

The Diagnostic Validity of Preterm Delivery in Adolescent Girls Based on Neonatal Clinical Assessment

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Abstract

Introduction: Pregnant adolescents are at an elevated risk of premature delivery. In the context of low levels of education and limited resources, several difficulties are encountered in determining gestational age. These include a lack of knowledge of the date of the last menstrual period, failure to perform first-trimester ultrasound, and absence of an electroencephalogram. In such circumstances, the utilisation of a morphological score, analogous to the Finnstrom score, to ascertain gestational age would appear to be a more accessible and straightforward approach. This study aimed to assess the accuracy of the Finnström score in newborns of teenage mothers, where the date of the last menstrual period may be subject to inaccuracy, in order to validate the diagnosis of preterm delivery. **Methods:** This was an analytical cross-sectional design of 87 newborns of teenage mothers, multicenter, conducted in the city of Kisangani, Democratic Republic of the Congo (DRC) with prospective data collection. **Results:** This study involved 87 newborns born to adolescent mothers. The incidence of premature delivery, as determined by the date of the last menstrual period, was observed to be 17.6% among teenage girls and 5.3% among adults. As indicated by the Finnström morphological score and early ultrasound dating, the incidence of preterm delivery was notably elevated, at 32.2% and 37.7%, respectively. The correlation between gestational age according to the date of the last menstrual period and gestational age according to early ultrasound dating was low (0.338), while there was a satisfactory correlation between gestational age according to the Finnström morphological

score and early ultrasound dating (0.828). **Conclusion:** The Finnström morphological score represents a valuable tool for accurately determining gestational age, thereby validating the diagnosis of preterm delivery in adolescents, who are prone to inaccuracies in determining the date of the last menstrual period. It is therefore recommended that this score be evaluated in our setting, where access to ultrasound is sometimes still problematic.

Keywords

Preterm Delivery, Adolescent Girls, Diagnostic, Neonatal Assessment

1. Introduction

The accurate determination of gestational age (GA) is of great importance in the field of obstetrics, as it can reveal abnormalities in the duration of pregnancy, including premature delivery, as well as pathologies of fetal growth [1]-[5]. The determination of gestational age is typically based on the application of obstetric criteria, which may include the date of the first day of the last menstrual period (LMP), ovulation, early ultrasound dating, measurement of uterine height, and examination of specific amniotic fluid components. However, the use of pediatric clinical scores and newborn electroencephalogram (EEG) may also be employed in this regard [5]-[8]. According to extant research, EEG is regarded as the most reliable method, provided that it is conducted by a duly qualified expert [7]-[10].

In countries with constrained resources, electroencephalography (EEG) is frequently unavailable. It is common practice among clinicians to estimate gestational age using a combination of methods, including the WILD and/or birth weight, as well as other available obstetric clinical estimates such as uterine height measurement [11]-[14]. The determination of gestational age in these cases remains challenging due to the high prevalence of maternal malnutrition and intra-uterine growth retardation [14]-[16]. In the context of adolescent childbearing and the lack of resources in our setting, several challenges are encountered in determining gestational age. These include a lack of awareness, a delayed start to prenatal care, which hinders early ultrasound dating, and a lack of ultrasound services in peripheral health facilities [1] [2]. In such circumstances, the use of morphological maturation scores, such as the Finnstrom and Farr scores, and neuro-morphological scores, including the Dubowitz and Ballard scores, can facilitate the estimation of gestational age [17]-[22].

Nevertheless, the utilization of neuro-morphological scores appears to be constrained in instances of neurological distress, particularly in extremely premature infants, and is often more challenging to perform. Therefore, in these peripheral structures, the utilization of morphological scores, such as the Finnstrom, to ascertain the term would appear to be a more accessible and straightforward approach for all practitioners, including physicians and delivery room paramedics [15] [22]-[26].

The Finnström score includes 7 morphological criteria whose rating varies from 1 to 4. It is a valid and relevant method for the assessment of gestational age [23].

