



Research Article

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Fetal growth restriction at Pikine National Hospital in Senegal from 2019 to 2024

Maternal characteristics gestational age and birthweight of 259 singleton live births

Mouhamet S*, Khalifa Ababacar G, Youssoupha T, Fary Thérèse F, Sokhna Diarra G, Souleymane B, Hamza Dane M, Anna Dia D, Moussa D, Abdoul Aziz D

Department of Obstetrics and Gynecology, Centre Hospitalier National de Pikine, Dakar, Senegal

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*Corresponding author: Mouhamet Sene, Department of Obstetrics and Gynecology, Centre Hospitalier National de Pikine, Dakar, Senegal.

Abstract

Objective: To describe maternal characteristics, obstetric management, gestational age, birthweight, and immediate neonatal outcomes of singleton live births recorded as fetal growth restriction at Pikine National Hospital, Senegal, from 2019 to 2024.

Methods: This retrospective descriptive study included 259 records from the e-Perinatal database. Descriptive statistics were calculated using available observations for each variable. The original case definition used birthweight below the third Gardosi percentile; calculated percentiles were unavailable for independent verification.

Results: Mean maternal age was 27.83 ± 6.55 years. Severe preeclampsia was recorded in 133 women (51.4%), and 213 (82.2%) delivered by cesarean section. Mean gestational age was 36.42 ± 3.31 weeks ($n = 173$), with 45.7% of documented births occurring before 37 weeks. Mean birthweight was $1,880.8 \pm 527.7$ g ($n = 258$); 86.0% weighed less than 2,500 g. A five-minute Apgar score ≥ 7 was recorded in 236 of 256 newborns (92.2%). Neonatal resuscitation was recorded in 54 of 232 newborns (23.3%).

Conclusion: This series showed high frequencies of severe preeclampsia, cesarean delivery, preterm birth, and low birthweight. Missing data and the absence of a comparison group limit interpretation. Improved documentation of fetal growth and neonatal follow-up is needed.

Keywords: Fetal growth restriction; Small for gestational age; Preterm birth; Birthweight; Preeclampsia; Senegal

Abbreviations: FGR: Fetal Growth Restriction; SGA: Small for Gestational Age; CHNP: Centre Hospitalier National de Pikine; ANC: Antenatal Care; BMI, body mass index; SD, standard deviation.

Introduction

Fetal growth restriction (FGR) is a pathological limitation of fetal growth potential. It should be distinguished from small for gestational age (SGA), which describes a low weight percentile without necessarily identifying the underlying mechanism. This distinction is particularly relevant to studies based primarily on birthweight. International guidelines combine fetal biometry, growth trajectory, and Doppler findings when assessing suspected FGR [1,2]. Birthweight classification also depends on the reference standard. Gardosi charts customize expected weight according to physiological characteristics [3]. Birthweight below the third percentile identifies a particularly small newborn but does not replace antenatal assessment of growth and placental function. In a Senegalese cohort of 251 twin pregnancies, Sene and colleagues compared Gardosi and EPOpé classifications, illustrating the

influence of chart selection [4]. At a referral maternity hospital, the case profile is influenced by maternal disease, transfers, and access to antenatal care. A hospital-based description can identify surveillance needs and documentation gaps. Gestational age and birthweight provide complementary information about neonatal vulnerability. This study aimed to describe these parameters, maternal characteristics, obstetric management, and immediate neonatal outcomes among singleton live births recorded as FGR at CHNP from 2019 to 2024.

Materials and Methods

Study setting and design

This retrospective descriptive study was conducted in the Department of Obstetrics and Gynecology at CHNP, a referral

maternity hospital in Dakar, Senegal. Data were obtained from the e-Périnatal platform. The analysis used the individual-level extract and was restricted to deliveries recorded from 2019 through 2024.

Study population and case definition

The 259 included records concerned singleton pregnancies resulting in live births and a positive FGR indicator. The original protocol specified inclusion of births after 22 weeks of gestation with birthweight below the third Gardosi percentile, and exclusion of multiple pregnancies, congenital malformations, and intrauterine fetal deaths. The extract contained the diagnostic indicator but neither calculated percentiles nor an explicit malformation variable. The original classification and all exclusions therefore could not be independently reproduced. The population comprised cases recorded according to the original protocol.

The total number of eligible births during the study period was unavailable in the case extract. Population prevalence was therefore not calculated.

