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Incidence of Adverse Perinatal Outcomes and Associated Risk Factors in Kinshasa, Democratic Republic of the Congo

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Abstract

This research involves an analytical epidemiological investigation carried out in Kinshasa to evaluate the occurrence and determinants of unfavorable perinatal results, specifically preterm delivery, low birth weight, and perinatal death. A forward-looking cohort investigation was performed involving 692 expectant mothers monitored across 30 healthcare centers in city, peri-urban, and countryside regions of Kinshasa during a span of six months. Information was gathered through surveys and health records, followed by processing with Excel and R programs.

Findings indicate that 40.8% of infants were born preterm, 7.8% exhibited low birth weight, and 2.2% experienced perinatal death. Peri-urban zones showed a notably higher likelihood of these negative results. Elements linked to preterm birth encompass lack of employment while pregnant, absence of contraceptive use, and residential location. Low birth weight correlates with limited maternal schooling and living in countryside settings. Regarding perinatal death, peri-urban zones are especially impacted. The investigation underscores the role of socioeconomic, educational, and geographic elements in perinatal well-being. It emphasizes the need for fair distribution of prenatal services and bolstering family planning initiatives in Kinshasa. These findings ought to inform intervention efforts aimed at enhancing maternal and infant conditions in both city and countryside environments within the DRC.

Keywords: Perinatal outcomes, Risk factors, Democratic Republic of the Congo, Perinatal

Introduction

Unfavorable perinatal results, including preterm birth, low birth weight, and perinatal death, represent a significant concern for public health, especially in nations with low and middle incomes. These serve as measures of maternal and newborn service quality while also stemming directly from biological, socioeconomic, cultural, and structural influences. Their elevated incidence frequently signals disparities in healthcare availability, inadequate health knowledge, ongoing economic hardship, and suboptimal functioning of family planning systems. Gaining insight into their prevalence and pinpointing related determinants is crucial for developing successful intervention approaches and bettering the well-being of mothers and infants [1].

Perinatal well-being continues to pose a critical challenge globally, most acutely in low- and middle-income nations. As reported by the World Health Organization (WHO), approximately 2.4 million infants perished in 2019, with most of these losses avoidable through superior maternal and newborn services [2].

Rates of perinatal death in sub-Saharan Africa rank among the globe's highest. Key contributors involve restricted prenatal service utilization, insufficient trained healthcare workers, and substandard medical facilities [3]. The Democratic Republic of Congo (DRC) exemplifies this pattern with alarming metrics. The Demographic and Health Survey (EDS-RDC III) report for 2023–2024 reports a maternal death rate of 547 per 100,000 live births (Institut National de Statistique [4]

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and Ecole de Santé Publique de Kinshasa [5]). Such statistics highlight ongoing obstacles in maternal and newborn care across the nation.

In Kinshasa, the DRC's capital, conditions are equally concerning. An earlier investigation at the university hospitals of Kinshasa found that negative perinatal results, like preterm delivery and low birth weight, occur often and are typically tied to preventable elements, such as insufficient prenatal attendance and unmanaged delivery issues [6]. Data concerning unfavorable perinatal results and their linked determinants in Kinshasa are limited, despite the city's substantial portion of national births and its varied healthcare centers differing in standards and reachability. Thus, assessing the incidence of these results and their regional drivers is vital for informing health strategies, improving delivery and newborn services, and directing focused efforts. The chief goal of this investigation is to measure the occurrence of unfavorable perinatal results and detect their linked determinants in Kinshasa. In particular, the work aims to (i) outline the sociodemographic and cultural profiles of the participating women, (ii) establish the rates of unfavorable perinatal results in city, peri-urban, and countryside health areas, (iii) pinpoint main perinatal determinants contributing to these results, and (iv) offer recommendations grounded in evidence to advance maternal and newborn care in the city.

Materials and Methods

Sampling

This investigation is a forward-looking cohort study encompassing all expectant mothers receiving prenatal services in healthcare centers throughout the city and province of Kinshasa who gave birth and were monitored up to the seventh day postpartum, aligning with the perinatal phase. It took place across the city and province of Kinshasa for six months, with information gathered via surveys; it constitutes an observational epidemiological effort with analytical objectives.

The primary population comprised all expectant mothers attending prenatal units in healthcare centers of the city and province of Kinshasa who delivered and were observed up to seven days post-birth.

