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EFFECT OF NURSE-LED INTERVENTION ON NUTRITIONAL STATUS OF UNDER–FIVE CHILDREN AND THEIR MOTHERS IN NIGERIA

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ABSTRACT: *Introduction: Malnutrition is a major health problem among children in sub-Saharan Africa. Despite the severity of malnutrition, evidence has shown that the management of malnutrition among the under 5 is still poor in Ibadan, Nigeria. Aims and Objectives: The study was designed to determine the effect of the infant nutritional welfare clinic on the management of malnutrition among under-5 children in Ibadan, Nigeria. The differences between the pre-intervention and post-intervention of malnutrition in under-5 children were tested. Methods: The quasi-experimental design, factorial matrix, pre- and posttest design was adopted. The purposive sampling technique was used to select two local government areas out of eleven: Ona-Ara and Ibadan Southeast Local Government Areas, with the highest and relatively low infant malnutrition rates. Mothers of stunted under-5 children in six communities (three from each of the LGAs) were selected. The LGAs were selected and assigned to Intervention (32) and control (53) groups. The instruments used were the Food Frequency Questionnaire, Mother's Feeding and Practice Knowledge, Shirkers Strip, the Adopted UNICEF's Infant and Young Child Feeding guide and anthropometric indices. The treatment included infant and young child feeding training and food demonstration, which lasted 12 weeks. Quantitative data were subjected to percentages, Pearson correlation and chi-square at a 0.05 level of significance. Results: The under-five children in both the intervention and control groups had a mean age of 15.4 ± 6.2 months. At baseline, 28 (87.5%) of the children in the intervention group and 49 (92.5%) of the children in the control group were mildly malnourished. Following the intervention, 28 (87.5%) of the children in the intervention group were of normal weight, while 4 (12.5%) were malnourished. Findings from the pre-intervention outcomes comparing the intervention and control groups' body mass index and anthropometric parameters (nutritional status) show that the coefficient (0.551) and negative Pearson correlation (–0.631) confirm a strong relationship. There was a significant association (47.998, df = 3, p = 0.001) between the children's body mass index and the intervention. However, the post-intervention results indicate no significant association between children's nutritional status and the intervention. The coefficient (.082) and Pearson correlation (-.082) suggest a very weak relationship. Conclusion: The nurse-led intervention provided to mothers of children under five helped improve their children's nutritional status. This programme should be adopted to combat malnutrition in children under five.*

KEYWORDS: Malnourished children, Infant feeding practice, Under-five children, Nutritional status.

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INTRODUCTION

Maintaining a healthy status throughout the life cycle requires a proper and well-balanced diet (Sanni et al., 2024). An imbalance in feeding and nutrition can lead to malnutrition, which is broadly classified as undernutrition (inadequate consumption of energy-giving foods) or overnutrition (excessive consumption of energy-giving foods and other nutrients required for growth, survival, reproduction, learning capacity, and the ability to function appropriately in society) (Jumbo-Uzosike, 2017; Abdel Wahed et al., 2017; Al Ameri et al., 2018; Ole Tankoi et al., 2016).

Malnutrition is an increasing health problem among children in developing countries, accounting for 54%-56% of child mortality worldwide (Abdel et al., 2017; Hasan et al., 2011; Igbokwe et al., 2017). Nutritional imbalance is an underlying factor in the deaths of 2.6 million children annually, accounting for one-third of all child deaths globally (Nnebue et al., 2016; Batool et al., 2012; Group, 2024). According to the World Bank's 2018 report and the World Poverty Clock, Nigeria now has the largest population living in extreme poverty in the world, with 86.9 million people (53.5% of the population) affected, overtaking India and other countries affected by war (Sanni et al., 2024).

