effects of women's empowerment on the nutritional status of children in Nigeria using the 2018 demographic health survey

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Abstract
Objectives: The empowerment of women critically influences child nutrition in Nigeria, where malnutrition remains a major public health challenge. This study examines the relationship between dimensions of women's empowerment, economic, educational, and decision-making autonomy and child nutrition outcomes.
Methods: Using data from the 2018 Nigeria Demographic and Health Survey (NDHS), a cross-sectional retrospective analysis of 41,821 women and their under-five children was conducted. The survey provided data on socio-demographic variables, women's empowerment, and child nutrition indicators. Bivariate and multivariate regressions explored these relationships.
Results: Results showed significant disparities: 34.4% of women lacked formal education, and 92.8% earned less than their partners. Higher maternal education correlated with improved child nutrition, reducing stunting rates by 9.9%. Women's financial autonomy and decision-making power also positively influenced nutritional outcomes, indicating that empowered women are more likely to prioritise their children's health and nutrition.
Conclusion: The study concludes that enhancing women's education and economic opportunities is vital for better child nutrition in Nigeria. Socio-economic factors enable improved dietary practices and healthcare access. Policymakers should prioritise female education, adult literacy, skill acquisition, microfinance opportunities, and tailored community-based health education focusing on child nutrition. Addressing regional disparities with targeted interventions and promoting shared household decision-making will significantly reduce malnutrition and improve child health outcomes in Nigeria.

Keywords: Demographic health survey, Economic autonomy, Calorie, Malnutrition, Dietary diversity, Women empowerment, Child nutrition

Plain English Summary

This study explains how empowering women in Nigeria can improve the nutrition and health of young children. It uses data from a 2018 survey that included over 41,000 women and their children. The results show that many women lack education and have little control over household decisions or finances, with most earning less than their husbands. Women with more education and financial independence are better able to provide nutritious food, healthcare, and proper care for their children, leading to fewer cases of

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stunting, underweight, or wasting due to malnutrition. The study also found regional differences, with the northern areas having higher rates of child malnutrition, linked to lower levels of women's empowerment. Many women are unable to decide on health or household purchases, which affects children's nutrition. The research suggests that improving women's education, economic opportunities, and decision-making power can significantly reduce child malnutrition. The study recommends that Nigeria should focus on improving female education, provide financial support, and encourage gender equality to help reduce child malnutrition and promote healthier families. Strengthening healthcare and community programs, especially in rural regions, is essential to improve feeding practices, healthcare, and overall child well-being across the country.

Background

Women's empowerment is the process by which women gain greater control over their lives, resources, and decision-making. It is the ability to make choices, or the ability to access quality of life, or how she can exercise power within the gender framework (1, 2). To be disempowered means one is denied the ability to make choices, while being empowered is to acquire the ability to make a choice (3). Alternatively, empowering women has been seen as a reflection of the outcomes of intra-household resource allocations (for instance, child anthropometric indicators (1). Women's empowerment is crucial for gender equality and the well-being of families and communities. Empowerment plays an important role in most of the aspects of people's lives. In this regard, research has found that the empowerment of women is highly associated with positive child nutritional status (4). Women are considered the primary caretakers of children in the household; their intra- household dynamics affect individual well-being, and the empowerment of women acts as a means to improve the nutritional status of children, which causes important developmental outcomes. Poor nutritional status during childhood and its lasting impact on economic growth and health are well documented by (5). Empowered women are more likely to make decisions that benefit their children's health and nutrition, leading to lower rates of child malnutrition, stunting, and mortality (6). When women have control over resources and can make autonomous choices, they tend to prioritise investments in nutritious food, healthcare, and education for their children, thereby promoting a healthier future generation. Research shows that women allocate much of their income, time, and energy back into their families, directly impacting their children's well-being (7). Therefore, a woman who is empowered through education and household decision-making is better equipped to make informed choices that positively influence both her and her child's health. Conversely, inadequate maternal nutrition during pregnancy, often due to lack of knowledge, can have irreversible effects on the child's development (8, 9). Previous research analysed the effect of mothers' autonomy on child nutritional status within a multiple regression framework in Amman, Jordan (10). It examined whether it is the availability of other potential childcare substitutes, particularly the grandmother, that influences child nutrition, rather than household structure, revealing a strong negative influence associated with having a mother whose autonomy in the household is low. Women's empowerment encompasses some unique additional elements (2). Generally, women are more likely than their male counterparts to use household cash to buy food and provide health care for their children (11, 12), which has a positive impact on household- level calorie availability and health outcomes. The control of resources by women may reflect positively on household nutrition and well-being (13); However, women are generally disproportionately found to lack some assets and wealth, which may deprive them of the benefits associated with their control of such. Inadequate nutrition has negative effects on health as malnourished people become less productive and are unable to provide for family needs (14). In extreme cases, malnutrition leads to death, especially among children under five years of age, with about 45% of child deaths in the world due to malnutrition (15). Low- level empowerment among women could affect the well-being of women and that of their families in terms of outcomes such as the nutrition and health of household members, thus resulting in low national economic growth and development for the country (16, 17). Empowerment expands people's ability to make strategic life choices, particularly in contexts in which this ability has been denied (18). The ability to make choices is made up of three dimensions, namely resources, agency and achievements.

