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SAVING YOUNG LIVES: EVIDENCE-BASED STRATEGIES FOR REDUCING INFANT MORTALITY IN JOS METROPOLIS, NIGERIA

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Abstract

Infant mortality rates remain alarmingly high in Nigeria, despite global improvements in infant health outcomes. This study aims to identify sustainable solutions to mitigate infant mortality in Jos Metropolis. The research explores the impact of education, maternal health, healthcare systems, and infant conditions on infant mortality. Data was collected through structured questionnaires from hospitals in Jos Metropolis and analyzed using multiple regression statistics. The results show that safe and adequate education is the only significant factor in reducing infant mortality, while maternal health and infant conditions have no significant effect. The study concludes that sustaining safe and adequate education is crucial, while also prioritizing improvements in maternal health, infant conditions, and healthcare systems to effectively reduce infant mortality in Jos Metropolis, Nigeria.

Keywords: Infant, Mortality, Reducing, Strategies

1.INTRODUCTION

Infant mortality is a devastating public health concern in Nigeria, with far-reaching implications for the country's development, healthcare system, and citizens' well-being. Despite numerous interventions and policy reforms, Nigeria's infant mortality rate remains alarmingly high, with 69 deaths per 1,000 live births. The situation is even more dire in Jos Metropolis, where up to 120 infants die per 1,000 live births, making it one of the most challenging regions in the country.

The high infant mortality rate in Jos Metropolis is attributed to multiple, interconnected factors (Adeyele, Izedomi, & Iyilade, 2016; Adeyele & Ogungbenle, 2020). These include inadequate access to quality healthcare services, including shortages of skilled birth attendants, emergency obstetric care, and neonatal care. Socio-economic challenges, such as poverty, illiteracy, and poor maternal education, also limit access to healthcare and hinder health-seeking behavior. Additionally, inadequate healthcare infrastructure, including shortages of essential medical supplies and trained personnel, exacerbates the problem.

Inadequate access to quality healthcare services is a significant contributor to infant mortality in Jos Metropolis. Many communities in the region lack access to skilled birth attendants, emergency obstetric care, and neonatal care. The shortage of skilled birth attendants poses a significant risk to both mothers and infants during childbirth. Emergency obstetric care, including interventions such as cesarean sections, blood transfusions, and the management of pregnancy-related complications, is often inaccessible due to the limited number of well-equipped healthcare facilities in the region.

Socio-economic factors also play a critical role in infant mortality in Jos Metropolis. Poverty, illiteracy, and poor maternal education limit access to healthcare and hinder health-seeking behavior. Many mothers lack basic knowledge about prenatal and postnatal care, proper infant feeding practices, and the importance of immunizations, all of which are crucial to reducing infant mortality. Health-seeking

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behavior in Jos is often influenced by traditional and cultural practices that may deter families from accessing modern healthcare services, further complicating efforts to reduce preventable infant deaths (Adeyele, 2014). Furthermore, the lack of access to clean water, sanitation, and hygiene facilities also contributes to the high infant mortality rate in Jos Metropolis. The absence of these basic necessities increases the risk of waterborne diseases, such as diarrhea and cholera, which can be fatal for infants. Moreover, the lack of adequate nutrition and micronutrients, particularly vitamin A and zinc, further exacerbates the problem.

This study seeks to address the root causes of infant mortality in Jos Metropolis by exploring and implementing effective, evidence-based strategies. The research aims to improve access to quality healthcare services, including the availability of skilled birth attendants, emergency obstetric care, and neonatal care. Promoting maternal education and awareness is also a critical component of the study, empowering mothers to make informed decisions about their health and their infants' health. Enhancing maternal health services, including access to antenatal care, nutritional support, and maternal health education, is also a key objective.

Strengthening the healthcare system is another critical focus of the study. Increasing the availability of essential medical supplies and expanding the healthcare workforce are essential to ensuring that healthcare services are available and accessible to all residents of Jos Metropolis. A well-functioning healthcare system, with adequate resources and trained personnel, is essential for addressing the root causes of high infant mortality and ensuring that both mothers and infants receive the care they need.