In Nigeria, approximately 23% of the population is school-age children. The country bears a significant burden of childhood malnutrition, and many of these children are at risk of long-term consequences (Adedeji et al., 2017; Igbokwe et al., 2017). Undernutrition is said to be more prevalent among children in lower socio-economic classes (particularly in rural areas), whereas overweight and obesity are more prevalent among children in higher socio-economic classes (particularly in urban areas) (Igbokwe et al., 2017). However, the increasing prevalence of overnutrition in rural communities due to a shift in dietary patterns (Jayne et al., 2011) has begun to dispel the notion that overnutrition is more prevalent among pupils from a higher socio-economic background and in urban areas (Igbokwe et al., 2017; Jayne et al., 2011).

With malnourished children under five years old having a mortality rate of 73 deaths per 1000 live births and an infant mortality rate of 59 per 1000 live births, Oyo State has the highest rate of malnutrition in southwest Nigeria (Hamadneh, Kassab, Abu-hammad, Al-bayyari, Hamadneh, Obeidat, and Saqan, 2018). A recent study conducted in southwest Nigeria, precisely in Ekiti, focused on cross-sectional study (Sanni et al., 2024). Also, little literature is available to describe how nurse education contributes to improving infant nutrition status in primary health centers in Nigeria.

Initial and ongoing training on the nutritional care process in clinical practice might also facilitate nurses to empower patients, family and caregivers in the self-management of nutritional care. However, the effectiveness of nursing nutritional interventions to improve the nutritional status of the infant and mothers' empowerment in nutritional care remains limited in primary health care in Nigeria. Malnutrition has severe negative effects; hence, efforts must be made to improve the nutritional status of children under five. This study evaluated the effect of Nurse-Led Intervention on Nutritional Status of Under–Five Children and Their Mothers in Nigeria

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METHODOLOGY

Study design

The quasi-experimental design, factorial matrix, pre- and posttest design was adopted to evaluate the nurse-led intervention training on the nutritional status of children under five in Ibadan, considering the moderating variables of gender and age. The design used in this study helps the researcher to offer a robust approach to studying the effects of multiple independent variables on a dependent variable.

Setting

The setting of the study is Ibadan, Oyo State, Nigeria. Ona-Ara Local Government and Ibadan-South-east Local Government areas were specifically used in Ibadan for the study. The headquarters of Ona-Ara Local Government, Oyo State, Nigeria, the location of this study, is Akanran. It is a 290-square-kilometre area with a population of 265,571, according to the 2006 census, with a predicted population of 265,571 in 2021 (Nigeria's National Population Commission (online) and the NBS Desmond et al., 2021). Akanran, Araromi, Badeku, Gbada-Efon, Idi-Ose, Idi-Osan, Olorunsogo, Ajia, Olunloyo, Gbedun, and Oremeji are the communities in the Local Government. The Local Government is organised into eleven (11) wards, which are made up of 495 villages and larger communities (two urban, two peri-urban and seven rural wards).

Sampling Technique

The sampling was carried out in two (2) phases: Firstly, the mothers were recruited using the simple random sampling; thereafter, the children were recruited using the purposive sampling technique. A total of Eighty-five (85) children participated in the study. Thirty-two children were in the intervention group and fifty-three were assigned to the control group. The assigning of the participants was carried out using simple random sampling, where mothers were made to ballot. A “yes” or “no” was inscribed in the paper, and mothers chose either of the two; anyone who chose “yes” fell into the intervention group, and those with “no” fell into the control group. Simple random sampling was used to assign the mothers to the intervention and control groups to limit bias. Secondly, a purposive sampling technique was used to recruit mildly malnourished children. This sampling technique was utilized due to the nature of the study; this was to ensure that only the mildly malnourished children were taken into consideration for intervention purposes. Mothers were chosen from the communities of Molete, Bewaji, and Elere in the selected Local Government Area. In order to encourage mothers of under-five malnourished children to visit the designated community area, shirker's strip (this is a tape that is wrapped around the children arm to measure their level of malnourishment) was taught to educable town criers (these are people who reside within the community and help with advocacy) who visited the communities (wards 5 - Idi Ose, 7 - Olorunsogo, and 9 - Olunloyo). The mothers who visited the designated area were eventually brought to the infant welfare clinic for the Infant-Feeding Health Education Intervention and malnutrition Management, which was the intervention accorded to the infants through their mothers. Because mothers who live in communities have a phobia of primary health care centers, the designated place in the community was the first point of call. In developing countries such as Nigeria, the prevalent consensus is that children should only visit health centers when they are ill. Mothers were provided with transportation fare as an incentive during the study period.