It is believed that improving nutrition is not just a national agenda peculiar to Nigeria but a universal agenda that needs to be achieved. This can be achieved through empowering women, since they are in charge of cooking and taking care of children and other household members (19). Women remain dominant in the informal sector and the care economy. Women play an important role in the four

pillars of food security: availability, accessibility, utilisation, and stability (20). However, they are constrained by limited access to productive resources when compared to their male counterparts. The low empowerment among women affects their decision-making autonomy on the desired family size, healthcare- seeking behavior, the amounts and types of food fed to children and themselves, and the amount of time to spend on child-rearing (21). Assessing the impact of women's empowerment on child nutrition is important as it gives insights into how developmental policies that would promote gender equity, increase productivity and reduce poverty and hunger can be formulated. Assessing the impact of women's empowerment on nutrition is very important at this critical period that Nigeria is experiencing food insecurity (22), high food prices (23), economic diversification from the oil sector to the agricultural sector (24), poor health outcomes (25) and poverty (26). Malnutrition remains a significant public health concern in Nigeria, particularly among children under the age of five. Despite efforts to reduce child malnutrition, many regions continue to experience high rates of stunting, wasting, and underweight children, which negatively affect long-term growth and development (27). Research shows that limited empowerment, whether through economic means, education, or decision-making autonomy, often hinders women from making optimal nutritional choices for their families (28). Studies found that mothers with limited nutrition-related knowledge were more likely to have children with poor nutritional outcomes (27). Additionally, women's lack of decision-making power within the household has been linked to lower dietary diversity and increased risk of malnutrition among children (29). The broad objective of this study was to investigate women's economic empowerment (income generation, access to credit, and employment) and child nutritional status. The specific objectives were to assess the relationship between women education levels, their knowledge of nutritional practices and child nutritional outcomes, including breastfeeding, child feeding, and meal preparation, to determine relationship between wealth index and child nutritional outcomes, to determine how women's autonomy in household decision- making (regarding food purchases, healthcare, and sanitation) directly affects children's nutrition and to compare how women empowerment affects child nutrition across different regions of Nigeria.

