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The Impact of Primary Healthcare System on Child Mortality Rates in Selected Health Organizations in North-Central Nigeria

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ABSTRACT

This study aims to investigate the impact of the Primary Health Care (PHC) system in North-Central Nigeria on child mortality by analysing accessibility, affordability, and staffing in seven selected health organisations. A quantitative research design was adopted, with data collected from 700 respondents, including healthcare professionals and carers. Descriptive and inferential statistics, including mean, standard deviation, chi-square tests, and logistic regression analysis, were employed to evaluate the key variables. The findings revealed a significant negative association between PHC accessibility ($p = 0.001$) and child mortality, indicating that improved accessibility was linked to lower child mortality rates. Additionally, there was a significant positive association between PHC affordability ($p = 0.021$) and child mortality, suggesting that higher affordability was associated with reduced child mortality. For instance, data showed that for every increase in accessibility, child mortality decreased by X%, highlighting the impact of improved access on lowering child death rates. However, staffing shortages, while perceived as a major challenge, were not significantly associated with child mortality ($p = 0.095$). Respondents also pointed out the main obstacles to efficient service delivery, which include poor healthcare facilities and continuous medication shortages. Reducing child mortality in the region requires bettering healthcare facilities and supply chains; thus, PHC becomes more accessible and fairly priced, and overall healthcare quality is raised. Policy suggestions advocate for supporting PHC initiatives, filling shortages of healthcare professionals, and raising health insurance coverage. To gain a deeper understanding of how PHC influences child health outcomes, future studies should incorporate longitudinal data to track changes over time and consider exploring the impact of PHC on specific health indicators such as vaccination rates, maternal health, and disease prevalence in different regions of Nigeria.

تأثيرنظام الرعاية الصحية الأولية على معدلات وفيات الأطفال في بعض المؤسسات الصحية في شمال وسط نيجيريا

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الملخص

تهدف هذه الدراسة إلى دراسة تأثير نظام الرعاية الصحية الأولية((PHC)) في شمال وسط نيجيريا على وفيات الأطفال من خلال تحليل إمكانية الوصول والقدرة على تحمل التكاليف والموظفين في سبع منظمات صحية مختارة .تم اعتماد تصميم بحث كمي، مع جمع البيانات من 700 مستجيب، بما في ذلك المتخصصين في الرعاية الصحية ومقدمي الرعاية .تم استخدام الإحصاءات الوصفية والاستدلالية، بما في ذلك المتوسط والانحراف المعياري واختبارات مربع كاي وتحليل الانحدار اللوجستي، لتقييم المتغيرات الرئيسية .كشفت النتائج عن وجود

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ووفيات الأطفال، مما يشير إلى (p = 0.001) ارتباط سلبي كبير بين إمكانية الوصول إلى الرعاية الصحية الأولية أن تحسين إمكانية الوصول كان مرتبطًا بانخفاض معدلات وفيات الأطفال .بالإضافة إلى ذلك، كان هناك ارتباط ووفيات الأطفال، مما يشير إلى (p = 0.021) إيجابي كبير بين القدرة على تحمل تكاليف الرعاية الصحية الأولية أن ارتفاع القدرة على تحمل التكاليف كان مرتبطًا بانخفاض وفيات الأطفال .على سبيل المثال، أظهرت البيانات مما يسلط الضوء على تأثير ،X٪ أنه مقابل كل زيادة في إمكانية الوصول، انخفض معدل وفيات الأطفال بنسبة تحسين الوصول على خفض معدلات وفيات الأطفال .ومع ذلك، فإن نقص الكوادر، على الرغم من اعتباره تحديًا كما أشار المستجيبون إلى العقبات الرئيسية أمام .(p = 0.095) كبيرًا، لم يرتبط ارتباطًا كبيرًا بوفيات الأطفال تقديم الخدمات بكفاءة، والتي تشمل ضعف مرافق الرعاية الصحية والنقص المستمر في الأدوية .يتطلب الحد من وفيات الأطفال في المنطقة تحسين مرافق الرعاية الصحية وسلاسل التوريد؛ وبالتالي، تصبح الرعاية الصحية الأولية أكثر سهولة في الوصول إليها وبأسعار معقولة، ويتم تحسين جودة الرعاية الصحية بشكل عام .تدعو مقترحات السياسات إلى دعم مبادرات الرعاية الصحية الأولية، وسد النقص في المتخصصين في الرعاية الصحية، وزيادة تغطية التأمين الصحي .للحصول على فهم أعمق لكيفية تأثير الرعاية الصحية الأولية على نتائج صحة الطفل، ينبغي للدراسات المستقبلية أن تتضمن بيانات طولية لتتبع التغييرات بمرور الوقت والنظر في ،استكشاف تأثير الرعاية الصحية الأولية على مؤشرات صحية محددة مثل معدلات التطعيم، وصحة الأم .وانتشار الأمراض في مناطق مختلفة من نيجيريا.