In light of the unavailability of EEG and early ultrasound dating in our context, coupled with the inherent imprecision of the LMP in adolescents, neonatal assessment by the Finnström score may prove invaluable in validating the diagnosis of preterm delivery in adolescent girls. The objective of this study was to assess the accuracy of the Finnström score in newborns of adolescent mothers, where LMP inaccuracy is a particular concern, in order to validate the diagnosis of preterm delivery and to calculate the correlation coefficients between the GA obtained from this score and that of the LMP with the age of the dating ultrasound.

2. Methods

2.1. Study Site

This multicenter study was conducted in the city of Kisangani, Democratic Republic of Congo (DRC), from February 1 to May 31, 2024. Five health facilities were selected from the nine that were included in the pre-survey, which was conducted to determine which facilities had a high frequency of deliveries and a high proportion of adolescent mothers. The selected facilities were as follows: Prince Al-Waleed Referral Health Center, Saint Joseph Referral Health Center, Matete Referral Health Center, Bolila Hospital, and Kabondo General Hospital.

2.2. Design, Sample, Eligibility and Exclusion Criteria

This was an analytical cross-sectional design of 87 newborns of teenage mothers. Our sample was exhaustive during the study period. The study included 87 infants who were less than three days old and born to teenage mothers with a known last menstrual period (LMP), a history of regular menstrual cycles prior to pregnancy and with or without early ultrasound scan performed before 14 weeks. The study excluded infants with life-threatening congenital malformations and twins.

2.3. Study Variables

The dependent variable was preterm delivery, while the independent variables were sociodemographic characteristics, delivery-related data (such as duration of labor, route of delivery, newborn weight), gestational age according to LMP, according to Finnström morphological score, and according to early dating ultrasound.

2.4. Data Collection Tool and Procedure

Data collection was prospective. After obtaining the consent of the teenage mother, a standardized questionnaire, was pre-tested and validated by the author. This questionnaire was based on maternal parameters and an assessment of the newborn using the Finnström morphological score (Table 1) for neonatal data. Early ultrasound results were obtained from protocols in the obstetric records.

The gestational age (GA) was calculated from the date of the first day of the last menstrual period according to the Naegele rule. Additionally, an early dating

ultrasound was performed before 14 weeks of amenorrhea, and the morphological examination of the newborn was conducted according to the Finnström score. The latter was conducted by two examiners, with the third assuming responsibility when a discrepancy of more than one week was identified between the gestational ages determined by the preceding examiners. These examiners were general practitioners and midwives who had received training from a specialist pediatrician in the use of the score. The evaluation of this score is comprised of three steps: first, the various morphological elements are scored; second, the scores are summed; and third, the corresponding gestational age is observed in **Table 1**.

Table 1. Finnström morphological score.

Mammary gland
Diameter < 5 mm = 1
Diameter 5 - 10 mm = 2
Diameter > 10 mm = 3
Nipple
No areola = 1
Flat areola = 2
Raised areola = 3
Abdominal skin
Collateral veins and venules = 1
Veins and collaterals = 2
Some large vessels = 3
Large vessels absent or indistinct = 4
Scalp
Fine, woolly or agglomerated hair = 1
Thick, silky, individualized hair = 2
Ear cartilage
Absent in antitragus = 1
Present in antitragus = 2
Present in antelix = 3
Complete in helix = 3
Fingernails
Not reaching end = 1
Reaching tip = 2
Hard and reaching or exceeding tip = 3
Plantar grooves
No wide furrows = 1
Grooves on front 1/3 = 2
Furrows on front 2/3 = 3
Grooves on entire plant = 4

Continued

Total score	Gestational age
7	27.5
8	28.5
9	29.0
10	30.0
11	31.0
12	32.0
13	33.0
14	34.0
15	34.5
16	35.5
17	36.5
18	37.5
19	38.5
20	39.5
21	40.5
22	41.5
23	42.0

2.5. Data Analysis

The data were entered into EpiData version 4.6.0.4 and exported to SPSS version 21 for analysis. The validity of Finnström's morphological score was evaluated through a Pearson's correlation test with dating ultrasound, resulting in the calculation of the correlation coefficient (r) [27] [28]. The latter was deemed statistically significant when the p -value was less than 0.05. Similarly, an assessment was conducted to determine the level of correlation between the Finnström score and the date of the last menstrual period. As the correlation coefficient (r) approaches 1, the strength of the correlation increases.