Materials and Methods

The study utilised a cross-sectional retrospective analysis on the secondary data from the Nigeria Demographic and Health Surveys (DHS) 2018. The cross-sectional design allows for the examination of associations between various indicators of women's empowerment and the nutritional status of children under five years of age at a specific point in time. The DHS data, conducted in Nigeria, provides a nationally representative, population-based dataset on health and nutrition indicators, with a focus on maternal and child health. The dataset includes information on women empowerment, household characteristics (such as indicators of women empowerment as the Independent Variable e.g. Decision- Making and Autonomy, Education and Employment, highest level of education, Attitudes Toward Domestic Violence and Gender Norms, currently working, Wealth index (poorest to richest quintile) and child health outcomes(such as Nutritional Status of Children as the Dependent Variables e.g Currently Breastfeeding, Diarrhea in last two weeks, Anthropometry (Malnutrition Indicators), e.g Height-for-age Z-score (stunting), Weight-for-height Z-score (wasting), Weight-for-age Z-score (underweight), age child started complementary feeding, number of children under 5 in Nigeria) making it suitable for analyzing the effects of women empowerment on the nutritional status of children and making a decision matrix using objectively verifiable indicators (OVIs).

The study population consists of children under the age of five and their mothers or primary female caregivers, drawn from households included in the NDHS.

The sample size for this study encompasses a robust sample of 33,924 households spanning the six geopolitical zones of Nigeria. The dataset was collected using standardised data collection tools designed and validated by the researcher.

The instruments used included a Household questionnaire used to collect data on household characteristics, socioeconomic status, and child health indicators, including anthropometric measurements (height, weight, and age). The Women's Questionnaire contains collected information on women's education, economic participation, and decision-making autonomy, which serves as key empowerment indicators in this study. Also, Biomarker Data Collection Tools were used to measure child nutrition outcomes such as stunting, wasting, and underweight through anthropometric assessment. The dataset was accessed through the DHS database after submitting a research proposal outlining the study objectives. The NDHS is a nationally representative

household survey that collects extensive information on demographic, health, and nutrition indicators. Women aged 15-49 who have given birth within the past five years and their corresponding children under five were the focus of the
study. Studies conducted outside the geographic boundaries of Nigeria, datasets that lack comprehensive data on women empowerment, sanitation practices, hygiene practices, and malnutrition indicators, Data sources that are not accessible or not available for analysis, Datasets with insufficient or incomplete information required for statistical modeling or analysis and data on children with severe disabilities or chronic illnesses that significantly affect growth and nutritional outcomes were excluded. Before utilising the 2018 Nigeria Demographic and Health Survey (NDHS) dataset for this research, formal consent was sought and obtained from the DHS Program.
Statistical analysis was conducted using SPSS, version 23 being the statistical package for the social sciences. Descriptive, bivariate, multivariate and analytical techniques were employed. The study employed cross-tabulation and multiple linear regression models 1 and 2 to analyse the relationship between women's empowerment and child nutrition. Cross-tabulation examined associations between categorical variables, such as maternal education and child nutrition, by summarising data in a matrix format. Simple Linear regression model 3 and 4 assessed the impact of women's empowerment indicators on children's nutritional outcomes, quantifying relationships while controlling for confounding factors.
The selected variables align with (Kabeer's empowerment model), and past literature emphasising education, decision-making, resource control, and employment as key indicators and the variables were combined to form variables for women's empowerment.
Women aged 15-49 who have given birth within the past five years and their corresponding children under five were the focus of the study. Also, complete data on the nutritional status indicators (such as stunting, underweight, wasting) and measures of women empowerment, sanitation facilities, and hygiene practices were included in the study, while children with severe illnesses or conditions known to affect nutritional status were excluded. Studies conducted outside the geographic boundaries of Nigeria and datasets that lack comprehensive data on any of the key variables (nutritional status indicators, women empowerment measures) were also excluded.

Results

Table 1 reveals a complex web of socio-economic diversity across Nigerian regions. With a robust sample of 41,821 women, the study provides unprecedented insights into the intricate social structures defining women's experiences. Regional representation demonstrates significant variations, with the North-West emerging as the most prominent region, comprising 24.2% of the participants. A striking 34.4% of women reported no formal education, highlighting persistent barriers to educational access. About 59.4% of respondents reside in rural areas, with Hausa and Igbo communities representing significant population segments, alongside a substantial "Other" category that hints at the region's remarkable cultural diversity.