1. Introduction

Globally, health has been a social issue for a long time. Evidence abounds that environmental and social factors are the causes of high mortality rates and other health challenges across the globe. The World Health Organisation [1] defines health as a state of complete physical, mental, and social well-being, not merely the absence of disease or infirmity. From this wide perspective, social factors of health comprise socioeconomic status, sanitation, education, and healthcare access. Health outcomes significantly impact underdeveloped nations, particularly in Africa, where significant health challenges persist. Most especially in areas with limited access to healthcare, child mortality remains a major concern among these problems.

Globally, child mortality is a commonly regarded indication of the general well-being of a community. Over the last several decades, [2] notes that gains in healthcare, nutrition, and immunisation efforts have contributed to cutting child mortality rates. Though progressively reducing, certain areas of South Asia and sub-Saharan Africa have shockingly high rates of child mortality. For 2020, global under-five mortality rates were 38.7 per 1,000 live births. Of these fatalities, though, 72.5 per 1,000 live births, which is more than half, occurred in sub-Saharan Africa [3]. Under this paradigm, the most populous nation in Africa, Nigeria, remains with one of the highest rates of infant death despite several national and international programs aimed to reduce the problem.

Nigeria's healthcare system operates at three levels: tertiary care, which includes specialised medical services; secondary care, providing more general hospital services; and primary care, which focuses on basic healthcare services such as preventive care and initial treatment [4]. The first stage of medical treatment, primary health care (PHC), comprises health education, immunisations, disease prevention, and mother-and-child care. Given most Nigerians reside in rural areas and have average incomes, the main healthcare system is fairly crucial in providing these individuals with medical treatment [5]. Notwithstanding its significance, the PHC system has had various difficulties, including inadequate facilities, a scarcity of educated healthcare staff, and limited financing [6]. High child death rates have been noted in several parts of the country, especially North Central Nigeria; these problems mostly explain this occurrence [7].

Though North-Central Nigeria has overwhelming support for the underfunded and congested public health system, the people there are committed to tackling the epidemic of infant death [7]. Many residents in rural or semi-urban areas in states such as FCT, Niger, Kogi, Benue, and Kono find it challenging to obtain the necessary high-quality medical treatment [8]. Woldeamanuel [9] proposes that the high frequency of infant and child death in these areas is explained by a combination of elements, including insufficient prenatal care, a lack of healthcare facilities, dietary limitations, and water pollution. According to Nwokoro et al. [6], customary knowledge and antiquated healthcare practices shape rural people's suspicion of and rejection of the PHC system.

Many interrelated factors define the neonatal mortality rate in northern and central Nigeria. The most typically occurring causes of this problem include maternal health care availability, water and sanitation concerns, and housing conditions. Nigeria is among the nations most impacted by malnutrition, according to John et al. [10], also one of the primary causes of infant mortality in sub-Saharan Africa. In addition to hunger, the region's high rate of child mortality is due to diseases like pneumonia, malaria, and diarrhoea. The inadequate healthcare system, which is characterised by a lack of necessary medications, medical supplies, and skilled medical staff, frequently makes these disorders worse [11].

In particular, numerous international organisations and initiatives have supported Nigeria's fight against child mortality through the Millennium Development Goals (MDGs) and their successor, the Sustainable Development Goals (SDGs). The fourth Millennium Development Goal sought to lower Nigerian infant mortality from 1990 to 2015, therefore enhancing the health of its children [12]. Still, the nation fell short of expectations, and ever since development has been sluggish. According to UNICEF [13], 114 fatalities for every 1,000 live births in Nigeria in 2015 were significantly more than the worldwide average. Starting many projects aiming at improving the overall status of children and strengthening the main healthcare system, the Nigerian government and its foreign partners.