Variables and definitions

Variables included maternal age, recorded parity, previous cesarean delivery, admission mode, ANC visits, maternal conditions, BMI, gestational age, labor onset, final mode of delivery, birthweight, five-minute Apgar score, neonatal resuscitation, and neonatal transfer. Numeric parity was grouped as 0, 1, 2–4, and ≥ 5 . Gravidity was not analyzed because its coding, including numerous zero values, was ambiguous.

Severe preeclampsia, obesity, gestational diabetes, and anemia were derived from dedicated database indicators without independent reassessment of clinical criteria. Available BMI values were classified as < 18.5 , 18.5 to < 25 , 25 to < 30 , and ≥ 30 kg/m². BMI-defined obesity was distinguished from the diagnostic obesity indicator. Equivalent labels for cesarean delivery before labor were combined. Labor onset was distinguished from final mode of delivery. Preterm birth was defined as delivery before 37 weeks and low birthweight as birthweight $< 2,500$ g. Gestational age was grouped as < 28 , 28 to < 32 , 32 to < 37 , 37 to < 42 , and ≥ 42 weeks. Birthweight was grouped as $< 1,000$, $1,000$ – $1,499$, $1,500$ – $2,499$, and $\geq 2,500$ g. Apgar categories of 0–3, 4–6, and ≥ 7 were recalculated from numeric scores. Resuscitation and transfer were analyzed using available yes/no fields.

Data processing and statistical analysis

The original workflow involved exporting the database to Excel and processing data in Stata. Quantitative variables are reported as means, sample SDs, ranges, and medians where appropriate. Categorical variables are reported as counts and percentages with explicit denominators. Missing values were not imputed. Maternal conditions could coexist. No comparative tests or multivariable

models were performed. One implausible gestational age value was excluded from gestational age summaries without excluding the record from other analyses. ANC means were reported.

Ethical considerations

The study used retrospectively collected routine care data. Direct identifiers were not included in the analytical dataset, confidentiality was maintained, and patients were not contacted.

Results

Study population

The analysis included 259 singleton live births recorded as FGR from 2019 to 2024. Annual counts were nine in 2019, 66 in 2020, 42 in 2021, 27 in 2022, 90 in 2023, and 25 in 2024. These counts describe the analyzed extract and do not represent estimates of annual incidence.

Maternal characteristics

Mean maternal age was 27.83 ± 6.55 years, ranging from 16 to 42 years. Women aged 25–29 years accounted for 26.6% of cases. Recorded parity was zero in 122 women (47.1%). Among the 242 women with documented cesarean history, 40 (16.5%) had a previous cesarean delivery. Transfer from another facility was recorded in 154 of 258 women (59.7%). BMI was available for only 58 women, of whom eight (13.8%) had a BMI ≥ 30 kg/m² (Table 1).

Table 1: Maternal characteristics

Characteristic	n	Available n	%
Age < 20 years	25	259	9.7
Age 20–24 years	63	259	24.3
Age 25–29 years	69	259	26.6
Age 30–34 years	53	259	20.5
Age 35–39 years	34	259	13.1
Age ≥ 40 years	15	259	5.8
Recorded parity 0	122	259	47.1
Recorded parity 1	62	259	23.9
Recorded parity 2–4	64	259	24.7
Recorded parity ≥ 5	11	259	4.2
Previous cesarean delivery	40	242	16.5
Transfer from another facility	154	258	59.7
BMI < 18.5 kg/m ²	4	58	6.9
BMI 18.5 to < 25 kg/m ²	30	58	51.7
BMI 25 to < 30 kg/m ²	16	58	27.6
BMI ≥ 30 kg/m ²	8	58	13.8

Antenatal care and maternal conditions

The median number of ANC visits was four among 257 documented records. Fewer than four visits were reported for 84 women (32.7%). Excluding the atypical value of 27 visits, the mean was 3.95 ± 1.31 visits ($n = 256$; range, 1–8); including this value, the mean was 4.04 ± 1.94 ($n = 257$; recorded range, 1–27). Severe preeclampsia was recorded in 133 women (51.4%), obesity in 48 (18.5%), gestational diabetes in 13 (5.0%), and anemia in seven (2.7%) (Table 2).