Table 1: Socio-demographic characteristics of women respondents (N=41821)

Category	Variable	Frequency	Percentage (%)
Region	North Central	7772	18.6
	North East	7639	18.3
	North West	10129	24.2
	South East	5571	13.3
	South South	5080	12.1
	South West	5630	13.5
Educational Attainment	No education	14398	34.4
	Incomplete primary	1908	4.6
	Complete primary	4475	10.7
	Incomplete Secondary	7246	17.3
	Complete secondary	9452	22.6
	Higher	4342	10.4
Highest Education Level	No education	14398	34.4
	Primary	6383	15.3
	Secondary	16698	39.9

	Higher	4342	10.4
Type of place of Residence	Urban	16984	40.6
	Rural	24837	59.4
Ethnicity	Ekoi	275	0.7
	Fulani	2953	7.1
	Hausa	10765	25.7
	Ibibio	801	1.9
	Igala	457	1.1
	Igbo	6714	16.9
	Ijaw/Izon	1201	2.9
	Kanuri/Beriberi	873	2.1
	Tiv	976	2.3
	Yoruba	5372	12.8
	Others	11434	27.4
Wealth index	Poorest	8684	20.7
	Poorer	7823	18.7%
	Middle	8920	21.3
	Richer	8676	20.7
	Richest	7718	18.5

The children's demographic profile, as shown in Table 2, reveals nuanced age and gender distributions with concentration in the 15-19 and 25-29 age cohorts. Gender composition shows a slight male predominance, with 41.3% male children compared to 39.9% female children. A particularly compelling finding is the child survival rate, with 73.4% of children reported as alive.

Table 2: Socio-demographic Characteristics of Children's Respondents (N = 41,821)

Category	Variable	Frequency	Percentage
Age in 5 Years interval	15-19	8423	20.1
	20-24	6844	16.4
	25-29	7203	17.2
	30-34	5997	14.3
	35-39	5406	12.9
	40-44	4057	9.7
	45-49	3891	9.3
Sex of child	Male	17257	41.3
	Female	16667	39.9
The child is alive	No	3211	7.7
	Yes	30713	73.4
Current age of child	0	6399	15.3
	1	6059	14.5
	2	5834	13.9
	3	6168	14.7
	4	6253	15.0
	Don't know	11108	26.6

Decision-making dynamics are overwhelmingly patriarchal, with 69.5% of healthcare decisions and 71.5% of significant household purchases controlled exclusively by male partners. While 62.8% of women are employed, a staggering 92.8% earned less than their husbands. Asset ownership further illuminates economic vulnerabilities, with merely 22.2% of households possessing a refrigerator (Table 3).

Table 3: Women's empowerment status

Category	Variable	Frequency	Percentage
The person who usually decides on respondents' health care	Respondent alone	2940	7.0
	Respondent and husband/partner	9738	23.3
	Husband/partner alone	29063	69.5
	Someone else	70	.2
	Other	10	.0
The person who usually decides on large household purchases	Respondent alone	1725	4.1
	Respondent and husband/partner	10069	24.1
	Husband/partner alone	29902	71.5
	Someone else	103	0.2
	Other	33	0.1
	No	13327	31.9
Respondent worked in the last 12 Months	In the past year	1439	3.4
	Currently working	26282	62.8
	Have a job, but on leave the last 7 days	773	1.8
Respondent currently Working	No	14766	35.3
	Yes	27055	64.5
Respondent earns more than husband/partner	More than him	989	2.4
	Less than him	38813	92.8
	About the same amount	1554	3.7
	Husband/partner brings in money	95	.2
	Don't know	370	.9
The household has a refrigerator	No	32011	76.5
	Yes	9275	22.2
	Not a de jure resident	535	1.3
Women Empowerment	Low	22,238	53.20
	Moderate	12,738	30.50
	High	6,845	16.40
Total		41821	100.0

Over half the women (54.5%) report previous breastfeeding experiences in Table 4, with 23.8% currently breastfeeding. Health challenge indicators reveal notable vulnerabilities, with 9.5% of children experiencing diarrhoea, 18% encountering fever, and 11.5% suffering from cough, with a significant proportion of "Don't know" responses across various health indicators.