Additionally, the study will explore the role of community-based interventions in reducing infant mortality. Community-based health workers can play a critical role in providing education, support, and referrals to pregnant women and new mothers, helping to ensure that they receive the care they need. The study will also examine the impact of community-based interventions on improving infant health outcomes, including reducing the risk of infant mortality.

Lastly, this study will examine the impact of improving infant conditions on reducing infant mortality. Early interventions are crucial for improving infant health outcomes, particularly in cases of prematurity, low birth weight, and infection. By providing timely and appropriate medical care, as well as promoting healthy infant feeding practices, this study aims to reduce the risk of infant mortality in Jos Metropolis.

In view of the above, the study is designed to achieve the following objectives: to explore the critical role of education in reducing infant mortality in Jos Metropolis; to examine the life-saving impact of improved maternal health on infant mortality; to investigate the influence of an enhanced healthcare system on reducing infant deaths; and to analyze the relationship between improved infant conditions and infant mortality. By addressing these objectives, this research seeks to provide actionable recommendations for reducing infant mortality rates in Jos Metropolis and contribute to broader efforts to improve child health outcomes in Nigeria.

The study's findings will have significant implications for policymakers, healthcare providers, and community leaders in Jos Metropolis. The research will provide evidence-based recommendations for improving access to quality healthcare services, promoting maternal education and awareness, and strengthening the healthcare system. The study's findings will also inform the development of community-based interventions aimed at reducing infant mortality and improving infant health outcomes.

Ultimately, this study aims to contribute to the reduction of infant mortality in Jos Metropolis and improve the health and well-being of mothers and infants in the region. By addressing the root causes of infant mortality and implementing effective, evidence-based strategies, the study seeks to make a meaningful difference in the lives of families and communities in Jos Metropolis.

LITERATURE REVIEW

Theoretical Foundation: The Health Belief Model (HBM)

Health Systems Improvement: The Health Belief Model (HBM), introduced by Rosenstock in 1966, explains how individuals' health-related behaviors are influenced by their perceptions of health risks, the severity of potential health problems, the benefits of p

reventive actions, and the barriers to taking such actions (Rosenstock, 1966). This model can be applied to health system improvements by focusing on how patient perceptions impact their utilization of healthcare services.

One key element of the HBM is perceived susceptibility—how likely individuals believe they are to develop a health issue. Health system improvements that raise awareness of specific risks, such as targeted health campaigns, can lead to increased uptake of preventive services like screenings and vaccinations. For example, a campaign on the risks of untreated hypertension may encourage individuals to seek early diagnosis and treatment (Champion & Skinner, 2008).

Another element, perceived severity, refers to beliefs about the seriousness of a health condition. Effective communication from healthcare providers about the potential consequences of untreated conditions can prompt people to take necessary preventive measures (Glanz et al., 2008).

The perceived benefits of health services also drive behavior. If people believe that visiting a clinic will improve their health, they are more likely to seek care. Health system reforms that enhance service quality and reduce wait times can increase patient confidence in healthcare systems, leading to better health-seeking behaviors (Janz & Becker, 1984).

Perceived barriers, such as cost, access, and fear of treatment, often discourage people from using health services. Addressing these barriers through health system improvements—such as expanding healthcare access or providing financial support—can reduce these obstacles and encourage more consistent use of services (Rosenstock et al., 1988).

Lastly, cues to action, like public health campaigns or reminders from health workers, prompt individuals to engage with the healthcare system. By improving health communication, systems can effectively provide the triggers necessary to drive health-promoting behaviors (Rimer & Glanz, 2005).

***Education*:** The Human Capital Theory, introduced by Becker (1964), offers a compelling lens through which to examine the impact of education—particularly maternal education—on infant mortality rates. The theory suggests that investments in human capital, such as education, yield economic and social returns by enhancing individuals' productivity and improving their quality of life. In this context, maternal education can be seen as a critical form of human capital that directly influences child health outcomes, including the reduction of infant mortality (Becker, 1964; Adeyele & Ogungbenle, 2020).

Education is one of the most significant determinants of health outcomes, particularly in low- and middle-income countries where infant mortality rates remain high (Caldwell, 1979). Educated mothers are more likely to have access to information about health and hygiene practices, proper nutrition, and preventive healthcare measures, such as immunizations and the importance of breastfeeding. These behaviors, facilitated by education, are associated with better child health outcomes. For example, a mother's ability to understand and apply health information increases her likelihood of adopting practices that promote child survival, such as ensuring adequate nutrition, maintaining hygiene, and seeking timely medical care when necessary (Cleland & Van Ginneken, 1988).