Recruitment period and selection criteria

Participants were enrolled in the study across a six-month timeframe, spanning from May 20 to November 20, 2024. Eligibility included women who had received antenatal consultations at the designated reference healthcare centers, delivered during the designated study window, and willingly consented to take part after signing an informed consent form. Excluded were those who had not attended prenatal services at these centers, whose births took place outside the specified timeframe, or who chose not to participate. Such criteria helped maintain the integrity and dependability of the gathered information by ensuring that every enrolled woman had undergone consistent antenatal monitoring.

Sample size

In this investigation, the sample size was determined post hoc, following the completion of data gathering. It consisted of 692 individuals.

Sampling method

A multistage probabilistic approach was employed, incorporating simple random selection with proportional stratification. To achieve a representative group, all healthcare centers equipped with maternity services were cataloged according to health zone category (urban, peri-urban, and rural). These were then ordered by increasing number of deliveries recorded in 2022, after which 10 centers from each category were chosen at random via OPENEPI software to serve as data collection locations. This resulted in a total of 30 facilities across the three health zone types. Each month, five centers were designated for intensive monitoring, where every delivery was tracked for a full month per facility, including follow-up of infants through the seventh postnatal day. The data collection process was thus distributed over the entire six-month duration.

Data collection method

Information was obtained through a structured questionnaire featuring both closed-ended and open-ended items.

Data collection technique

Field data gathering involved administering questionnaires directly and reviewing documents, including patient files and antenatal care records.

Measuring instrument

Data were captured and documented using an interview guide questionnaire, with entries made via the KOBO Collect mobile application.

Analysis plan and data processing

Responses collected on-site were inputted into KOBOCOLLECT, then aggregated, coded, processed, and exported to Excel 2010 and R software (Version 4.3.1) for examining variables related to participant identification.

The analysis proceeded in two phases: first, characterizing the distribution of adverse perinatal results and associated risk elements in Kinshasa; second, performing bivariate assessments to detect factors linked to these negative outcomes.

Ethical considerations

As this research involved human subjects, clearance was secured from the Bioethics Committee at the Higher Institute of Medical Techniques of Kinshasa (ISTM-KIN), Democratic Republic of the Congo, under approval reference 055/ESU/ISTM/DG/2022. The study design adhered rigorously to national and international ethical guidelines, encompassing the Declaration of Helsinki and pertinent domestic rules for biomedical studies with human participants. Before initiating data gathering, every potential participant was given a thorough and comprehensible overview of the research aims, methods, possible risks, and expected advantages. Sufficient opportunity was allowed for consideration and independent decision-making, free from any pressure or inducement. Signed informed consent was collected from all enrollees in line with established ethical norms. Measures to protect confidentiality and privacy were strictly applied throughout. Individuals were guaranteed that their personal details would remain anonymous and safeguarded, with all shared data utilized exclusively for research objectives. The study team upheld commitments to the core ethical tenets of autonomy, dignity, and respect toward every participant.

Results and Discussion

Table 1 displays the distribution of perinatal risk factors in Kinshasa.

Table 1. Distribution of perinatal risks in Kinshasa (n = 692)

Perinatal risks	Category	%	n
Prematurity			
	Yes	40.8	282
	No	59.2	410
Low birth weight			
	Yes	7.8	54
	No	92.2	638
Perinatal mortality			
	Yes	2.2	15
	No	97.8	677

Table 1 reveals that among the infants studied, 40.8% were born preterm (n = 282), whereas 59.2% were delivered at full term (n = 410). Additionally, 7.8% presented with low birth weight (n = 54), in contrast to 92.2% who had normal birth weights (n = 638). Perinatal death occurred in 2.2% of cases (n = 15), with 97.8% of newborns surviving (n = 677).

Table 2 outlines the occurrence of preterm births and low birth weight cases stratified by area type across Kinshasa.

Table 2. Distribution of prematurity and low birth weight by area type in Kinshasa

Area Type	Prematurity		Low Birth Weight	
	Yes	No	Yes	No
Urban	142 (20.5%)	167 (24.1%)	26 (3.8%)	283 (40.9%)
Urbano-rural	55 (7.9%)	109 (15.8%)	11 (1.6%)	153 (22.1%)
Rural	85 (12.3%)	134 (19.4%)	17 (2.5%)	202 (29.2%)

*Total N = 692

Table 2 indicates that in urban health zones, preterm births accounted for 20.5% of cases (n = 142), whereas full-term deliveries represented 24.1% (n = 167). Within

the same urban settings, low birth weight was observed in 3.8% of infants (n = 26), in contrast to 40.9% who achieved normal birth weight (n = 283). In peri-urban health zones, preterm births comprised 7.9% (n = 55), with full-term births at 15.8% (n = 109). Low birth weight occurred in 1.6% (n = 11), compared to 22.1% with normal birth weight (n = 153). In rural health zones of Kinshasa, preterm deliveries made up 12.3% (n = 85), while full-term births were 19.4% (n = 134). Low birth weight affected 2.5% (n = 17), against 29.2% with normal birth weight (n = 202).