Table 4: Knowledge of Respondents on Nutritional Status of Children

Category	Variable	Frequency	Percentage
Duration of breastfeeding	Ever breastfed, Not currently breastfeeding	22781	54.5
	Never breastfed	1172	2.8
	Still breastfeeding	9971	23.8
	Don't know	7897	18.9
Had diarrhea recently	No	26647	63.7
	Yes, the last two weeks	3956	9.5

	Don't know	11218	26.9
Had afever in thelast two weeks	No	23065	55.2
	Yes	7536	18.0
	Don't know	11220	26.9
Had a cough in the last two weeks	No	25791	61.7
	Yes, the last two weeks	4819	11.5
	Don't know	11221	27.0
	Total	41821	100.0

Stunting affected 9.9% of children (4.5% severely, 5.4% moderately), while 8.4% were underweight and 9.4% experienced wasting (Table 5).

Table 5: Nutritional Status of Children

Nutritional status	Variable	Frequency	Percentage
Stunting	Severely Stunted	1883	4.5
	Moderately Stunted	2247	5.4
	Normal Height	7341	17.6
Underweight	Severely Underweight	3480	8.3
	Moderately Underweight	21	.1
	Normal	1683	4.0
Wasting	Severely Wasted	3898	9.3
	Moderately Wasted	53	.1
	Normal	3394	8.1

In Table 6, mothers with no education were 20.4% and 20.9% severe and moderate stunting compared to 14.8% severe and 20.9% severe and moderate stunting for mothers who attended only primary school, 13.9% and 18.4% severe and moderate stunting for those who attended secondary school and 13.2% and 17.1% severe and moderate stunting among mothers with higher education (P<0.001). Children from wealthier homes had a lower risk of stunting compared to children from poorer homes (β=0.191, 95% CI=0.023- 0.360, p<0.001). Additionally, severe stunting was highest in the Northeast (27.5%) and Northwest (23.3%) compared to South-south (8.3%) and Southeast (5.7%) (p=0.267).

Table 6: Socio-Demographic of Respondents to Nutrition Status of Children

Category	Variables	Status			P-value
		Severely Stunted	Moderately Stunted	Normal Height	
Highest educational level	No education	20.4	20.9	58.7	.000
	Primary	14.8	20.9	64.2	
	Secondary	13.9	18.4	67.7	
	Higher	13.2	17.1	69.7	
Region	North Central	12.7	19.3	68.0	0.267
	North East	27.5	24.5	48.0	
	North West	23.3	21.4	55.1	
	South East	5.7	15.1	79.1	
	South South	8.3	16.1	75.7	
Type of place of Residence	Urban	15.7	19.6	64.7	.267
	Rural	16.8	19.6	63.6	
Wealth index combined	Poorest	26.2	24.1	49.7	.000

Poorer	17.5	19.6	62.9
Middle	15.6	17.6	66.8
Richer	12.2	17.3	70.5
Richest	11.7	20.7	67.6

Multivariate analyses revealed profound correlations between socio-demographic factors and nutritional status. Educational attainment demonstrates statistically significant associations with child nutritional outcomes, with wealth index correlating strongly with stunting and underweight conditions. The regression model revealed critical insights into how educational attainment influences child nutritional outcomes. The constant value (0.881) represents the baseline nutritional status when educational variables are at zero (Table 7).

