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Outcomes for Premature Babies Weighing More than 1000 g in Sub-Saharan Africa: A Study of 237 Cases in Dakar

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Abstract

Objective: This paper aims to analyze morbidity, predictors of mortality, and growth kinetics in moderate and late preterm infants (>1000 g) in a tertiary referral center in Senegal. **Patients and Method:** It was a descriptive, retrospective, and analytical, single-center study (January 2019-April 2021) including 237 preterm infants (29 - 36 weeks' gestation) weighing > 1000 g. Factors associated with death were identified by bivariate analysis (Chi-2, $p < 0.05$) and calculation of odds ratios (OR). **Results:** Of 281 admissions for prematurity, the >1000 g cohort accounted for 84.3%. The maternal profile was marked by precariousness (54% of low socioeconomic status) and vascular pathologies (43.6%). Neonatal transfer presented a major paradox: although 93.7% of newborns were transported by ambulance, 72.6% were admitted with hypothermia. Morbidity was dominated by jaundice (64.9%), anemia (41.3%), and respiratory distress (50.6%). The hospital mortality rate was 21.1%. The prognostic factors significantly associated with death were: hypothermia (OR = 0.29; $p = 0.005$), respiratory distress ($p = 0.000$), and jaundice (OR = 2.0; $p = 0.03$). Antenatal corticosteroid therapy was administered in only 24% of cases. Catch-up growth using the kangaroo method was effective (mean gain of 18.2 g/kg/day), resulting in a mean weight of 7900 g at 12 months of corrected age. **Conclusion:** Mortality remains high and is correlated with preventable factors. Optimizing the warm chain during transfers and widespread use of antenatal corticosteroid therapy are urgent imperatives.

Keywords

Prematurity > 1000 g, Hypothermia, Neonatal Transfer, Neonatal Mortality, Kangaroo Mother Care, Dakar

1. Introduction

Prematurity remains the leading cause of neonatal mortality worldwide [1]. While high-income countries have significantly improved the survival rates of extremely premature babies, low- and middle-income countries still account for most neonatal deaths, often due to preventable causes.

In West Africa, and specifically in Senegal, where the prevalence of prematurity is estimated at 9.7% [2] [3], the challenge is twofold. On the one hand, the management of preterm infants weighing less than 1000 g remains technically difficult, with a mortality rate exceeding 50% as reported by Dieng [4] in the same department. On the other hand, the category of premature babies weighing more than 1000 g, which constitutes most admissions, is often mistakenly considered to be "low risk".

However, this population remains highly vulnerable to respiratory and infectious complications. The objective of this study is to evaluate the impact of transfer and care conditions on the vital and functional prognosis of premature infants weighing more than 1000 g at the Albert Royer National Children's Hospital (CHNEAR).

2. Patients and Method

Type of study: Descriptive, retrospective, and analytical, single-center study, conducted over 28 months (01/01/2019-04/30/2021) in the neonatal unit at CHNEAR (Level 3), which has resuscitation, intensive care, and Kangaroo Mother Care (KMC) units.

Population: Comprehensive inclusion of premature newborns (<37 weeks gestation) weighing > 1000 g at birth. Exclusion of premature infants weighing more than 1000 g who stayed in hospital for less than 3 days and had unusable records. Variables of interest: Maternal data (hypertension, corticosteroid therapy), transfer conditions (mode, temperature), morbidities (Silverman score, jaundice, infections), and anthropometric data at 3, 6, and 12 months.

Definitions: Nosocomial infection as any infection occurring after 48 hours of hospitalization in a newborn who was uninfected upon admission; Secondary infection as any infection occurring beyond the first week outside of a nosocomial setting.

Statistical analyses: Data entry and analysis using Sphinx. Qualitative variables were compared using Pearson's chi-square test. The association between independent variables and death was measured using the odds ratio (OR). The significance threshold was set at $p < 0.05$.

3. Results

Study population: The cohort included 237 newborns, representing 84.3% of the 281 premature infants weighing more than 1000 grams admitted during the study period. Figure 1 illustrates the selection process.