Table 2: Antenatal care maternal conditions and delivery

Characteristic	n	Available n	%
Fewer than 4 ANC visits	84	257	32.7
4–7 ANC visits	169	257	65.8
At least 8 ANC visits	4	257	1.6
Recorded severe preeclampsia	133	259	51.4
Recorded diagnostic obesity	48	259	18.5
Recorded gestational diabetes	13	259	5
Recorded anemia	7	259	2.7
Cesarean delivery before labor	164	240	68.3
Spontaneous labor	69	240	28.8
Labor induction	7	240	2.9
Cesarean delivery	213	259	82.2
Spontaneous vaginal delivery	45	259	17.4
Vacuum-assisted delivery	1	259	0.4

Obstetric management

Final mode of delivery was documented in all records: 213 women (82.2%) delivered by cesarean section, 45 (17.4%) had spontaneous vaginal delivery, and one (0.4%) had vacuum-assisted delivery. Among the 240 records documenting labor onset, 164 (68.3%) indicated cesarean delivery before labor, 69 (28.8%) spontaneous labor, and seven (2.9%) labor induction. The 19 missing values were not classified as cesarean delivery before labor.

Gestational age birthweight and neonatal outcomes

Gestational age was usable in 173 records after exclusion of one implausible value. Mean gestational age was 36.42 ± 3.31 weeks (range, 24.29–44.00 weeks). Preterm birth occurred in 79 of 173 documented births (45.7%). Two births (1.2%) occurred before 28 weeks, 16 (9.2%) at 28 to < 32 weeks, and 61 (35.3%) at 32 to < 37 weeks. Birthweight was documented for 258 newborns, with a mean of $1,880.8 \pm 527.7$ g (range, 470–3,600 g). A total of 222 newborns (86.0%) weighed < 2,500 g, including 56 (21.7%) weighing < 1,500 g (Table 3). The numeric five-minute Apgar score was available for 256 newborns: 236 (92.2%) had a score ≥ 7 , 14 (5.5%) a score of 4–6, and six (2.3%) a score of 0–3. Overall, 20 newborns (7.8%) had a score < 7. Resuscitation was recorded

in 54 of 232 newborns (23.3%) and transfer in 28 of 221 (12.7%). Neonatal discharge status was documented in only nine records, preventing estimation of neonatal mortality.

Table 3: Gestational age birthweight and immediate neonatal outcomes

Characteristic	n	Available n	%
Gestational age < 28 weeks	2	173	1.2
Gestational age 28 to < 32 weeks	16	173	9.2
Gestational age 32 to < 37 weeks	61	173	35.3
Gestational age 37 to < 42 weeks	91	173	52.6
Gestational age ≥ 42 weeks	3	173	1.7
Birthweight < 1,000 g	13	258	5
Birthweight 1,000–1,499 g	43	258	16.7
Birthweight 1,500–2,499 g	166	258	64.3
Birthweight $\geq 2,500$ g	36	258	14
Preterm birth < 37 weeks	79	173	45.7
Birthweight < 2,500 g	222	258	86
Five-minute Apgar score 0–3	6	256	2.3
Five-minute Apgar score 4–6	14	256	5.5
Five-minute Apgar score ≥ 7	236	256	92.2
Recorded neonatal resuscitation	54	232	23.3
Recorded neonatal transfer	28	221	12.7

Discussion

Principal findings

This series of 259 cases recorded as FGR from 2019 to 2024 showed high frequencies of severe preeclampsia, transfers, and cesarean delivery. Mean gestational age was below 37 weeks and mean birthweight was approximately 1,881 g. Although most newborns with available data had an Apgar score ≥ 7 , the frequencies of preterm birth, low birthweight, and resuscitation indicate neonatal vulnerability. These results describe a selected population and do not establish causal effects of maternal characteristics or the comparative effectiveness of obstetric strategies.

Birthweight classification and the Senegalese twin study

Birthweight below the third percentile identifies severe SGA but is insufficient by itself to establish pathological antenatal growth restriction. Interpretation of Gardosi charts requires documentation of the reference standard, customization parameters, and pregnancy dating. The absence of calculated percentiles prevented independent verification of classification. Without a denominator of eligible births, FGR prevalence cannot be estimated. Our previous study of 251 twin pregnancies in Senegal demonstrated strong agreement between EPOPé M2 and Gardosi, with κ coefficients of 0.858 for the first twin and 0.828 for

the second. This agreement did not demonstrate the prognostic superiority of either model or validate FGR diagnosis based solely on a percentile. Twin findings cannot be directly extrapolated to singleton births. Their contribution is methodological: chart selection changes classification, whereas clinical interpretation requires growth trajectory, Doppler findings, and neonatal outcomes.