Furthermore, maternal education contributes to the intergenerational transmission of human capital. Educated mothers tend to invest more in the health and well-being of their children, leading to improved child survival rates and reduced infant mortality (Glewwe, 1999). This investment can be viewed as a form of intergenerational capital transfer, as mothers who are well-informed about health and nutrition provide their children with better chances of survival and long-term development. These early investments in child health have a multiplier effect, contributing to a healthier and more productive future generation (Schultz, 2002).

In economic terms, reducing infant mortality through education has long-term benefits for both individuals and society. Healthier children have a higher likelihood of surviving into adulthood, completing their education, and contributing to the labor force (Adeyele & Ogungbenle, 2020). This, in turn, enhances overall economic productivity and growth. Additionally, from a public health perspective, lowering infant mortality rates reduces healthcare costs, as fewer resources are needed to address preventable childhood diseases and complications (Victora et al., 2003).

Empirical evidence strongly supports the link between maternal education and reduced infant mortality. Studies show that higher levels of maternal education are associated with increased use of

maternal healthcare services, including prenatal care and skilled birth attendance (Gage, 1997). Educated mothers are also more likely to adopt safer child-rearing practices, such as exclusive breastfeeding and the timely use of vaccinations. These practices directly contribute to lower rates of infant mortality, particularly in regions with limited healthcare infrastructure (Gubhaju, 1986).

Moreover, the benefits of maternal education extend beyond infancy. Educated mothers typically have fewer children, allowing them to allocate more resources to each child's health and development (Schultz, 2002). This reduction in fertility rates, combined with better health practices, creates a virtuous cycle in which each subsequent generation benefits from improved health, education, and economic opportunities.

Despite the strong association between maternal education and infant mortality, it is important to recognize the limitations of Human Capital Theory in this context. While education is a key factor in improving child health outcomes, it is not a panacea. Structural determinants such as poverty, inadequate healthcare infrastructure, and social inequalities also play significant roles in shaping health outcomes (Farahani, Subramanian, & Canning, 2009). Education alone cannot fully mitigate these broader socio-economic factors. Additionally, the quality of education is crucial. Simply increasing years of schooling may not lead to better health outcomes if the education system does not equip individuals with relevant and actionable health knowledge (Filmer & Pritchett, 1999).

Infant Conditions and Health Outcomes*:* Addressing infant conditions is crucial for improving health outcomes and reducing mortality rates. Ensuring access to comprehensive neonatal care, including vaccinations, routine check-ups, and early interventions, significantly enhances infant survival and development (WHO, 2018).

Educational initiatives aimed at parents about infant care practices, such as breastfeeding and safe sleeping, can promote healthier environments for infants and improve overall health outcomes. Community health programs that provide resources and support can further empower families to adopt healthy practices (UNICEF, 2016).

Integrating infant health services with maternal care facilitates continuity, allowing for comprehensive support that addresses both maternal and infant needs. This approach ensures timely interventions and monitoring for conditions such as prematurity or low birth weight, which can adversely affect infant health (Koblinsky et al., 2012).

Data collection on infant health indicators is essential for identifying trends and evaluating the effectiveness of health interventions. Robust health information systems enable targeted policy adjustments to improve service delivery and health outcomes for infants (Lewin et al., 2010). In summary, focusing on infant conditions through access to care, education, integrated services, and data-driven strategies is vital for enhancing health systems and improving outcomes for infants.

Improved Maternal Health: Improved maternal health is critical for enhancing overall health outcomes and reducing maternal mortality. Ensuring access to quality care is essential, as comprehensive maternal health services, including antenatal care, skilled birth attendance, and postnatal support, contribute to safe pregnancies and deliveries (WHO, 2018). Additionally, educating women about their reproductive health rights and available services empowers them to make informed decisions, leading to better health outcomes. Community outreach programs can effectively raise awareness and encourage healthcare utilization (UNICEF, 2016).
Integrating maternal health services with general healthcare facilitates continuity of care and helps identify and address comorbid conditions, ensuring holistic health management (Koblinsky et al., 2012). Furthermore, monitoring maternal health indicators through robust health information systems allows for targeted interventions and policy adjustments based on evidence, ultimately improving service delivery and outcomes (Lewin et al., 2010). In summary, focusing on improved maternal health through access to quality care, education, integrated services, and data-driven approaches can significantly enhance health systems and outcomes for women.