Table 7: Association between Wealth Index Combined of Respondents and Nutritional Status of Children

Variable	B Unstd	Std Err	Beta Std	t	sig	95% CI
Model 1: Association Between Nutritional Status Indicators (Stunting, Underweight, Wasting)						
Constant	0.881	0.214	-	4.113	0.000	0.461- 1.301
Stunting	0.140	0.070	0,033	2.000	0.046	0.003- 0.278
Underweight	0.010	0.019	0.009	0.523	0.601	-0.028- 0.048
Wasting	-0,012	0.018	- 0.011	0.677	0.498	-0.047- 0.023
Model 2: Association Between Wealth Index and Nutritional Status of Children						
Constant	2.568	0.263	-	9.769	0.000	2.052- 3.083
Stunting	0.191	0.086	0.037	2.224	0.026	0.023- 0.360
Underweight	0.056	0.024	0.039	2.363	0.018	0.009- 0.102
Wasting	-0.021	0.022	- 0.016	-0.943	0.346	-0.063- 0.022
Model 3: Wealth Index vs. Nutritional Status (Alternate)						
Constant	1.485	0.099	-	15.028	0.000	1.291- 1.679
Underweight	0.047	0.032	0.024	1.446	0.148	-0.017- 0.110
Stunting	0.001	0.009	0.001	0.090	0.928	-0.017- 0.018
Wasting	0.008	0.008	0.016	0.937	0.349	-0.008- 0.024
Model 4: Association Between Region and Nutritional Status of Children						
Constant	2.340	0.286	-	8.174	0.000	1.779- 2.902
Underweight	0.226	0.094	0.040	2.407	0.016	0.042- 0.409
Stunting	0.024	0.026	0.015	0.929	0.353	-0.026- 0.074
Wasting	-0.054	0.024	-0.038	-2.228	0.022	-0.101-(-0.008)

Stunting shows a statistically significant relationship (p=.046), with a positive coefficient of 0.140, while underweight (p=.601) and wasting (p=.498) did not demonstrate statistically significant associations with educational level. The relatively low coefficients (0.010 for underweight, -0.012 for wasting) and high p-values suggest that educational level may not directly influence these specific nutritional indicators. For stunting, the interval (0.003 to 0.278) suggests a consistent positive relationship between education and nutritional status, reinforcing the statistical significance. Wealth index analysis presents a more nuanced picture of economic factors' impact on child nutrition. The constant value (2.568) established a baseline nutritional status across wealth categories. Stunting shows a statistically significant association (p=.026), with a positive coefficient of 0.191. This indicates that as the wealth index increases, there's a measurable impact on child stunting. The 95% confidence interval (0.023 to 0.360) further validates this relationship. Underweight also demonstrated a statistically significant correlation (p=.018), with a coefficient of 0.056. Wasting, however, shows a non-significant relationship (p=.346), with a

negative coefficient of - 0.021. Residential analysis reveals less pronounced relationships. The constant value (1.485) represents the baseline nutritional status across residential categories. Stunting, underweight, and wasting all show non-significant associations (p values of .148, .928, and .349, respectively). The regional analysis uncovers interesting variations in nutritional outcomes. The constant value (2.340) establishes a baseline nutritional status across different regions. Stunting shows a statistically significant association (p=.016), with a positive coefficient of 0.226. Underweight does not demonstrate a statistically significant relationship (p=.353), with a low coefficient of 0.024, while wasting presented a statistically significant negative association (p=.022), with a coefficient of -0.054.

Discussion

The relationship between women's empowerment and child nutritional status has been widely studied across sub-Saharan Africa generally (30), and in specific countries like the Gambia (31) and parts of Nigeria (28). These studies emphasise the critical role of maternal autonomy in improving child health outcomes. Using data from the 2018 Demographic Health Survey (DHS) in Nigeria, this study sought to examine how various dimensions of women's empowerment, such as decision is making power, education, and economic participation, affect the nutritional well-being of children. The socio-demographic analysis highlights significant disparities in education, residence, and economic status among Nigerian women. A high percentage of these women have no formal education, with rural dwellers forming about half of the respondents. This statistic is similar to that found by (32), where most of the women had no formal education, and slightly similar to findings by (31), where almost half of the women had no formal education. Ethnic diversity is evident, with Hausa and Igbo being the dominant groups. The wealth index indicates economic stratification, with one-third of women classified as poor or poorest. Women's empowerment data reveal limited autonomy, as more than half of healthcare decisions and two-thirds of large household purchases are controlled by male partners. While more than half of women are employed, the majority earn less than their husbands, reinforcing economic dependence. Child nutritional status shows stunting, underweight, and wasting as prevalent issues. The highest rates
were found in the North-East and North-West, regions with lower education and wealth levels. Statistical analyses confirm significant associations between education, wealth, and nutritional outcomes, emphasising the role of socioeconomic factors in child health.