The Community Health Insurance (CHI) program, initiated in Kwara State in 2007, aimed to provide affordable healthcare services to low-income communities through resource pooling and shared healthcare expenses [14]. By pooling resources and ensuring equitable sharing of healthcare expenses, the CHI project aimed to provide low-income communities with access to affordable medical treatments, including essential healthcare services and medications [15]. Although the program has enhanced healthcare access, weak management, widespread illiteracy, and inadequate coverage have prevented it from lowering child mortality [16]. Many individuals in North-Central Nigeria still consult traditional healers rather than public health clinics due to cultural beliefs and mistrust of modern medical practices [17]. Against this backdrop, the study aims to look at seven health organization in north-central Nigeria to find whether the performance of the PHC system and child mortality link. Focusing on paediatric healthcare within the PHC system, this paper aims to identify the primary factors contributing to child mortality in North-Central

Nigeria and propose targeted interventions to mitigate these factors. Including seven distinct health organisations, it looks at public and commercial healthcare systems all over to find how different strategies affect children's health results.

2. Material and Methods

The objective of this quantitative study was to investigate if the PHC system and child mortality were connected using seven chosen health organisations in North Central Nigeria (Kwara, Kogi, Niger, Benue, Plateau, Nasarawa, and the FCT). With this configuration, we could gather information to see whether there are trends or patterns in the performance of the PHC system in lowering infant mortality.

Seven distinct healthcare organisations, one from each of the North Central States, were selected for the study purposively. The researchers intended to have a holistic picture of healthcare in the area, hence selecting groups reflecting the public and private sectors. Along with healthcare practitioners (including doctors, nurses, midwives, and community health extension workers) who commonly interface with the PHC system, the intended receivers were carers, such as mothers of children under five.

Health agencies and respondents were selected utilising a multi-stage sampling process. After looking at the seven states' different obligations for child health services, one PHC institution was conviniently chosen from each. From the health agencies, a total of 700 people were purposively selected based on their availability and readiness to partake in the research exercise in the second stage, that is, 100 from each state. Respondents' awareness of the PHC system and their roles as caretakers and healthcare providers puts them in a pole position to offer perceptive analysis of child health outcomes and healthcare service efficiency.

Data for the study was gathered using a structured questionnaire designed to achieve the study's goals and align with existing literature. Key sections of the questionnaire were separated to provide thorough information on child mortality as well as the main healthcare (PHC) system compiled. Comprising demographic data in Section A; details on PHC system in Section B such as availability, accessibility, service quality, and utilisation. Section C examined child mortality within the framework of basic health care. Section D contained dietary support of health services and Section E considered the issue of PHC system. The respondents' opinions were rated using a five-point Likert scale, which spans from strongly disagree to strongly agree.

Fieldwork spanned four weeks, during which research assistants trained in ethical considerations and survey administration of data collection through structured questionnaires to ensure reliable results. Participants were informed of the goal of the study and given the opportunity to freely provide their answers so as to guarantee reliable results.

Professionals in public health and health systems research reviewed and confirmed the questionnaire's content and visual design to ensure its validity. Thirty participants participated in a pilot test to guarantee the questions were relevant, clear, and suitable; they were not included in the final sample. Cronbach's alpha, a measure of internal consistency, was utilised to assess the reliability of the questionnaire. A reliability score of 0.70 or higher indicates a dependable instrument for data collection.

Before they began their engagement, each respondent had the opportunity to provide their informed approval. Data was anonymised in relation to privacy so as to preserve respondents' identities. At last, permission was obtained from the relevant North-Central Nigeria's health authorities as well as from the Ethics Review Committees of the chosen PHC facilities.

The collected data was entered into the Stata software for analysis and interpretation. To look into the links between the main parts of the healthcare system and child deaths, descriptive (including frequency, percentages, mean, and standard deviation) and inferential statistics, such as chi-square testing and logistic regression analysis, were used to analyse the characteristics and points of view of the respondents.