3. METHODOLOGY

This study was carried out in some selected hospitals in Jos metropolis, among the health workers of different departments including Pediatrics, Pediatrics and Surgery, nursing, Medicine, Obstetrics and

Gynecology. Primary data was employed collect data in selected hospitals in Jos metropolis. The copies of questionnaire were distributed to some selected staff members of the various hospitals. The statistical tools used for the data analysis are descriptive statistics and multiple regressions.

Model Specification

It has shown for many years that both infants and children are exposed to mortality risk.

$$INFMORT = f(SAE, MHI, HIS, ICI)$$

$$INFMORT = \beta_0 + \beta_1 \sum_j^n SAE + \beta_2 \sum_j^n MHI + \beta_3 \sum_j^n HIS + \beta_4 \sum_j^n ICI + \varepsilon \quad (1)$$

INFMORT = Infant mortality

SAE = Safe and adequate education

MHI = Maternal health improvement

HSI = Health system improvement

ICI = Infant condition improvement

$\hat{a}_0$ *= Intercept*

$\hat{a}_1$ *to* $\hat{a}_4$ *= coefficients of the* var*iables measured*

4. RESULTS

In Jos Metropolis, infant mortality rates remain alarmingly high. This study investigated the relationship between mitigating techniques for infant mortality, focusing on safe and adequate education, maternal health improvement, health system improvement, and infant condition improvement. The results reveal some striking findings on the most effective ways to reduce infant mortality. Detailed of the results are presented in Tables 1 and 2.

Table 1: Relationship of mitigating techniques for infant mortality in Jos metropolis

				Std.	Change Statistics					
Model	R	R Square	Adjusted R Square	Error of the Estimate	R Square Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
1	.622[a]	0.387	0.383	0.68979	0.387	106.071	1	168	0	
2	.635[b]	0.403	0.396	0.68291	0.016	4.401	1	167	0.037	
3	.639[c]	0.408	0.397	0.68198	0.005	1.456	1	166	0.229	
4	.640[d]	0.409	0.395	0.6832	0.001	0.41	1	165	0.523	1.582

a. Dependent Variable: INFMORT

Source: Authors' computation

Table 1 is concerned with relationship of mitigating techniques for infant mortality in Jos metropolis. As revealed in the table, safe and adequate education accounted for 38.7% and has a relationship with infant mortality (SAE: R^2 =0.387; F= 106.071, p<0.000). This implies that safe and adequate education accounts for 38.7% reduction in infant mortality in Jos metropolis. However, maternal health improvement (MHI: R^2 =0.016; F= 4.401, p<0.037), health system improvement (HIS: R^2=0.005; F= 1.456, p<0.229) and infant condition improvement (ICI: R^2 =0.001; F= 0.410, p<0.523) all put together only mitigated infant mortality by 2.2%. This brings the total to 40.9% as it is evident in Table 1a. This invariably means that both safe and adequate education and maternal health improvement significantly contributed 40.3% of the infant mitigation techniques in Jos metropolis while health system improvement and infant's condition improvement does not contribute anything to the mitigation techniques of infant mortality in Jos metropolis.

Table 2: Impact of mitigating techniques on infant mortality in Jos metropolis

Model		Unstandardized Coefficients B	Unstandardized Coefficients Std. Error	Standardized Coefficients Beta	T	Sig.
4	(Constant)	0.651	0.409		1.593	0.113
	SAE	0.397	0.134	0.374	-2.966	0.003
	MHI	0.186	0.096	0.189	1.943	0.054
	HSI	0.06	0.09	0.057	0.666	0.506
	ICI	0.08	0.124	0.083	0.640	0.523