2.6. Operational Definitions

- The World Health Organization (WHO) defines an adolescent as any girl between the chronological ages of 10 and 19 years old.
- Preterm was defined as deliveries before 37 weeks' amenorrhea, while term was defined as deliveries between 37 and 40 weeks' amenorrhea. Postterm was defined as deliveries after 40 weeks of amenorrhea.
- The term "primiparous" refers to a woman who has given birth only once. A "secondiparous" woman has given birth twice, while a "multiparous" woman has given birth three to five times. A "grand multiparous" woman has given birth more than five times.
- The term "ANC" was defined as "not attended" if a woman had not attended

any sessions, “poorly attended” if the number of sessions attended varied between one and three, and “well attended” if the number was equal to or greater than four.

- Low birth weight was defined as any birth weight below 2500 grams, while normal weight was defined as a birth weight between 2500 and 3499 grams. Additionally, a birth weight between 3500 and 3999 grams was classified as large for gestational age, and a birth weight above 4000 grams was classified as macrosomia.

2.7. Ethical Issue

A research attestation was provided by the FMP of the University of Kisangani, and the Ethics Committee of the same university granted authorization for data collection. Prior to the interview and data collection, the purpose and importance of the study were elucidated to each study participant. Each adolescent provided written informed consent to participate in the study. The data were kept anonymous.

3. Results

3.1. Sociodemographic Data

The present study involved 87 newborns born to adolescent mothers. The mean maternal age was 16.9 years. 94.3% of the adolescent mothers were primiparous. The antenatal visit rate was 16.1% (Table 2).

Table 2. Socio-demographic characteristics.

<i>Socio-demographic characteristics</i>	N	n (%)
Average age (years)	87	16.9 (1.5) ¹
Parity	87	
Primiparous		82 (94.3%)
Secondiparous		5 (5.7%)
Multiparous		0 (0.0%)
Large multiparous		0 (0.0%)
Antenatal visits	87	
Poorly attended		58 (66.7%)
Well attended		14 (16.1%)
Not attended		15 (17.2%)

¹Average (standard deviation).

3.2. Delivery-Related Parameters

In 28.7% of cases, the duration of labor was prolonged. A total of 23% of cases resulted in a caesarean section. The newborns of teenage mothers exhibited a low birth weight (35.6%) (Table 3).

Table 3. Delivery-related parameters.

<i>Delivery characteristics</i>	N	n (%)
Length of labor	87	
Normal		62 (71.3)
Prolonged		25 (28.7)
Mode of delivery	87	
Cesarean section		20 (23.0)
Vaginal delivery		67 (77.0)
Birth weight	87	
Low birth weight		31 (35.6)
Normal weight		46 (52.9)
Large fetus		8 (9.2)
Macrosomia		2 (2.3)

3.3. Gestational Age According to LMP, Finnström Score and Early Ultrasound Dating

The prevalence of preterm delivery, as defined by the LMP, was 17.6%. As indicated by the Finnström morphological score and early ultrasound dating, the incidence of premature delivery was notably elevated (32.2% and 37.7%, respectively) (Table 4).

Table 4. Gestational age according to LMP, Finnström score and early ultrasound dating.

Gestational age	N	n (%)
Gestational age according to date of last menstrual period	68	
Pre-term		12 (17.6%)
Full term		51 (75.0%)
Post-term		5 (7.4%)
Gestational age according to Finnström score	87	
Pre-term		28 (32.2%)
Full term		57 (65.5%)
Post-term		2 (2.3%)
Gestational age according to ultrasound dating	53	
Pre-term		20 (37.7%)
Full term		31 (58.5%)
Post-term		2 (3.8%)

3.4. Correlation Coefficient between Gestational Age According to Date of Last Menstrual Period and GA According to Finnström Correlated with GA According to Ultrasound Dating (Standard Method)

The correlation between gestational age (GA) determined by the date of the LMP and GA determined by dating ultrasound was low (0.338). In contrast, there was

a high correlation between GA according to the Finnerström method and dating ultrasound in cases (0.828) (**Table 5**).