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Inclusion and exclusion Criteria

Children aged 6 to 24 months who are accompanied by mothers were included in the study. Additionally, children who were mildly malnourished during screening were recruited for the study (using the Shirker's strip and measurements seen in the yellow column). However, children aged 6 to 24 months who showed no signs of malnutrition and children whose mothers declined to participate in the study were excluded from the study.

Instrument

The study employed two instruments to gather data. The baseline nutritional status and demographic data of the malnourished children were obtained using the Food-Frequency-Questionnaire. The anthropometric information of the malnourished children was evaluated using an anthropometric indices checklist. To aid those who do not speak English, the questionnaire was originally developed in English and then translated into Yoruba, which is the native language spoken at the study setting. The instruments were developed in accordance with the study's objectives after an assessment of the relevant literature. By presenting the instrument's draft to professorial experts in the Department of Adult Education and Food and Nutrition, content, face, and construct validity were ensured. The Food Frequency Questionnaire's reliability value was 0.76, while the reliability index for anthropometric indices was 0.76.

Procedure for Data Collection

The Oyo State Ministry of Health Ethics Body and the University of Ibadan's Social Sciences and Humanities Research Ethics Committee (SSHE) received an introduction and authorization to perform the study. The study was authorized with the following numbers: AD/13/479/1089 and UI/SSHREC/2019/0025. Mothers gave their informed consent. Participants received guarantees of privacy. There was no coercion, and participants were free to leave the study whenever they wanted to without incurring any fees. To help with the data collection process, the researchers also recruited the assistance of a few research assistants with training. A nutritionist, a community health extension worker, and town criers were among the research assistants who received sufficient training to become familiar with the data collection tools and assist illiterate mothers in completing their questionnaires. The research assistants hold master's degrees in their various fields. Three stages of data collection were conducted: pre-intervention, intervention, and post-intervention.

Pre-intervention phase

The study's objectives were communicated to the participants. A signed statement of informed consent was made prior to the study. The mothers signed the consent forms and completed the questionnaires, but the body measurements were done with the infant/child participants. The research assistants collected the signed informed consent forms. The two groups—intervention and control—were randomly assigned to the facilities. To establish baseline data, the pre-intervention anthropometric indexes of height, weight, and mid-upper arm circumference were assessed.

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Intervention Phase

The research assistants received training on the Shirkers' strip, a community-based intervention tool, to help them detect mildly malnourished children under five. Subsequently, an area outside the health center was selected in the community. Eventually, mothers who arrived at the designated location were sent to the infant welfare clinic for the management of malnutrition and the infant-feeding health education intervention. A total of fifty-three (53) mothers were assigned to the control group, while thirty-two (32) women were assigned to the intervention group. The height, weight, and BMI of the under-five children were measured at baseline and at 13 weeks. The research team (Nurses) carried out the intervention activities as follows: mothers were trained on how to feed their under-five children using the UNICEF Infant and Young Children Feeding module. The team had sessions of food demonstration using readily available staple foods as well as fortified soya. All three days of the week, each instruction lasted at least an hour and covered the different food classes and their nutritional significance. The food demonstration was delivered through lectures, discussions and charts. Mothers were taught how to prepare local staple meals for their children in such a way that nutrient is not lost. After the food demonstration, mothers were given time at the centre to feed their children with the prepared food. The control group attended lectures for an hour each day for three days a week, and topics included family planning, vaccination schedules, and personal hygiene.

Post-intervention Phase: The malnourished children's post-intervention anthropometric measures were obtained at this stage, which was week 13.

Method of data analysis

The study was conducted using the Statistical Package for Social Sciences Version 25.0 statistical software. The demographic data and the anthropometric measurements were examined using descriptive statistics, such as frequencies, counts and simple percentages, and the Pearson correlation and chi-square were used to test the association between variables at p p-value of 0.05. Anthropometric analysis was carried out using the Nutri Survey software.

