

Factors influencing the perinatal outcomes of teenage deliveries in a regional hospital in KwaZulu-Natal Province, South Africa

F Fodo, MB ChB, FCPaed (SA); T Hariram, MMed (Paed)

Department of Paediatrics and Child Health, University of KwaZulu-Natal, Durban, South Africa

Corresponding author: F Fodo (fefekazifodo@yahoo.com)

Background. Teenage pregnancy is a global problem and is associated with maternal and neonatal complications. Developing countries show a rising prevalence in teenage pregnancies. A limited number of studies have investigated perinatal outcomes within the pregnant teenage population.

Objectives. To describe and analyse the effect of maternal factors on perinatal outcomes of teenage pregnancies.

Methods. Data were collected retrospectively from the labour ward and neonatal admission registers of a regional hospital in South Africa over a 6-month period in 2018. Teenagers between 10 and 19 years of age, who delivered at the institution, were included in the study. Maternal factors were analysed for the risk of a complicated perinatal outcome, which was defined as either stillbirth or live neonate requiring admission to the neonatal nursery. A secondary analysis was conducted on the risk of stillbirth, prematurity and low birthweight (LBW).

Results. The prevalence of teenage deliveries was 15.6% ($n=707/4\ 519$). One-fifth (20%) of teenagers were ≤ 16 years old. Complicated perinatal outcomes were present in 19.5% of deliveries and were associated with a lack of antenatal care (ANC) and emergency caesarean section (CS). Unbooked teenagers had a ten-fold higher chance of delivering a stillbirth and were three times more likely to deliver an LBW baby. Maternal complications were also associated with LBW. Age, parity and HIV status did not show any statistically significant difference in perinatal outcomes.

Conclusion. The prevalence of teenage pregnancy was high in our cohort. Lack of ANC, maternal complications and emergency CS in teenagers were associated with adverse perinatal outcomes.

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Teenage pregnancy sparked global concern as early as 1856, when it was first recognised as a high-risk pregnancy, with an increased incidence of obstetric and neonatal complications. These include pregnancy-induced hypertension, gestational diabetes, maternal anaemia, prematurity, low birthweight, intrauterine foetal death, congenital malformations, and an increased rate of admission to the neonatal intensive care unit.^[1,2] These adverse outcomes can have lifelong and even inter-generational consequences, making it a priority area for both primary and secondary preventive measures. Worldwide, the percentage of young women giving birth before the age of 18 years is estimated to be 15%.^[3] In Africa, the prevalence of teenage pregnancy is on an upward trajectory and in South Africa (SA), there has also been a steady increase in the national teenage pregnancy prevalence rate from 7.7% in 2012/13 to 12.7% in 2017/18.^[4,5]

Low socioeconomic status, poor contraceptive use and sociocultural expectations linked to early marriage have been identified as risk factors for teenage pregnancy.^[1,6-8] In SA, gender-based violence, inability to negotiate condom use in age-disparate sexual relationships, peer pressure and poor school performance are said to further contribute to the rise in prevalence of teenage pregnancy.^[9,10]

Most studies have focused on the association of teenage pregnancy with adverse outcomes in comparison with the adult population. However, there is a paucity of studies that have examined risk factors for adverse perinatal outcomes within the teenage population itself. With the rising prevalence noted in

teenagers in an HIV-endemic country such as SA, it is necessary to examine the effect of maternal factors such as younger adolescent age, teenage multiparity, HIV infection and antenatal attendance within the pregnant teenage population on perinatal outcomes.^[1] In so doing, risk factors can be identified, which can guide secondary prevention strategies aimed at improving perinatal outcomes in teenagers. The aims of the present study were to: (i) determine the prevalence of teenage deliveries; (ii) describe the demographic profile of teenage deliveries; (iii) describe maternal and perinatal outcomes of teenage deliveries; and (iv) identify risk factors for complicated perinatal outcomes.

Methods

We conducted a quantitative descriptive and analytical study at Prince Mshiyeni Memorial Hospital (PMMH), a peri-urban regional hospital located in the eThekweni Metropolitan Municipality of KwaZulu-Natal Province (KZN), SA. It is a 1 075-bed facility that serves the surrounding Durban South area, including parts of the Eastern Cape Province.

We employed a purposive sampling method and teenagers between 10 and 19 years of age, who delivered at the hospital between 1 January and 30 June 2018, were included in the study population. Data were collected retrospectively from the hospital's labour ward and neonatal admission registers using a data collection tool designed by the investigators. The total number of deliveries was obtained from the labour ward register.