Table 3 displays the occurrence of perinatal mortality across Kinshasa.

Table 3. Perinatal risk factors in the city of Kinshasa

Risk factors	Prematurity			Low birth weight (LBW)			Perinatal mortality		
	OR	95% CI		OR	95% CI		OR	95% CI	
		Bi	Bs		Bi	Bs		Bs	Bs
Type of health area									
Ubano rural	2.80	1.54	5.10	1.54	0.60	3.98	3.85	1.75	4.56
Rural	2.16	1.27	3.67	2.23	0.92	5.39	1.5709	0.2864	8.617
Study level									
Secondary	0.58	0.29	1.14	0.68	0.26	1.77	1.0677	0.2600	4.385
Primary	0.37	0.13	1.03	0.37	0.06	2.33	3.3038	0.4590	23.779
None	1.46	0.22	9.80	8.37	0.00	Inf	0.1951	0.0462	0.823
Religion									
Pentecost	2.56	1.40	4.67	0.76	0.30	1.89	2.73e + 8	0.0000	Inf
Kimbanguist	1.36	0.55	3.37	0.24	0.027	2.19	1.5412	0.2066	11.496
Non believer	0.87	0.21	3.61	0.72	0.07	7.32	1.1768	0.1941	7.133
Muslim	1.34	0.31	5.68	1.24	0.12	12.88	1.0582	0.2317	4.833
Protestant	1.48	0.63	3.46	0.60	0.15	2.47	2.05e + 7	0.0000	Inf
Jehovah's Witness	15.66	1.84	132.8	1.83	0.00	Inf	0.2716	0.0399	1.850
Main activity									
Civil service	1.46	0.83	2.56	0.84	0.32	2.19	4.46e + 7	0.0000	Inf
Private sector	1.31	0.77	2.24	2.02	0.92	4.41	5.18e + 7	0.0000	Inf
Professional activity before pregnancy									
No	0.38	0.20	0.71	0.64	0.20	2.06	2.55e + 7	0.0000	Inf
Professional activity during pregnancy									
No	2.59	1.53	4.39	1.10	0.45	2.67	1.18e + 7	0.0000	Inf
Owner of dwelling									
No	0.27	0.16	0.45	0.50	0.24	1.05	1.3491	0.3029	6.009
Access to information during pregnancy									
No	0.29	0.13	0.67	0.82	0.25	2.68	3.7498	0.6242	22.527
Use of contraception									
No	2.30	1.47	3.59	0.80	0.40	1.61	1.26e-8	0.0000	Inf
Special diet during pregnancy									

Legend : "95% CI" ou "95% Confidence interval"

Table 3 highlights three main perinatal risks: premature birth, low birth weight, and perinatal death. Babies born in urban-rural zones show a much higher chance of being premature (OR = 2.80; 95 percent CI [1.54–5.10]), with a similar but slightly lower elevation in rural zones (OR = 2.16; 95 percent CI [1.27–3.67]). These patterns likely

stem from differences in healthcare access and local facilities. Mothers who were unemployed during pregnancy also faced greater odds of preterm delivery (OR = 2.59; 95 percent CI [1.53–4.39]; $p < 0.05$), which may tie to financial or social stressors. Not using contraception before pregnancy further raised this risk (OR = 2.30; 95 percent CI [1.47–3.59]), possibly due to inadequate family planning resources.

Low birth weight was strongly tied to maternal schooling: women without any education had dramatically higher odds (OR = 8.37; 95 percent CI [0.00–Inf]), implying that education helps promote better prenatal nutrition and care. Rural living showed an association with increased risk (OR = 2.23; 95 percent CI [0.92–5.39]), though the imprecise confidence interval suggests results should be interpreted carefully. Working in the private sector appeared linked to somewhat higher odds (OR = 2.02; 95 percent CI [0.92–4.41]), an area that deserves more study.