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RESULTS

Demographic characteristics of the respondent

Table 1 above showed that the mean of both intervention and control group for mothers and children were 30.26±7.41; 15.14±6.19, respectively. The sex of the children in both groups was female (40.6%; 56.6%) in the intervention and control.

Table 1: Demographic characteristics of the respondents

Pre-test and post-test Anthropometric measurement of malnourished children

Demographic Characteristics		**Intervention**	**Control**
Mean age of mother in years		30.26±7.41	30.26±7.41
Mean age of children in months		15.14± 6.19	15.14±6.19
Sex of the children	**Sex**	**Intervention**	**Control**
		f (%)	f (%)
	Male	19(59.4)	23(43.4)
	Female	13(40.6)	30(56.6)

Table 2 shows that during the pre-intervention the majority of children's nutritional status in the intervention/control group were mildly malnourished. Post-intervention, 28(87.5%) of children in the intervention group were normal, and 4(12.5%) of the children were malnourished. For pre-intervention, 2(6.3%) had oedema in the intervention group, but during the post-intervention, 1(3.1%) had oedema in the intervention group. The control group had 1(1.9%), both at the pre- and post-intervention.

Table 2: Pre-test and post-test Anthropometric measurements of malnourished children

Nutritional dimensions	**Labels**	**Pretest (n=85)**		**Post test (n=85)**	
		Intervention (n=32)	**Control (n=53)**	**Intervention (n=32)**	**Control (n=53)**
Nutritional status	Green (Normal) Yellow (Mild Malnourished) Red (Severe malnourished)	- 19(59.4%) 13(40.6%)	37(69.8%) 16(30.2%) -	28(87.5%) 4(12.5%) -	49(92.5%) 4(7.5%) -
Body Mass Index	Normal Mild Malnutrition Moderate Malnutrition Severe Malnutrition No response	6(18.8%) 3(9.4%) 18(56.3%) - 5(15.6%)	49(92.5%) 4(7.5%) - - -	16(50.0%) 4(12.5%) 4(12.5%) 12(37.5%) -	53(100.0%) - - - -
Oedema	No Yes	30(93.8%) 2(6.3%)	52(98.1%) 1(1.9%)	31(96.9%) 1(3.1%)	52(98.1%) 1(1.9%)

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Illness in the past 30 days	No Yes	20(62.5%) 12(37.5%)	41(77.4%) 12(22.6%)	21(65.6%) 11(34.4%)	35(66.0%) 18(34.0%)

Inferential Statistics

Preintervention outcomes between the intervention and control groups (Cross tabulate Body mass index with Anthropometric parameters (Nutritional status)

Table 3 showed the chi-square analysis revealed a significant association between children's nutritional status and the intervention programme in the pretest category. In the experimental group, the majority of the children fell within the yellow (56.3%) and red (40.6%) categories, indicating moderate to poor nutritional status, while only 3.1% were classified as green (healthy). In contrast, the control group had a disproportionately high number of children in the green category (69.8%), with fewer in yellow (22.6%) and red (7.5%). The contingency coefficient (.551) and negative Pearson correlation (–.631) further confirmed a strong relationship between intervention exposure and nutritional outcomes. The study revealed a chi-square value (χ^2-value=37.149, p<.05), revealing that this association is statistically significant.

Table 3. Association between the Nutritional status of children and the intervention for post-intervention

Nutritional status	Experimental group		Total	Contingency coefficient	Pearson Corr.	χ^2 - value	df	P-value
	Intervention	Control						
Green	1(3.1%)	37(69.8%)	38(100.0%)	.551	-.631*	37.149	2	<.001
Yellow	18 (56.3%)	12(22.6%)	30(100.0%)					
Red	13 (40.6%)	4 (7.5%)	17(100.0%)					
Total	32 (37.6%)	53(62.4%)	85(100.0%)					