Demographic details and maternal outcomes, which included mode of delivery, maternal complications and maternal deaths, were obtained from the labour ward register for all teenage deliveries. Maternal complications as documented in the labour ward registers included perineal tears, haemorrhage, manual removal of placenta and hypertension.

Perinatal outcomes were obtained from both the labour ward and neonatal admission registers. These included gestational age at birth, birthweight, stillbirth, need for admission to the neonatal nursery, which provides low and high care, as well as intensive care facilities for sick and small newborns. Information on the need for respiratory support and death before discharge from the neonatal nursery was also obtained from the registers.

The primary outcome measure used for analysis in the present study was the risk of a complicated perinatal outcome, which we defined as a combined-outcome variable that included stillbirths and sick neonates requiring admission to the neonatal nursery post delivery. Uncomplicated perinatal outcomes were defined as those neonates who were transferred directly to their mother post delivery for routine care. Secondary outcome measures analysed were the risk of stillbirth, prematurity (≤ 37 weeks' gestational age), or low birthweight (LBW) < 2.5 kg).

Gravid patients ≥ 20 years and teenage mothers who delivered their babies before arrival at the hospital were excluded. Data were captured in an Excel spreadsheet (Microsoft Corp., USA) and analysed using Stata version 17 (Stata Corp., USA). A sample size of 673 was calculated for us to detect a difference in complicated perinatal outcomes between the different age groups with 80% power and 95% probability. Chi squared and Fisher's exact tests were used to identify risk factors associated with primary and secondary outcome measures. A multi-variable logistic model was then used to identify independent risk factors. A p -value of < 0.3 in the unadjusted model was used to identify risk factors included in the model. This p -value ensured that factors showing moderate association were included without the risk of over-fitting the model. A p -value < 0.05 was considered significant.

Ethics

Ethics approval was obtained from the Biomedical Research Ethics Committee of the University of KwaZulu-Natal (ref. no. BE244/19).

Results

There was a total of 4 519 deliveries in PMMH during the 6-month study period. Of these, 707 were teenage deliveries, with a prevalence of 15.6%. The demographic profile, maternal and perinatal outcomes of the sampled population are described in Table 1.

Of the 113 neonates admitted to the nursery, there was one early neonatal death – this was a term neonate who required invasive ventilation for meconium aspiration syndrome. The remaining 112 neonates survived until discharge from the neonatal nursery. The most frequent reason for admission to the neonatal nursery was respiratory distress 45 neonates, of whom 4 (8.9%) required invasive ventilation, 9 (20%) required non-invasive ventilation and 32 (71.1%) required low-flow oxygen. Sepsis was suspected in 33 (29%) neonates, 25 (22.1%) had LBW, 4 (3.5%) had low APGAR scores, 5 (4.4%) were admitted for birth injuries and 11 (9.7%) neonates were admitted for monitoring and observation. There were no congenital anomalies documented in the admitted cohort. Overlap of descriptive reasons for admission was noted in the neonatal admission register.

Risk factors for a complicated perinatal outcome are shown in Table 2.

Table 1. Demographic profile, maternal and perinatal outcomes of teenage deliveries

	n (%)
Age group	
10 - 16	142 (20)
17 - 19	565 (80)
Parity	
Primiparous	645 (92.5)
Multiparous	53 (7.5)
HIV status	
Positive	91 (12.8)
Negative	616 (87.2)
WR status	
Positive	5 (0.7)
Negative	699 (98.8)
Unknown	3 (0.5)
Antenatal booking	
< 20 weeks	368 (52.1)
≥ 20 weeks	316 (44.5)
Unbooked	24 (3.4)
Maternal outcomes	
Mode of delivery	
NVD	479 (67.8)
ELCS	13 (1.8)
EMCS	215 (30.4)
Maternal complications	
Yes	128 (18.1)
No	579 (81.9)
Maternal deaths	
Yes	0
No	707 (100)
Perinatal outcomes	
Birthweight (grams)	
$< 1\ 000$	10 (1.4)
1 000 - 1 499	11 (1.6)
1 500 - 2 499	82 (11.6)
$> 2\ 500$	604 (85.4)
Gestational age (weeks)	
< 28	12 (1.7)
28 - 36	115 (16.3)
> 37	580 (82)
Birth outcomes	
Stillbirth	25 (3.5)
Live birth	
Neonatal nursery admission	113 (16)
Transferred directly to mother	569 (80.5)

WR = Wasserman reaction (point-of-care syphilis test);
 NVD = normal vaginal delivery; ELCS = elective caesarean section;
 EMCS = emergency caesarean section.