3. Results

Table 1: Demographic Characteristics of Respondents (n= 700)

Variable	Option	Frequency (n)	Percentage (%)
Gender	Male	285	40.7
	Female	415	59.3
Age Group (years)	< 25	145	20.7
	25 – 34	280	40.0
	35 – 44	205	29.3
	45+	70	10.0
Education Level	No Formal Education	53	7.6
	Primary Education	153	21.9
	Secondary Education	214	30.5
	Tertiary Education	280	40.0
Occupation	Healthcare Worker	430	61.4.
	Caregiver	270	38.6

Source: Field Survey, 2024

Table 1 above depicts that the proportion of females in the sample is higher than their counterparts 415 (59.3%), while the largest age group is 25-34 years (40%), followed by 35-44 years (29.3%). In addition, 280 (40%) of the respondents have tertiary education, which indicates a relatively literate sample. Finally, the healthcare workers represent the majority of the sample with 430 (61.4%).

Table 2: Perceptions of the Accessibility and Utilisation of PHC Services (Likert Scale Responses)

Variable	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	SD
PHC centres are easily accessible.	56	105	84	308	147	3.55	1.19
PHC services are affordable for all.	98	168	112	210	112	3.05	1.30
PHC centres have adequate healthcare workers.	140	210	126	140	84	2.85	1.25
I regularly use PHC services for my child.	56	105	126	238	175	3.50	1.23

Source: Field Survey 2024

Table 2 shows that respondents agree or strongly agree that PHC centres are accessible, with a mean score of 3.55. On their perceptions of affordability, it is lower with a mean score of 3.05, indicating some concerns regarding the cost of PHC services. Also, perceptions of the availability of healthcare workers are the lowest (mean = 2.85), suggesting staff shortages in PHC facilities. Finally, many respondents (mean = 3.50) report regular use of PHC services for their children.

Table 3: Awareness and Causes of Child Mortality

Variable	1. Yes (%)	2. No (%)	3. Undecided (%)
Are you aware of the main causes of child mortality?	4. 546 (78.0%)	5. 84 (12.0%)	6. 70 (10.0%)
Have you ever experienced the death of a child under five?	7. 210 (30.0%)	8. 420 (60.0%)	9. 70 (10.0%)
Common cause: Malaria	10. 448 (64.0%)	11. 154 (22.0%)	12. 98 (14.0%)
Common cause: Pneumonia	13. 392 (56.0%)	14. 196 (28.0%)	15. 112 (16.0%)
Common cause: Diarrhea	16. 350 (50.0%)	17. 238 (34.0%)	18. 112 (16.0%)

Source: Field Survey 2024

Table 3 revealed that 546 (78%) of respondents are aware of the

leading causes of child mortality. Meanwhile, 210 (30%) of respondents have experienced the death of a child under five, indicating the significant impact of child mortality in the region. Finally, the most identified causes of child mortality are malaria (448, 64%) and pneumonia (392, 56%).

Table 4: Perceptions of Challenges in the PHC System (Likert Scale Responses)

Challenges	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Mean	SD
There are frequent stockouts of essential drugs.	35	70	105	280	210	3.75	1.10
There is a shortage of healthcare workers.	56	84	126	238	196	3.55	1.19
The healthcare infrastructure is inadequate.	70	98	84	280	168	3.50	1.24
The PHC system faces funding challenges.	98	154	126	196	126	3.05	1.29

Source: Field Survey 2024

Table 4 depicts that frequent drug stockouts (mean = 3.75) and healthcare worker shortages (mean = 3.55) are perceived as significant challenges by respondents. Inadequate healthcare infrastructure is also a concern (mean = 3.50), and funding challenges are less consistently reported (mean = 3.05).

Table 5: Chi-Square Test of Association Between PHC Utilisation and Child Mortality

Variable	Chi-Square Value	df	p-value	Significance
PHC accessibility and child mortality	12.58	1	0.001	Significant
PHC affordability and child mortality	5.36	1	0.021	Significant
PHC staffing and child mortality	2.78	1	0.095	Not Significant

Source: Field Survey, 2024

The strong link between PHC accessibility and child mortality (p = 0.001) shows that better access to PHC services reduces child mortality rates. In terms of affordability of health services and child mortality, there is also a significant association between both variables (p = 0.021). Finally, staffing levels, while important, did not show a significant association with child mortality in this dataset (p = 0.095).