Antenatal care and maternal conditions

The median of four ANC visits and the proportion of women reporting fewer than four visits support improved documentation of the timing and content of care. The World Health Organization recommends eight contacts for uncomplicated pregnancies, with surveillance adapted to risk [5]. Visit counts do not measure care quality, and shorter pregnancies also provide fewer opportunities for visits. The frequency of severe preeclampsia is consistent with referral hospital recruitment and the coexistence of hypertensive disorders and impaired growth. Takahashi and colleagues investigated FGR as an initial finding in pregnancies subsequently complicated by preeclampsia [6]. Our study cannot estimate the risk of FGR associated with this condition. Obesity also requires cautious interpretation because BMI was missing for most women and BMI classification differed from the diagnostic indicator. Numeric fundal height measurements did not allow a gestational age-adjusted classification to be reproduced. International symphysis-fundal height standards provide a framework for longitudinal monitoring [7], but measurement conditions and local thresholds remain to be documented.

Obstetric management

The cesarean rate of 82.2% describes final mode of delivery, whereas the 68.3% frequency of cesarean delivery before labor applies only to records with documented labor onset. These indicators address different questions. Their frequencies may reflect maternal severity, fetal condition, and transfers, but the completeness of clinical data was insufficient to assess individual indications. The DIGITAT trial compared induction with expectant monitoring for suspected growth restriction near term and found no important differences in its principal outcomes or cesarean rates [8]. Those findings cannot be directly applied to this series, which included many preterm births. Delivery strategies should be assessed in relation to maternal and fetal circumstances.

Gestational age birthweight and neonatal adaptation

Preterm birth accounted for 45.7% of births with usable gestational age data. Low birthweight affected 86.0% of weighed newborns, and 21.7% weighed < 1,500 g. These dimensions should not be conflated: low birthweight may reflect prematurity, growth restriction, or both. Available data do not fully distinguish their contributions. The preterm birth estimate was based on 173 records and may not represent all 259 cases. The Apgar

score describes immediate neonatal adaptation and should be interpreted alongside gestational age and resuscitation; it is insufficient to diagnose asphyxia or predict individual prognosis [9]. A reassuring score does not exclude morbidity in preterm or low-birthweight newborns. Studies distinguishing SGA from antenatally diagnosed FGR emphasize the value of documenting neonatal complications [10]. In this series, resuscitation indications, hypoglycemia, hypothermia, and reliable death outcomes were unavailable. Selection of live births and highly incomplete discharge status precluded estimation of perinatal mortality.

Strengths and limitations

This study provides a local description of cases identified in a computerized hospital database. The tables present detailed distributions of recorded parity, previous cesarean delivery, gestational age, birthweight, and Apgar scores. The series of 259 cases provides a useful summary of the profile of patients managed at the hospital. Limitations include the retrospective single-center design, selection of recorded cases, lack of a comparison group, and incomplete documentation of Gardosi calculations. Missing data, particularly for gestational age and BMI, may introduce bias. Gravity coding, atypical values, and discrepancies between diagnostic and numeric fields limit data quality. The extract did not permit reliable identification of possible duplicate records or reconstruction of all initial exclusions. Independent risk factors, population prevalence, and perinatal mortality cannot be inferred. The retained maximum gestational age of 44 weeks also warrants verification.

Conclusion

The 259 singleton live births recorded as FGR at CHNP from 2019 to 2024 were characterized by high frequencies of severe preeclampsia and cesarean delivery. Among available observations, mean gestational age was 36.42 weeks and mean birthweight was 1,880.8g; preterm birth and low birthweight were frequent. Despite generally reassuring five-minute Apgar scores, recorded resuscitation indicates neonatal care needs. Improved documentation of growth, pregnancy dating, and neonatal follow-up is necessary. A comparative study with a validated case definition would help clarify associated factors and prognosis.

Declarations

Funding: This study received no specific funding.

Conflicts of interest: The author declares no conflicts of interest.

Data availability: Confidential clinical data are not publicly available. An anonymized dataset may be considered for review upon reasonable request, subject to applicable institutional authorizations.

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