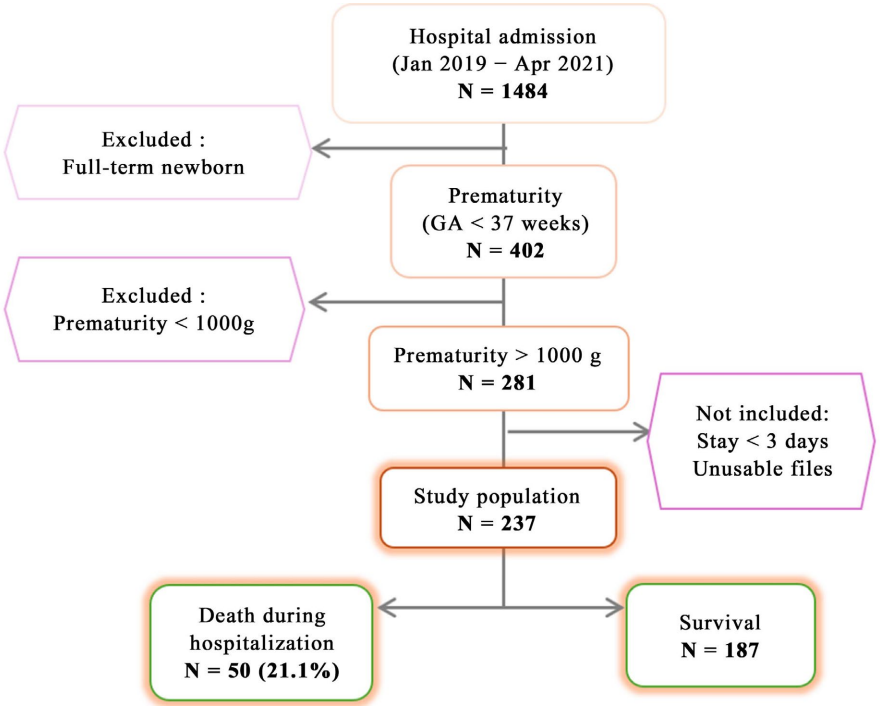

Figure 1. Flowchart.

Maternal and obstetric profile: The average maternal age is 28. Socioeconomic insecurity affects 54% of mothers. Hypertension and preeclampsia dominate the obstetric picture (43.6% of complications). Despite an acceptable prenatal care rate (67.1% ≥ 3 prenatal visits), coverage of antenatal corticosteroid therapy remains critical: only 24% of mothers received it, while 35% of deliveries were medically induced (induced prematurity).

Neonatal transfer: Analysis of admission conditions reveals a major discrepancy between apparent medicalization (93.7% of transfers were by ambulance) and clinical reality (72.6% of newborns were admitted with hypothermia (<36.5˚C)). In addition, 50.6% of patients presented with immediate respiratory distress (Silverman > 3).

Morbidity and management: The main complications encountered during hospitalization are summarized in Table 1 and were dominated by metabolic disorders. with jaundice in 64.9% of cases, infectious in 50.6% of cases, including 15.6% nosocomial, and hematological, with anemia found in 41.3% of premature infants. Therapeutic support was based on incubators (81.8%), oxygen therapy (70.9%, including 18.3% invasive ventilation), and antibiotic therapy (66.7%). The kangaroo method was used in 67% of patients after stabilization, with an average

weight gain of 18.2 g/kg/day.

Table 1. Distribution according to the type of complications that occurred.

Type of complication	Number	Frequency
Metabolic	**186**	**78.5**
Jaundice	154	64.9
Fluid and electrolyte disorders	115	48.5
Hematological	**121**	**51**
Anemia	98	41.3
Thrombocytopenia	44	18.5
Infectious	**120**	**50.6**
Maternal-fetal infection	57	24
Nosocomial infection	37	15.6
Secondary infection	33	13.9
Respiratory	**111**	**46.8**
Hyaline membrane disease	80	33.7
Transient tachypnea	28	11.8
Pulmonary hypertension	13	5.4
Bronchopulmonary dysplasia	3	1.3
Cardiovascular	**68**	**28.7**
Patent ductus arteriosus	57	24
Other heart diseases	30	12.6
Neurological	**43**	**18.1**
Intraventricular hemorrhage	21	8.8
Grade 1	6	28.6
Grade 2	10	47.6
Grade 3	5	23.8
Periventricular leukomalacia	21	8.8
Seizures	9	3.7
Hydrocephalus	2	0.8
Digestive/nutritional	**34**	**14.3**
Necrotizing Enterocolitis	25	10.5

Determinants of mortality: The in-hospital mortality rate was 21.1% (50 deaths). Statistical analysis (bivariate analysis) identified three major predictors of death: respiratory distress: 86% of deaths vs. 41% of survivors ($p = 0.000$), hypothermia: 92% of deaths occurred in hypothermic patients (the absence of hypothermia is a powerful protective factor OR = 0.29 and $p = 0.005$) and jaundice (usually associated with prematurity or infection) which was associated with an

increased risk of death (OR = 2.00; p = 0.030). Birth weight was not statistically associated with death in this range > 1000 g (p = 0.219). Table 2 summarizes the causal relationships we found.