Table 5. Comparison of correlation coefficient between gestational age according to date of LMP, gestational age according to Finnström, and gestational age according to ultrasound dating (standard method).

Variables	Correlation coefficient	95% confidence interval	p value
gestational age according to date of LMP	0.338	0.053 – 0.572	0.021
gestational age according to Finnström score	0.828	0.719 – 0.897	<0.001

4. Discussion

The prevalence of preterm delivery among teenagers was higher according to the Finnström morphological score and early ultrasound dating (32.2% and 37.7%) than that obtained according to the date of the last menstrual period (17.6%), as evidenced in our study. This discrepancy may be attributed to the fact that adolescent females are frequently unable to ascertain the precise date of their last menstrual period due to a lack of education and an absence of motivation to become pregnant. It is important to note that the date of the last menstrual period does not necessarily correspond to the actual date of the menstrual cycle. The date of the last menstrual period is not always a reliable indicator, particularly in the case of teenage mothers.

In reference to the date of the last menstrual period, our findings align with those of Kakudji *et al.* [29], who reported a preterm delivery rate of 12.7% in Lubumbashi, Democratic Republic of the Congo (DRC). The physical immaturity of the uterus, which remains hypoplastic, is frequently the underlying cause of preterm delivery in adolescents [30]. Nevertheless, the prevalence of prematurity according to the Finnstrom score is comparable to that of early ultrasound dating (32.2% vs. 37.7%). These findings are consistent with those of Boiro *et al.* [23], who reported a prevalence of 21% versus 23.2%. Early ultrasound remains the most reliable examination for determining gestational age (GA). A study conducted in Paris, France, demonstrated that measuring the craniocaudal length during an ultrasound performed between 11 and 14 weeks of gestation allows for an accurate estimation of the date of conception, with a precision of plus or minus five days in 95% of cases [31].

A study conducted in Cameroon revealed that in 42.7% of cases, the gestational age (GA) calculated based on the date of the last menstrual period (LMP) differed from that estimated using ultrasound dating. The primary factors contributing to this discrepancy in the estimated date of the last menstrual period were forgetfulness, irregularity of the menstrual cycle, and uncertainty expressed by the pregnant woman regarding the date of the last menstrual period provided [32]. In the study by Latis *et al.* [33], a comparison of the Dubowitz score with the Finnström

score revealed no statistically significant difference between the two clinical scores. In approximately 10% of cases, the Dubowitz score was not utilized due to the critical condition of the neonates. For these reasons, the Finnström score is the most appropriate for routine clinical work.

In the present study, the date of the last menstrual period and the Finnström score were compared with the results of the dating ultrasound. The date of the last menstrual period demonstrated a weak correlation ($r = 0.338$; $p = 0.021$) in newborns of adolescent mothers, while the Finnstrom score exhibited a satisfactory correlation ($r = 0.828$; $p < 0.001$). The weak correlation observed for the date of the last menstrual period was attributed to the imprecision inherent in this method, particularly in adolescent girls with a low level of education, who constituted the majority of the study population.

Study limitations

One of the primary constraints of our investigation is that the initial ultrasound dating assessment, which is also contingent upon the expertise of the sonographer, was conducted by disparate operators.

5. Conclusion

It can be concluded that neonatal clinical assessment for the purpose of determining gestational age is of significant importance in the diagnosis of premature delivery in adolescents, who are frequently subject to inaccuracies in the estimation of the date of the last menstrual period. This assessment allows obstetricians to identify instances of term error and refer premature newborns to a neonatology unit for further care. The Finnström morphological score is an accessible, straightforward, and reliable method for determining gestational age. In light of these considerations, we propose the assessment of this score in low-resource settings, where access to EEG and, on occasion, ultrasound is still a challenge.

Conflicts of Interest

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

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