Maternal risk factors, which included age group, parity, HIV status, mode of delivery, booking gestation and maternal complications, were compared against secondary outcome measures of stillbirth, prematurity and LBW (Table 3). Unbooked teenage mothers had a higher risk of delivering a LBW baby (aOR 2.9) and a significantly higher risk of having a stillbirth (aOR 10.2). Maternal complications were also associated with LBW babies (aOR 1.9).

Table 2. Risk factors for a complicated perinatal outcome

	Complicated perinatal outcome, n (%)	Uncomplicated perinatal outcome, n (%)	p-value	OR (95% CI)	aP	aOR (95% CI)
Age group (years)						
10 - 16	30 (21.1)	112 (78.9)				
17 - 19	108 (19.1)	457 (80.9)	0.6	0.9 (0.6 - 1.4)		
Parity						
Primiparous	124 (19)	530 (81)				
Multiparous	14 (26.4)	39 (73.6)	0.2	1.5 (0.8 - 2.9)	0.4	1.4 (0.6 - 3)
HIV status						
Negative	118 (19.2)	498 (80.8)				
Positive	20 (22)	71 (78)	0.5	1.2 (0.7 - 2.0)		
Syphilis						
Negative	136 (19.5)	563 (80.5)				
Positive	2 (40)	3 (60)	0.6	2.8 (0.5 - 16.7)		
Unknown	0	3 (100)	-	-		
Booking status						
<20 /40	72 (19.6)	296 (80.4)				
≥20/40	54 (17.1)	261 (82.9)	0.4	0.9 (0.6 - 1.3)	0.5	0.8 (0.5 - 1.3)
Unbooked	12 (50)	12 (50)	0.001	4.1 (1.8 - 9.5)	0.02	3.5 (1.3 - 9.8)
Delivery						
NVD	76 (15.9)	403 (84.1)				
ELCS	3 (23.1)	10 (76.9)	0.5	1.6 (0.4 - 5.9)	0.34	2 (0.5 - 8.8)
EMCS	59 (27.4)	156 (72.6)	<0.001	2 (1.4 - 3)	0.01	2 (1.2 - 3.4)
Maternal complications						
No	96 (16.6)	483 (83.4)				
Yes	42 (32.8)	86 (67.2)	<0.001	2.5 (1.6 - 3.8)	0.1	1.6 (0.9 - 2.8)

OR = odds ratio, CI = confidence interval; aP = adjusted p-value; aOR = adjusted odds ratio; NVD= normal vaginal delivery, ELCS = elective caesarean section; EMCS = emergency caesarean section.

Discussion

The teenage pregnancy prevalence rate in the present study was higher than the national rate (12.7%) but lower than the provincial rate (17.6%) for the 2017/18 financial year.^[5]

A recent publication by Statistics SA reported that, in 2019, KZN recorded the highest percentage of registered live births in adolescents, being the only province to have a prevalence of >20%. Improved education and access to family planning services are required for teenagers in KZN.^[11]

Of particular concern in this study, was that one-fifth of the teenagers were between 10 and 16 years old at delivery. According to Act No. 5 of 2015: Criminal Law (Sexual Offences and Related Matters) Amendment Act, consensual sex with a child (under 16 years of age) is prosecutable as statutory rape, with the following exceptions: both teenagers engaging in sex are older than 12 years but younger than 16 years of age and consenting; or if there is an age gap of less than 2 years between the consenting teenagers.^[12] Importantly, we noted that information regarding the age of the biological father was not routinely collected. With the alarming number of teenagers delivering babies in this age group, it may be beneficial to record this in admission registers so that appropriate action, including referral for social services interventions, can be instituted. Improving sex health education and empowering teenage girls with their legal rights, from as young as the age of 10, should also be considered.