Perinatal death rates were notably higher for infants in urban-rural settings (OR = 3.85; 95 percent CI [1.75–4.56]; $p < 0.05$), probably because of uneven neonatal services. Mothers with poor access to pregnancy-related information trended toward greater mortality risk (OR = 3.75; 95% CI [0.62–22.52]), reinforcing how vital health education and awareness are.

Table 4 details the particular perinatal risk factors found specifically in Kinshasa.

Table 4. Perinatal risk factors in the city of Kinshasa

Risk factors	Prematurity			Low weight			Perinatal mortality		
	OR	95% CI		OR	95% CI		OR	95% CI	
		Bi	Bs		Bi	Bs		Bs	Bs
Yes	0.80	0.36	1.78	5.57	2.19	14.19	0.2983	0.0848	1.049
Shock during pregnancy									
Yes	1.77	0.58	5.36	1.00	0.20	4.93	1.07	1.0101	2.50
Performed ANC									
No	2.42	0.19	29.71	1.23	0.00	Inf	1.47e + 7	0.0000	Inf
Advice on HIV testing									
No	2.49	1.24	4.99	1.54	0.59	3.99	1.4519	0.2246	9.388
Sleep under a mosquito net									
No	1.36	0.78	2.38	0.88	0.37	2.07	1.5099	0.3161	7.213
Vaccination against Tetanos									
No	0.86	0.42	1.76	2.77	1.07	7.16	0.7840	0.0786	7.822
Chronic illness Before pregnancy									
Yes	0.55	0.17	1.69	1.18	0.28	6.31	7.04e + 7	0.0000	Inf
Illness during pregnancy									
Yes	1.94	1.23	3.06	0.61	0.28	1.32	1.0746	0.2866	4.029
Have an ultrasound scan during pregnancy									
Yes	1.34	0.82	2.18	1.28	0.59	2.79	1.0106	0.2651	3.852
Loss of water before delivery									
Yes	0.61	0.36	1.06	1.39	0.58	3.32	1.0994	0.1886	6.409
Place of delivery									
At home	0.64	0.06	5.91	6.80	0.00	Inf	1.1928	0.2706	5.258
On the road	1.84	0.00	Inf	8.38	0.00	Inf	1.18e + 7	0.0000	Inf
Person who directed the delivery									
Doctor	1.15	0.54	2.43	0.01	8.32	0.32	1.5709	0.2864	8.617
Nurse	0.47	0.29	0.76	0.07	0.00	1.19	3.20e + 6	0.0000	Inf
Other	0.06	0.00	0.61	0.01	8.69	0.33	1.2116	0.2408	6.097

Termination of delivery									
Caesarean section	1.13	0.43	2.91	0.53	0.16	1.78	4.11e + 7	0.0000	Inf
Extraction	2.50	0.00	Inf	1.03	0.00	Inf	1.0994	0.1886	6.409

Table 4 indicates that multiple elements contribute to prematurity, low birth weight, and perinatal mortality. For prematurity, mothers who received no guidance on HIV testing faced elevated odds (OR = 2.49; 95 percent CI [1.24–4.99]), underscoring the value of prenatal counseling. Health problems during pregnancy were likewise strongly linked to early delivery (OR = 1.94; 95 percent CI [1.23–3.06]), and giving birth outside healthcare settings—for instance, en route—posed a substantial threat (OR = 1.84; 95 percent CI [0.00–Inf]). In relation to low birth weight, failing to receive tetanus immunization markedly raised the likelihood (OR = 2.77; 95 percent CI [1.07–7.16]), while skipping antenatal visits additionally hindered proper fetal growth (OR = 1.23; 95 percent CI [0.00–Inf]). As for perinatal mortality, births occurring outside formal medical environments were powerfully connected to newborn deaths (OR = 8.38; 95 percent CI [0.00–Inf]), and episodes of maternal shock in pregnancy similarly heightened the chances (OR = 1.07; 95 percent CI [1.01–2.50]), suggesting that such physical distress can trigger critical complications leading to perinatal loss.

What sets this research apart is its commitment to carefully recording the occurrence of negative perinatal events in Kinshasa, drawing on information gathered from healthcare centers across various tiers of the system in a thorough and locally relevant way. Whereas most investigations in the Democratic Republic of Congo tend to examine maternal or neonatal deaths separately, this work employs a comprehensive perspective on perinatal health, incorporating several adverse markers (fetal death, low birth weight, premature delivery) that are seldom explored collectively within the regional body of work. The investigation aligns closely with the Sustainable Development Goals (SDGs), especially SDGs 3, 5, and 10, which advocate unified efforts to enhance well-being, advance gender equity, and diminish disparities.