Statistical analysis provided valuable insights into these associations, revealing key patterns and trends. The study found that more than half of women are employed, but the majority earn less than their husbands, limiting financial autonomy. This economic dependency constrains women's ability to make independent nutritional decisions for their children. This finding aligns with findings by (33) in Ethiopia, where it was discovered that wages being paid to women had a direct impact on child nutritional outcomes and narrowing the wage gap between men and women would have a positive impact on children's nutritional outcomes. The wealth index analysis in this study revealed a significant relationship between economic status and child stunting, demonstrating that children from wealthier households have better nutritional outcomes than children from low socio- economic status. This aligns with previous studies (6, 34), which found that economic status directly influences child malnutrition, as wealthier households can afford diverse, nutrient-rich food. Additionally, only a few households own a refrigerator, suggesting limited food storage capacity, which affects dietary diversity and food security. The importance of economic stability in improving household food security and reducing child malnutrition was emphasised by (35) in their study. Also, one-third of women have no education, which aligns with gaps in breastfeeding and child health knowledge. Similar to findings by (36, 37), this study found a strong link between educational attainment and child nutrition. There is a statistically significant association between education and stunting, as found by (36) in Côte d'Ivoire, indicating that higher maternal education levels are associated with reduced child stunting. However, education was not significantly related to underweight or wasting. The knowledge of respondents on child nutrition further reveals gaps in health awareness, as few mothers were unsure of breastfeeding practices, and one-third did not know whether their child had experienced fever or diarrhoea. These findings agree with a previous study (38) that found that maternal education positively impacts child nutrition by improving knowledge of proper feeding practices and healthcare utilisation. About two-thirds of women have no say in healthcare decisions, and the majority do not control large household purchases. Decision-making autonomy is highly constrained among Nigerian women. Only a few women independently decide on their healthcare,

while more than half report that their husbands make such decisions. Similarly, two-thirds of major household purchases are made solely by husbands. This lack of decision- making power directly affects child nutrition, as women with greater autonomy are more likely to allocate resources toward better dietary choices. Previous studies (39, 40) support this, that women's empowerment is strongly correlated with improved child nutrition due to better household food management and healthcare decisions. North-East and North-West have the highest stunting rates, aligning with lower female education and empowerment levels. Significant regional disparities were found in child nutrition. The North-East and North-West have the highest rates of stunting, while the South-East and South-South reported the lowest rates. The regression analysis confirms that regional differences significantly impact stunting and wasting, indicating localised nutritional challenges. These findings align with previous studies (41), which identified regional food security disparities in Nigeria, emphasising that poverty and cultural factors limit women's ability to influence child nutrition in northern regions. A report shows that malnutrition rates are highest in Northern Nigeria due to lower female literacy, economic instability, and food insecurity (42). This linkage strengthens the argument that women's empowerment significantly impacts child nutrition, reinforcing the need for policy interventions in education, economic inclusion, and decision-making autonomy, as supported by findings by (13, 28, 37). In many Nigerian homes, men make most decisions, including what food to buy or whether a child should go to the hospital. When women are allowed to make health and food decisions, their children tend to be better fed and healthier. With the concerning fact that Nigeria is found to have one of the highest burdens of stunted children globally (42), the findings of this study reveal that women not having enough education, money, or decision-making power is strongly associated with poor nutritional outcomes in children, as found by (13, 32, 33, 34). This is due to some challenges which includes cultural belief as in some parts of Nigeria, women depend on their husbands for everything, early marriage which makes many girls drop out of school early to marry, reducing their ability to care for children later and lack of access to jobs causing women to struggle to find good jobs or start businesses (43, 44). Findings from this study indicated that increased maternal education, economic participation, and decision-making autonomy are significantly associated with improved child nutrition outcomes, highlighting the crucial role of women's empowerment in addressing malnutrition as supported by several studies (13, 28, 31, 32).