Table 6: Logistic Regression Results on Predictors of Child Mortality

Independent Variable	Odds Ratio (OR)	95% Confidence Interval (CI)	p-value	Significance
PHC accessibility	0.65	0.48 – 0.89	0.004	Significant
Socio-economic status (SES)	1.42	1.12 – 1.81	0.002	Significant
Maternal education	0.78	0.65 – 0.93	0.012	Significant
Healthcare worker availability	1.12	0.92 – 1.36	0.260	Not Significant

Source: Field Survey, 2024

From Table 6 above, PHC accessibility has an odds ratio of 0.65, indicating that better access to PHC services reduces the odds of child mortality by 35% (p = 0.004). Also, socio-economic status is a significant predictor of child mortality (OR = 1.42, p = 0.002), meaning that poorer households have higher odds of child deaths. Higher maternal education significantly reduces the risk of child mortality (OR = 0.78, p = 0.012). Finally, child mortality (p = 0.260) revealed no statistically significant correlation with the presence of medical practitioners.

4. Discussion

Aiming primarily on the availability, cost, and personnel of specific health organisations, this study sought to find the correlation between child mortality in North-Central Nigeria and the Primary Health Care (PHC) system. The results underline the vital contribution PHC makes in lowering child mortality as well as validate regional and worldwide trends.

The results revealed a connection between PHC accessibility and child mortality (p = 0.001), indicating that improved access to PHC services is linked to lower child mortality. This aligns with the World Health Organisation's (2023) [18] assertion that easily accessible basic healthcare services are crucial for achieving global health goals for maternal and child health. Comparatively, regionally researched Ethiopia found that reducing under-five death rates required more access to main healthcare services like immunisation and mother education (Zeleke, 2022) [19]. In rural parts of Nigeria, problems with healthcare facilities and transportation still limit optimum service delivery (Abah, 2022) [20]. The third aim of the Sustainable Development Agenda by 2030 is to eliminate avoidable deaths of children under five years old. Should these issues be addressed, child mortality rates might be dramatically dropped.

The affordability of PHC services has a notable impact on child mortality (p = 0.021). The fairly high healthcare costs in Nigeria might be the reason for poor child health outcomes; this discouragement of their utilisation is especially noticed in lower-income households (Dasgupta et al., 2022) [21]. Lack of resources is one of the primary drivers of health disparities; hence, our results line with that consensus (UNICEF, 2022) [2]. By reducing healthcare costs and enhancing access for all socioeconomic levels, nations like Rwanda, which has established universal healthcare coverage, have shockingly decreased newborn mortality rates (Nyandekwe et al., 2022) [22]. Abubakar et al. (2022) [23] argue that, especially in undeveloped regions, present initiatives to extend the National Health Insurance Scheme (NHIS) in Nigeria have the potential to cut infant mortality by making healthcare more affordable and accessible.

Although staffing shortages at PHC sites were seen as a main concern, shockingly there was no statistically significant connection between child mortality (p = 0.095) and the availability of healthcare professionals. One possible explanation is that rural hospitals struggle to afford increased staffing due to the limited availability of healthcare professionals (Nwokoro et al., 2022) [6]. Low- and middle-income countries that have successfully reduced global child mortality rates (Cha & Jin, 2019) [24]. The authors attributed these improvements to the density of healthcare workers. Brain drain, which is the migration of trained medical professionals seeking benefit elsewhere, is one of the systematic problems facing Nigeria's healthcare sector. By means of better incentives and retention strategies, one may help to close the workforce gap and thereby facilitate long-term improvements in child health outcomes.

The leading causes of infant mortality were malaria (64%), pneumonia (56%), and other infectious diseases, known by a good number of respondents (78%). This is in line with past studies conducted in sub-Saharan Africa showing that among children less than five years old, these avoidable illnesses account for the most fatalities (Tesfa et al., 2021) [25]. Although modern global health efforts such as the Integrated Management of Childhood Illness (IMCI) plan assist in demonstrating a decline in some illness prevalence, countries like Nigeria with insufficient healthcare infrastructure still show huge gaps (Oko et al., 2023) [26]. One can significantly reduce the child death rate by improving the preventative healthcare services of the PHC system, including dietary assistance and immunisation.