The 2020 Stats SA publication^[13] reported a rise in the number of girls as young as 10 delivering babies, with >600 live births

in girls aged 10 to 13 years registered in 2020. The biological immaturity of the uterus at a young age as well as the competing nutritional demands of the fetus and the growing adolescent have been proposed as contributory factors in the increased incidence of adverse maternal and neonatal outcomes in teenagers compared with adults.^[14] Studies that have examined the difference in outcomes of pregnancy during early v. later stages of adolescence, however, show conflicting results. A study done by Uzan *et al.*^[15] reported that teenagers 16 - 17 years old had a higher risk of adverse neonatal outcomes than the 18- to 19-year age group. A higher risk of prematurity in younger compared with older teenage mothers was also observed in a cross-sectional study conducted in the UK.^[16] In contrast, a small case-control study published in 2009 showed similar perinatal outcomes between early and late adolescent age groups.^[17] Similarly, our study did not find any association between the younger adolescent age group and adverse perinatal outcomes. With the rapid rise in pregnancies in early adolescence, it is increasingly important to focus future research on causal factors for these very young pregnancies, as well as their short- and long-term outcomes.

Studies done in developing countries around the world have recognised the influence of primiparity and grand multiparity on the risk of stillbirth in the pregnant adult population.^[18] However, the evidence appears to differ within the teenage population specifically, as a 2001 study by Smith and Pell *et al.*^[19] highlighted an increased risk of stillbirths and prematurity in teenagers having their second babies, compared with teenagers having their first babies, and adult controls. A 2010 study also showed that, while all teenage mothers

Table 3. Risk factors for stillbirth, prematurity and low birthweight

	Stillbirth, n=25			Prematurity, n=127			Low birthweight, n=103					
	p-value	OR (95% CI)	aP	aOR (95% CI)	p-value	OR (95% CI)	aP	aOR (95% CI)	p-value	OR (95% CI)	aP	aOR (95% CI)
Age group (years)												
10 - 16												
17 - 19	0.3	0.6 (0.3 - 1.6)	0.2	0.6 (0.2 - 1.4)	0.3	0.8 (0.5 - 1.2)	0.3	0.8 (0.5 - 1.2)	0.09	0.7 (0.4 - 1.1)	0.1	0.7 (0.4 - 1.1)
Parity												
Primiparous												
Multiparous	0.1	2.5 (0.8 - 7.5)	0.1	2.4 (0.8 - 7.6)	0.8	0.9 (0.4 - 2)			0.4	1.4 (0.7 - 2.9)		
HIV status												
Negative												
Positive	0.5	0.6 (0.1 - 2.5)			0.7	0.9 (0.5 - 1.6)			0.3	0.7 (0.4 - 1.4)	0.4	0.7 (0.4 - 1.5)
Booking GA												
<20												
≥20	0.06	2.4 (1 - 6)	0.08	2.3 (0.9 - 5.7)	0.3	0.8 (0.6 - 1.2)	0.3	0.8 (0.5 - 1.2)	0.5	0.9 (0.6 - 1.4)	0.5	0.9 (0.6 - 1.3)
Unbooked	<0.001	10.3 (2.8 - 38.2)	0.001	10.2 (2.7 - 38.4)	0.09	2.2 (0.9 - 5.3)	0.09	2.2 (0.9 - 5.3)	0.02	2.9 (1.2 - 7.1)	0.02	2.9 (1.2 - 7.2)
Delivery												
NVD												
ELCS	-	-			0.8	0.8 (0.2 - 3.6)			0.5	0.5 (0.1 - 4)		
EMCS	0.7	0.9 (0.3 - 2.2)			0.4	0.8 (0.6 - 1.3)			0.4	1.2 (0.8 - 1.9)		
Maternal complications												
No												
Yes	0.07	2.2 (0.9 - 5.2)	0.09	2.2 (0.9 - 5.2)	0.08	1.5 (0.9 - 2.42)	0.07	1.6 (0.9 - 2.5)	0.01	1.9 (1.2 - 3)	0.01	1.9 (1.2 - 3.1)

OR = odds ratio; CI = confidence interval, aP = adjusted p-value; aOR = adjusted odds ratio; GA = gestational age; NVD = normal vaginal delivery; ELCS = elective caesarean section; EMCS = emergency caesarean section.

have a higher chance of preterm birth compared with adult mothers, the risk is further increased in the second teenage pregnancy.^[16] Short inter-pregnancy interval and reduced antenatal booking in second pregnancies are thought to be some of the factors that contribute to the association of multiparity and adverse outcomes.^[16] Despite these reports in the literature, our study showed no association between multiparity and adverse perinatal outcomes.