Table 2. Determination of factors related to deaths during hospitalization of premature infants weighing more than 1000 grams.

Parameters		Survivors (187)		Deceased (50)		p-value	OR	Total
		n	%	n	%			
Birth Weight (g)	1000 - 1499	81	43.3	28	56	0.219	0	109
	1500 - 2499	95	50.8	21	42			115
	≥2500	11	5.9	1	2			12
IUGR	yes	84	44.9	23	46	0.54	0.82	107
	no	103	55,1	27	54			130
Respiratory Distress	yes	77	41.1	43	86	0.000		120
	no	110	58.8	7	14			117
Hypothermia	yes	126	67.3	46	92	0.005	0.29	172
	no	61	32.6	4	8			65
Blood Glucose	HyperG	30	16	12	24	0.31	0.66	42
	NormoG	151	80.7	34	68			185
	HypoG	16	8.5	4	8	0.61	1.03	20
Anemia	yes	75	40.1	23	46	0.45	0.79	98
	no	112	59.9	27	54			166
Jaundice	yes	128	68.4	26	52	0.030	2.00	154
	no	59	31.5	24	48			83
Length of stay	≤7 days	16	8.5	32	64	0	0	48
	8 - 14 days	34	18.1	7	14			41
	≥15 days	137	73.2	11	22			148

Growth dynamics: Among the 152 patients in the cohort followed on an outpatient basis until the age of 12 months, longitudinal follow-up shows effective weight recovery. The average weight increased from 1715 g at discharge to 7900 g at 12 months of corrected age, with an average height of 71.6 cm. Figure 2 illustrates this growth pattern in weight, height, and head circumference. Among those lost to follow-up, 67% were due to geographical distance (interregional transfer).

4. Discussion

Socioeconomic vulnerability and maternal determinants: The epidemiological profile of our cohort illustrates the significance of socioeconomic factors in the occurrence of prematurity in sub-Saharan Africa. Most mothers (54%) were from a low socioeconomic background and 63.3% had a low level of education.