The reliability of the findings, both internally and externally, relies mainly on the strict methodology applied across the entire study, with particular attention to minimizing biases and addressing potential confounders.

The outcomes concerning prematurity, low birth weight, and perinatal mortality in Kinshasa share certain parallels and contrasts with investigations from other areas.

Prematurity

The rate of premature births recorded here (40%) stands considerably above levels seen in various other African settings. For instance, research from northwestern Algeria noted a preterm delivery frequency of 10.5% [7]. Such variations might arise from differences in healthcare frameworks, delivery protocols, and economic conditions across locations.

The contributors to prematurity uncovered in this work—including location in urban-rural health zones, absence of paid work, and failure to practice contraception—match the socioeconomic influences commonly described in existing studies. Evidence indicates that females in rural or mixed urban-rural zones with restricted prenatal services encounter greater chances of early births [8]. Furthermore, unemployment often correlates with reduced economic standing, which can restrict healthcare availability and knowledge.

Low birth weight

The proportion of low birth weight cases identified in this investigation reached 7.8%, falling below figures documented in certain African regions. As an example, work at the University Hospital Center in Brazzaville indicated a 45.6% rate of low birth weight [9]. These differences could stem from variations in participant groups, approaches to gathering data, and standards for classifying low birth weight.

An additional review of Demographic and Health Survey information from the DRC pinpointed maternal schooling as a key influence on low birth weight [10]. Moreover, research in Kamina revealed that exposure to secondhand smoke and unplanned pregnancies served as notable contributors to low birth weight [11].

Perinatal mortality

The perinatal mortality rate recorded in this research (2.2%) is notably below levels documented in various other African settings. The World Health Organization reports that sub-Saharan Africa is responsible for approximately 47% of global stillbirths and 46% of

neonatal deaths [12]. These discrepancies may stem from differences in healthcare structures, delivery methods, and economic conditions. Limited access to information, which emerged as a contributor in our findings, is similarly noted in existing studies. For example, one investigation revealed that extreme heat events, worsened by climate change, elevated the chances of perinatal death, stressing the need to educate expectant mothers about environmental hazards [8].

Risk factors according to health zones categories

This analytical epidemiological investigation in Kinshasa sought to evaluate the occurrence and causes of negative perinatal events, covering prematurity, low birth weight, and perinatal mortality. A prospective group of 692 expectant mothers was monitored in 30 healthcare centers spanning urban, peri-urban, and rural locations over a six-month period. In total, 40.8% of infants were born prematurely, 7.8% exhibited low birth weight, and 2.2% faced perinatal death, with clear variations across zones. Urban settings showed elevated prematurity but relatively lower mortality, probably owing to improved healthcare availability and professional assistance during delivery, aligning with prior work in Kinshasa and Beni City [13, 14]. Peri-urban regions displayed markedly greater likelihoods for all poor outcomes, mirroring patterns in semi-urban and rural groups where restricted prenatal services, financial limitations, and substandard facilities are blamed [15]. Rural areas had higher rates of low birth weight, tied to poor maternal nutrition, limited schooling, and inadequate antenatal monitoring, while perinatal mortality stayed higher than in cities, echoing reports from other resource-scarce areas in the DRC and sub-Saharan Africa [16]. Prematurity was linked to joblessness in pregnancy, failure to use birth control, and residential location, while low birth weight related to minimal maternal schooling and rural living. These results underline the strong effects of socioeconomic, educational, and locational elements on perinatal well-being, calling for fair distribution of effective prenatal services and robust family planning measures. In comparison to previous investigations, this work provides a finer breakdown of risks by urban, peri-urban, and rural categories within Kinshasa, offering data to shape precise actions for bettering mother and infant health in varied environments.

Conclusion

The investigation carried out in Kinshasa revealed a considerable presence of unfavorable perinatal events, chiefly prematurity, low birth weight, and perinatal mortality. Key contributors identified, including residence in urban-rural areas, lack of employment, limited maternal education, work in the private sector, and avoidance of contraception, demonstrate the vital impact of social, financial, and geographic aspects. Strengthening prevention efforts in perinatal care, improving availability of education, contraception services, and reliable prenatal support, along with targeted aid for at-risk women, is crucial. Additionally, upcoming studies ought to explore particular maternal infections—such as malaria, HIV, sexually transmitted infections, and tuberculosis—to better understand their role in negative outcomes and develop tailored prevention approaches.

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