Adolescents having unprotected heterosexual intercourse are said to be at increased risk for unwanted pregnancy and HIV acquisition, as evidenced by a significantly higher HIV incidence rate in pregnant women aged 15 years or younger.^[20] Furthermore, with early diagnosis and universal antiretroviral treatment (ART) initiation in HIV-infected infants, there is an increasing number of perinatally HIV-infected children surviving into adolescence, who may fall pregnant. There is limited research investigating the perinatal outcomes of pregnant HIV-infected adolescents, with conflicting results published in recent studies. One study conducted in Botswana^[21] found that HIV-infected adolescents had a higher risk of preterm birth and small-for-gestational-age babies. However, a study done in Mozambique concluded that adolescent pregnancy outcomes were not modified by HIV status, which was in keeping with the results from our study.^[22] The difference in study outcomes could be explained by the timing of acquisition of HIV, the timing of initiation of ART and subsequent viral load suppression in the study population. More research, accounting for these factors in the analysis, are warranted.

UNICEF data from Africa have shown that fewer adolescent females make contact with healthcare facilities and have access to antenatal care (ANC).^[23] In KZN, the indicator for early ANC booking before 20 weeks' gestation in the general pregnant population was ~73.2% in 2018/19. However, our study showed that only 52.1% of pregnant teenagers booked early.^[24] Young maternal age has been associated with late ANC booking.^[25] While the present study found no difference in outcomes between early and late ANC booking, another SA study^[25] found that under-utilisation of ANC (<4 visits) and late booking in teenagers was associated with prematurity and LBW, respectively.

We found that unbooked teenagers faced a significantly higher risk of adverse perinatal outcomes, including a 10-fold higher risk of stillbirth. These findings were echoed in a Nigerian study,^[26] which also reported a higher risk of stillbirths in unbooked teenage mothers. Negative attitude from nurses, fear to test for HIV, lack of knowledge and financial barriers were factors identified in SA teenagers that influenced their decision to seek ANC and should be addressed to improve perinatal outcomes.^[25]

Maternal complications and emergency caesarean sections were identified as risk factors for LBW

and a complicated perinatal outcome, respectively, in our study. Monitoring, prevention and treatment of pregnancy complications with planning of labour and mode of delivery are directly related to the provision of adequate ANC, which may possibly explain the association of these risk factors with adverse outcomes.^[25] Once again, the importance of antenatal booking in improving both maternal and perinatal outcomes in teenagers is highlighted.

Study limitations

While this study had a large sample size, the review was conducted in a single centre with no adult control group, therefore findings may not necessarily be generalised to all institutions in KZN.

Data collected from the labour ward and nursery admission registers were reliant on the accuracy of nursing documentation, and there was evidence of missing information with overlap of descriptive reasons for admission noted in the neonatal admission register. Nursery admission was included as a criterion for a complicated outcome. However there were neonates who were admitted for observation with no further documentation of a diagnosis following this observation period. The specific maternal complications included in this study are not standardised, therefore the definition of a maternal complication as documented in the labour ward register may differ between institutions. Possible confounders such as smoking and socioeconomic status of teenage mothers were not considered in the analysis of outcomes.

Conclusion and recommendations

The prevalence of teenage deliveries in this study was high, in keeping with the high national teenage pregnancy prevalence rates in recent years. Lack of ANC and emergency caesarean sections were significant risk factors for a complicated perinatal outcome in teenage deliveries. Unbooked teenage mothers had a ten-fold higher chance of delivering a stillbirth and were three times as likely to deliver a LBW baby. Maternal complications were also associated with LBW. Age, parity and HIV status did not show any statistically significant difference in perinatal outcomes, however, larger studies that consider possible confounding factors are warranted to conclusively analyse these factors further.

A qualitative study exploring the reasons underlying teenage pregnancies would be useful in developing primary preventative strategies aimed at reducing the high prevalence of teenage deliveries at PMMH. It is necessary to enquire about the age of the biological father to implement appropriate legal and social services intervention for teenagers delivering under the age of 16. Improving sex health education and empowering teenage girls with their legal rights, from as young as the age of 10 years, should also be considered.

Secondary preventative strategies should be focused on educating pregnant teenagers on the need to initiate antenatal care, as well as identification and early referral of pregnant teenagers within school and community settings to initiate antenatal care. This ultimately impacts on the monitoring, prevention and treatment of pregnancy complications in both the mother and fetus, as well as safe planning of labour and mode of delivery.

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