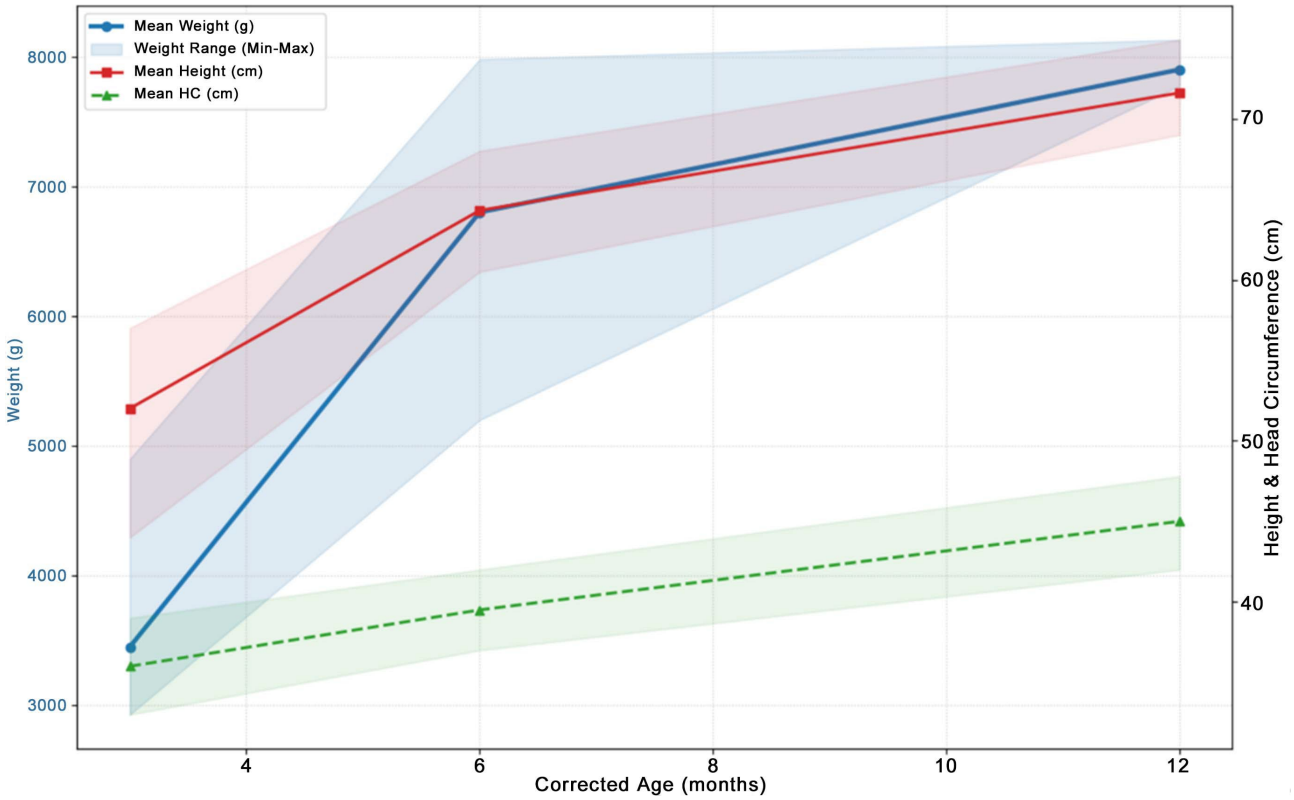

Figure 2. Changes in anthropometric parameters in former premature infants weighing more than 1000 grams during follow-up after discharge.

This "social precariousness" is a major determinant found by Ouedraogo *et al.* [5] in Burkina Faso and Faye *et al.* [6] in Dakar, confirming that lack of education and income limits access to quality prenatal care. Unlike in developed countries, where advanced maternal age (>35 years) is a growing risk factor, our study found a young population (average age 28 years), similar to regional data. In terms of obstetrics, vascular pathologies (preeclampsia/hypertension) dominate the etiologies (43.6%), explaining the significant rate of induced prematurity (35%).

Transport paradox—A quality emergency: One of the most critical findings of our study is the failure of pre-hospital thermal regulation. While 93.7% of transfers were medicalized by ambulance, 72.6% of newborns were admitted with hypothermia. This paradoxical finding suggests that ambulances function more as physical transport vehicles than as mobile intensive care units (lack of functional transport incubators). This rate is higher than that reported by Diakité [7] in Bamako, where half of all transports were by taxi. Hypothermia was found to be an independent factor in mortality in our multivariate analysis ($p = 0.005$), corroborating the work of Heidarzandhed [8] in Nepal, which demonstrated the lethal impact of "cold stress" on the metabolism of premature infants. The "warm chain" is therefore the weak link in our referral system.

Respiratory morbidity and corticosteroid therapy—A lost opportunity: Hospital morbidity was dominated by respiratory distress (50.6%), correlated with hy-

aline membrane disease (33.7%). Mortality analysis reveals that respiratory distress is responsible for 28% of deaths and is statistically associated with fatal outcomes ($p = 0.000$). This heavy toll must be viewed in the context of the low coverage of antenatal corticosteroid therapy, which is administered to only 24% of mothers. Compared to the international standards recommended by the WHO [9] and the rates observed in high-income countries, this deficit in lung maturation represents a major loss of opportunity for these newborns, especially since 35% of births were medically induced, theoretically offering a therapeutic window for the administration of betamethasone.

Mortality: Progress and persistent challenges: With a mortality rate of 21.1%, the prognosis for premature infants weighing > 1000 g at CHNEAR is significantly more favorable than that for infants weighing < 1000 g (55.6%) reported by Dieng [4] in the same department, confirming birth weight as a major prognostic factor, as described by Katz *et al.* [10]. Nevertheless, this rate remains concerning when compared to Western data such as the EPIPAGE-2 cohort [11]. Neonatal infections (28% of deaths) and respiratory disorders (28%) remain the leading causes, consistent with the observations of Koko *et al.* [12] in Gabon. The majority of deaths occur early (64% before 7 days), highlighting the critical importance of initial resuscitation.

Catch-up growth and the impact of the Kangaroo Mother Care: Our study confirms the effectiveness of the Kangaroo Mother Care method, initiated in 67% of patients. The average weight gain of 18.2 g/kg/day is excellent. Long-term follow-up is reassuring: at 12 months of corrected age, the average weight of 7900 g shows a catch-up rate comparable to the local results of Kambale Mukulu [13] (8119 g). These results validate the sequential "Incubator then Kangaroo" approach described by Faye *et al.* [6], positioning the Kangaroo method as a major therapeutic tool for survival and growth, in line with Charpak's [14] seminal trial and Worku's [15] Ethiopian experiments.

5. Conclusion

Premature infants weighing more than 1000 g at CHNEAR present a hidden vulnerability. While weight is no longer a direct risk factor for mortality above 1000 g, the quality of perinatal care is. To reduce mortality by 21.1%, WHO recommendations must be applied locally through two priorities: effective medicalization of transport and systematic use of corticosteroid therapy, along with increasing coverage beyond 24% to impact respiratory mortality.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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