Respondents highlighted two major challenges affecting the efficiency

of the PHC system: frequent drug shortages (mean = 3.75) and insufficient healthcare infrastructure (mean = 3.50). These results, in accordance with earlier research on Nigeria, stress the importance of better supply chain management and investment in hospital infrastructure in raising service delivery (Machuki et al., 2023) [27]. Similar difficulties have beset health systems in low- to middle-income nations all around. Conversely, nations that have focused on building basic healthcare systems, such as Brazil with its Family Health Strategy, have shown considerable improvement in health outcomes (Roman, 2023) [28].

This study adds to the mounting body of data demonstrating, especially in LMICs, the great value of primary health care (PHC) systems in lowering child mortality rates. A strong relationship between PHC access and child mortality supports theoretical models stressing healthcare access as a main determinant of population health. These results reinforce the Health Belief Model (HBM), which posits that individuals' access to health services is influenced by perceived barriers and benefits, leading to improved health outcomes when access is facilitated. Moreover, the study advances the discourse on the Social Determinants of Health (SDOH), particularly by illustrating how socioeconomic status and maternal education can affect health outcomes, aligning with global health equity theories.

From a policy perspective, the study emphasises the critical need for immediate and targeted interventions to enhance PHC access and affordability in north-central Nigeria. Policies that focus on reducing financial barriers, such as expanding the National Health Insurance Scheme (NHIS) to cover more underserved populations, are essential. The findings further suggest that government policies should incentivise healthcare worker retention, especially in rural areas, to mitigate the staffing shortages observed across PHC facilities. Aligning with Sustainable Development Goal (SDG) 3, policymakers should also emphasise child health initiatives, such as immunisation programs and maternal education campaigns, to address preventable causes of child mortality, such as malaria and pneumonia.

For healthcare practitioners, the results suggest the need for a more proactive approach to addressing the service delivery gaps within PHC facilities. Healthcare providers should focus on enhancing the quality of services offered by strengthening preventive care programs, especially for vulnerable populations such as children under five. Community health workers, in particular, can play a crucial role in increasing awareness of child mortality causes and promoting health-seeking behaviours with coordination improvement between PHC centres and community stakeholders, healthcare professionals could create a more robust and responsive health system.

This study is not without limitations. One major limitation is its geographic scope, as it focuses only on seven PHC organisations in North-Central Nigeria. While these organisations were purposefully selected to represent both public and private healthcare providers, the findings may not be fully generalisable to other regions of Nigeria or other LMICs with differing healthcare contexts. Additionally, the cross-sectional nature of the data limits the ability to infer causality between PHC factors and child mortality. Longitudinal studies would be better suited to capture trends over time. Lastly, social desirability bias and other forms of prejudice might influence the accuracy of the self-reported data of medical practitioners and caretakers.

5. Conclusion

This research reveals how the PHC system links to the need for fairly priced and easily available healthcare to lower child mortality in North-Central Nigeria. Although there are certain limitations, the study contributes to the mounting body of data confirming the strength of PHC systems in enabling the meeting of world health objectives, including those stated in SDG 3. Based on the results, minimising child mortality in the area calls for extending mother education programs, overcoming budgetary constraints, and enhancing PHC service accessibility. Although shortages of healthcare professionals remain a problem, future initiatives should concentrate on structural problems such as medicine shortages and inadequate infrastructure to raise the effectiveness of PHC service delivery.

6. Abbreviations and Acronyms

PHC : Primary Health Care
WHO: World Health Organization
UNICEF: United Nations International Children's Emergency Fund
MDG: Millenium Development Goals
CHI: Community Health Insurance
FCT: Federal Capital Territory
SD: Standard Dviation
LMIC: Low- and Middle-Income Countries
IMCI: Integrated Management of Childhood Illness
HBM: Health Belief Model
SDOH: Social Determinant of Health
NHIS: National Health Insurance Scheem
SDG: Sustanable Development Goal

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