* Significant at 0.05 level

Association between Body mass index of children and the intervention.
Table 4 showed a significant association between children's body mass index (BMI) and the intervention. In the experimental group, a higher proportion of children fell within the normal (18.8%) and mild malnutrition (9.4%) categories compared to the control group (3.8% and 7.5% respectively), revealing some positive effects of the intervention. However, both groups still recorded substantial cases of moderate and severe malnutrition, with 40.6% and 31.3% in the experimental group versus 37.7% and 50.9% in the control group, respectively, showing that malnutrition remains prevalent. The contingency coefficient (.601) and negative Pearson correlation (–.679) point to a strong relationship between intervention and BMI outcomes. The chi-square statistics (47.998, df = 3, p < .001) confirmed that this association is statistically significant.

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Table 4. Association between Body mass index of children and the intervention.

Body Mass Index	Experimental group		Total	Contingency coefficient	Pearson Corr.	χ^2 - value	df	P-value
	Intervention	Control						
Normal	6 (18.8%)	2(3.8%)	8(100.0%)	.601	-.679*	47.998	3	<.001
Mild malnutrition	3 (9.4%)	4(7.5%)	7(100.0%)					
Moderate malnutrition	13(40.6%)	20(37.7%)	33(100.0%)					
Severe malnutrition	10(31.3%)	27 (50.9%)	37(100.0%)					
Total	32(37.6%)	53(62.4%)	85(100.0%)					

* Significant at 0.05 level

Post-intervention outcomes between the intervention and control groups (Cross tabulate Body mass index with Anthropometric parameters (Nutritional status)

Table 5 showed the post-intervention chi-square analysis, indicating no significant association between children's nutritional status and the intervention. In both the experimental and control groups, most of the children were classified as green (healthy), with 87.5% in the intervention group and 92.5% in the control group, while only a small proportion remained in the yellow category (12.5% and 7.5% respectively). The contingency coefficient (.082) and Pearson correlation (–.082) suggest a very weak relationship, and the chi-square value (0.574, p>.05) confirmed that the difference between groups is not statistically significant.

Table 5. Association between the Nutritional status of children and the intervention for post-intervention

Nutritional status	Experimental group		Total	Contingency coefficient	Pearson Corr.	χ^2 - value	df	P-value
	Intervention	Control						
Green	28 87.5%	49 92.5%	77 100.0%	.082	-.082	0.574	1	.449
Yellow	4 12.5%	4 7.5%	8 100.0%					
Total	32 37.6%	53 62.4%	85 100.0%					

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DISCUSSION OF FINDINGS

Participants Characteristics

The mean age of the respondents in both groups was between 15.14± 6.19, which confirmed the findings of a study conducted by Ajao, Ojoifetimi, Adebayo, Fatusi, and Abiola (2010). Children in the intervention group gained the same amount of weight and length as children in the control groups at 18 months, in accordance with research by Waddington et al. (2019). The weight gain in the intervention group could be because of retention of knowledge by mothers, which perhaps was demonstrated at their various homes on food preparation. From the intervention group, more than half had a male child, while from the control group, more than half had a female child. The findings from this study show the peculiarity of the geographical location with predominantly female children.

Anthropometric Measurement of Malnourished Children

The result showed that the majority of children's nutritional status pre-intervention, in the intervention group, were mildly malnourished. Post-intervention, most children in the intervention group were normal. Meanwhile, pre-intervention and post-intervention, a few had oedema. This present study is in line with that of Folake et al. (2008); the prevalence rates of stunting, underweight, and wasted children were found to be 44.4%, 41.9%, and 21.0%, respectively, in high-density urban settings. These findings are consistent with those of other researchers who found that under-5 children were malnourished on a widespread basis. Mehdi et al. (2006) discovered that among children aged 6 to 8, there was 21.2 percent waste, 51.7 percent underweight, and 47.4 percent stunting in underprivileged areas of India. Our study has shown that, considering the nation's persistent economic issues, this finding is not surprising. Many households have seen a decline in their purchasing power due to the sharp increase in the cost of items, notably food. As a result, a lot of children, especially those from low-income households, have undoubtedly been forced to eat poor quality food.