a. Dependent Variable: INFMORT
Source: Authors' computation

In Table 2 revealed impact of mitigating techniques on infant mortality in Jos metropolis. As shown in the table, safe and adequate education significantly has negative effect on infant (SAE: Beta=0.397, t = 2.966, $p<0.05$). This means that this technique employed significantly mitigates infant mortality in the study area at the rate of 39.7% while maternal health improvement (MHI: Beta=0.186, t = 1.943, $p<0.05$), health system improvement (HSI: Beta=0.060, t = 0.666, $p>0.05$) and Infant condition improvement (ICI: Beta=0.080, t = 0.640, $p>0.05$) have positive but no significant effect on infant mortality. This implies that the maternal health improvement, health system improvement and infant condition improvement as mitigating techniques are more likely to increase the rate of infant mortality. Luckily, these variables are not statistically significant.

CONCLUSION AND RECOMENDATIONS

Over the years, there are some causes of infant mortality ranging from illiteracy, poverty, and other factors. This research brings out some mitigation strategies which affects infant mortality significantly, these factors are safe and adequate education and improvement on maternal health. Therefore these factors if properly implemented will lead to a certain amount of reduction in infant mortality though not promising that it will stop it.

Based on the data collected from the various hospitals in Jos metropolis, it shows that there are various causes that have claimed the life of infants (infant mortality), and its simply due to some reasons such as poverty, mothers education, environmental factors etc. From the analysis conducted, it was concluded that mortality will keep decreasing if the analyzed mitigation strategies are put in place to reduce infant mortality.

In this research work, there has been an analysis of the mitigation techniques of infant mortality in Jos metropolis. This finding was made possible by data collection through the use of questionnaires from different hospitals in Jos metropolis. From the findings, it was discovered that many factors contributes to help mitigate infant mortality. The chief among these factors is safe and adequate education to parents about infancy. It is said that parents and most especially mothers should be enlightened on how to take care of infant's health, food and eating habit, sleep pattern, etc.

The test performed was to ascertain if the various factors such as safe and adequate education, maternal health improvement, health system improvement and infant condition improvement. The tool for this analysis was descriptive statistics, regression and correlation statistics and was used to analyze the data collected. In two of the cases, the null hypothesis was rejected, while in the other cases, the null hypothesis was accepted. It was established that while safe and adequate education (SAE= $R^2 = 0.387$, $F= 106.071$, $p<0.000$) and maternal health improvement (MHI= $R^2 = 0.016$, $F= 4.401$, $p<0.037$)mitigates infant mortality, factors such as health system improvement (HIS= $R^2 = 0.005$, $F= 1.456$, $p<0.229$) and infant condition improvement (ICI= $R^2 = 0.001$, $F= 0.410$, $p<0.523$) don't mitigate infant mortality.

In conclusion, it was found out that in recent years, number of infants born in Jos metropolis is on the

increase as the years passes by, just as the Nigerian population is also increasing. From the review of some literatures, it was found out that there was a decrease of infant mortality from the year 2014 – 2017. This was due to improved health standards and some campaign against infant mortality.

Finally, based on the data collected on infant mortality, and from the analysis carried out so far, the researcher has been able to see that death is a phenomenon that is consistent with human nature. It only requires some safety caution to avoid the unnatural aspect of it. But for the natural, it is inevitable because it is due to human nature and creation.

On the foregoing, the following recommendations are made:

- Safe and adequate education should be giving to parents especially mothers. Education and enlightenment should be done through campaigns and bill boards, T-shirts and other means.
- Standards of health facilities should be improved in the metropolis so that the increase in infant mortality can be curbed and reduced
- Public health care centres should be given adequate facilities to cater for infants. It was noticed that public health care has been neglected especially in rural areas. They should be revived and put in adequate functional shape.
- It was observed during the cause of the research work that Lack of adequate health workers has led to the rise of infant mortality. Therefore, to improve the health conditions means to also improve the health workers conditions. Employment and deployment should be done in health care centers especially in rural areas
- Public health care centers should be given adequate facilities to cater for infants. This is because the standard of living in the study area is so poor that many prefer to use public health care.

Suggestion for Further Study

More research should be carried out in other local governments outside Jos metropolis so as to ascertain if the causes of infant deaths are peculiar to that in Jos metropolis, and what measures should be put in place to mitigate them. Then compare them to Jos metropolis and see if it is peculiar to Plateau State as a whole.

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