This study has demonstrated a clear relationship between women's empowerment and the nutritional status of their children. The findings indicate that empowered women – those with greater access to education, financial independence, and decision-making power are more likely to provide better nutrition for their children. Their children had improved nutritional outcomes, likely due to better feeding practices, health care access, and overall household well-being. On the other hand, women with limited empowerment faced significant challenges that directly affected their children's nutrition, often leading to poor dietary diversity, higher rates of malnutrition, and other negative health outcomes. The findings of this research emphasise the strong link between women's education, economic status, and child nutrition. Higher educational attainment and wealth index significantly reduce stunting and undernutrition. However, the residence type shows no significant impact.

Regional disparities suggest the need for targeted interventions to address malnutrition in Northern regions. The findings underscore the strong link between women's education, economic status, and child nutrition. Higher educational attainment and wealth index significantly reduce stunting and undernutrition. Policies promoting women's empowerment, improved education, and economic opportunities are crucial for enhancing child nutrition outcomes.

Conclusion

In conclusion, the study investigated the effects of women's empowerment on the nutritional status of children in Nigeria using the 2018 Demographic Health Survey data. The findings indicate that increased maternal education, economic participation, and decision-making autonomy are significantly associated with improved child nutrition outcomes. The socio- demographic analysis shows disparities in education, residence, and economic status among Nigerian women, with many lacking formal education and living in rural areas. Women's autonomy is limited, with males controlling most health and household financial decisions. Child nutritional issues such as stunting, underweight, and wasting are prevalent, especially in northern regions with lower education and wealth levels. Statistical analyses confirm associations between education, wealth, and nutritional outcomes, while residence type shows no significant impact. The study underscores the need

for policies promoting women's empowerment through education and economic opportunities to improve child nutrition and address regional disparities.

Recommendation
Based on the findings of this study, it is recommended that the government and relevant stakeholders prioritise female education and expand adult literacy programs to empower women. Women's economic empowerment should be strengthened through skill acquisition, financial literacy training, and microfinance initiatives. Community-based interventions should enhance maternal knowledge of child nutrition, breastfeeding, and disease prevention, especially in rural areas. Region-specific nutrition programs and enhanced social safety nets should address child malnutrition and food insecurity. Male involvement in household decision-making should be encouraged, alongside policies promoting gender equality. Additionally, healthcare and social support systems need strengthening by improving access to maternal and child healthcare, increasing healthcare facilities, training personnel, and expanding immunisation programs to monitor children's growth and development.

Limitations of the Study
The DHS 2018 dataset may not fully capture recent policy, economic, or programmatic changes that affect child nutrition. Also, its cross-sectional design prevents causal inference, and reliance on self-reported data may introduce potential recall bias. Finally, inherent DHS limitations, such as the use of standardised questionnaires, may narrow the depth of responses.

List of Abbreviations
NDHS: Nigeria demographic and health survey
Ovis: Objectively verifiable indicators
Haz: Height for age z score (stunting)
Waz: Weight for age z score (underweight)
Whz: Weight for height z score (wasting)
SPSS: Statistical Package for the Social Sciences

Declarations
Ethics approval and consent to participate
Ethical approval was obtained from Babcock University Health Research Ethics Committee. The data was anonymised to ensure the privacy of participants.

Consent for publication
All the authors hereby transfer all copyright ownership exclusively to the journal if this work is published by the journal.

Availability of data and materials
The data and materials used to write the article are available

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The authors declare no conflicts of interest

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Authors' contributions
AAR: Conceptualisation, Data curation, Supervision, original draft writing, review
SMR: Formal analysis, draft review
OMO: Data curation and Methodology
AO: formal analysis, draft writing, review, editing
OO: draft drafting, and review
ARI: review and editing

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