Preintervention outcomes between the intervention and control groups (Cross tabulate Body mass index with Anthropometric parameters (Nutritional status)

The negative Pearson correlation confirmed a strong relationship between intervention exposure and nutritional outcomes. Also, findings from this study revealed that there is an association which was statistically significant, i.e., the intervention had a measurable impact on the distribution of nutritional status among children. The results of Bhattacharya and Ravi (2021) agree with this one, where a nutritional education intervention was carried out among mothers with children. Nurses instructed mothers on the benefits of supplementary meals and how to best feed their babie,s and their intervention should significantly change. Infants whose parents started supplement feeding at six months showed a considerable increase in weight gain and linear growth. Sánchez-Encalada et al. (2019), who examined how well mothers adhered to dietary guidelines to aid in their children's weight gain, concurred with the findings. In our current study, it can be judged that the educational intervention prevented further malnutrition that could have been on the increase in the respondent. For this reason, the mothers' commitment to educational intervention was crucial to the children's improved health.

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Association between the Body mass index of children and the intervention group

The negative Pearson correlation points to a strong relationship between intervention and BMI outcomes of the children. Also, there was an association which was statistically significant. The study by O'Connor et al. 2024 is in line with our study, where the authors conducted a systematic review and found that weight management interventions led to lower BMI in children. Also, a systematic review by Su et al. (2025) their finding shows that physical activity, diet, and behavioral and informational support reduced BMI. It can be inferred from our study that the intervention had a measurable though not complete effect on improving nutritional status as reflected in BMI.

Postintervention outcomes between the intervention and control groups (Cross tabulate Body mass index with Anthropometric parameters (Nutritional status)

The post-intervention findings show that there is no significant association between children's nutritional status and the intervention. Also, the coefficient and Pearson correlation suggest a very weak relationship, and the chi-square value confirmed that the difference between groups is not statistically significant. Our present study is in line with that of Bhanat et al. (2022) conducted a community-based intervention study in India found where nutritional interventions significantly improved anthropometric outcomes in malnourished children. Another systematic review conducted by Susanti in 2023 stated in their findings that the average birth weight of children is increasing compared with birth weight in the control group. The inference from our study shows that the intervention had a substantial positive impact on improving children's BMI and reducing severe malnutrition. The retention of knowledge by mothers has helped to bridge malnutrition.

LIMITATIONS OF THE STUDY

There are a few limitations of this study; the research was conducted in a region of the country, which is a state in southwestern Nigeria, with a small sample size. Mothers of under-5 children suffering from malnourishment were difficult to locate because they were not always present at the health Centers for easy identification at the time of the study. The intervention was carried out over 13 weeks; however, the post-intervention data were only collected at the end of the 13th week. This might have been due to the phobia of health centers. Notwithstanding these drawbacks, the study offers mothers of children under five empirical data for mitigating under-five malnutrition. Additionally, the intervention provided has helped mothers of children under five realise how crucial it is to enhance their children's nutritional health to reduce the number of under-five mortality.

CONCLUSION

In Ibadan, particularly in Ona Ara Local Government, malnutrition among children under five years old continues to be a serious public health concern. The intervention taught mothers of under-five children the value of how to prepare locally available foods, breast milk, personal and environmental sanitation, and a balanced daily meal for children, which includes breakfast,

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lunch, and dinner with fruits in between, to improve the nutritional status for all under-five children.

RECOMMENDATIONS

Community and public health nurses are urged to use the intervention as a practical means of lowering and controlling under-five children's nutritional status. Programmes that would improve mothers of children under-five's understanding of their dietary status must also be included. To help mothers give better instructions, baby welfare and immunization clinics should provide ongoing training programmes, instructional aids, and informational and communicational tools and materials, including flyers, posters, handbills, and even digital media banners.

Suggestion for further studies

Another study could be conducted by including other local government districts in the state to provide a more accurate representation of the findings. This can help lower rates of sickness and mortality by improving the nutrition of kids, especially those under the age of five. Poor nutrition also affects a child's cognitive development and the ability to learn.

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