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Perinatal deaths and low birthweight in an urban health centre in the Gambia: A prospective cohort study

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Abstract

Perinatal deaths (stillbirths after 28 weeks gestation and early neonatal deaths) are rarely reported separately but are the deaths most closely associated with complications during pregnancy, birth and the first days of life. We conducted a prospective cohort study to report perinatal deaths, late neonatal deaths and low birthweight babies as they occur. This cohort of birth outcomes from The Gambia was conducted between 2012 and 2016 and followed 1611 women attending a government-supported health center from the first antenatal visit to 28 days post-delivery. The outcome of the pregnancy was known for 1372 women (85.2%) and included 20 stillbirths and 12 early neonatal deaths. Of 1252 singleton babies with known birthweight 85 weighed less than 2500g (6.8%). Using multivariate analysis it was shown that women who attended the antenatal clinic four times or more were less likely to have a low birthweight baby than women who attended less than four times, OR 0.47 (95% CI:0.273-0.799). We conclude that frequent visits to the antenatal clinic are associated with better outcomes. *(Afr J Reprod Health 2022; 26[3]: 20-28).*

Keywords: Perinatal death, stillbirth, early neonatal death, low birthweight, The Gambia, cohort study, antenatal care

Résumé

Les décès périnatals (mortinaissances après 28 semaines de gestation et décès néonatals précoces) sont rarement rapportés séparément mais sont les décès les plus étroitement associés à des complications pendant la grossesse, l'accouchement et les premiers jours de la vie. Nous avons mené une étude de cohorte prospective pour rapporter les décès périnatals, les décès néonatals tardifs et les bébés de faible poids à la naissance au fur et à mesure qu'ils surviennent. Cette cohorte de résultats de naissance en Gambie a été menée entre 2012 et 2016 et a suivi 1611 femmes fréquentant un centre de santé soutenu par le gouvernement de la première visite prénatale à 28 jours après l'accouchement. L'issue de la grossesse était connue pour 1372 femmes (85,2%) et comprenait 20 mortinaissances et 12 décès néonatals précoces. Sur 1 252 bébés uniques dont le poids à la naissance était connu, 85 pesaient moins de 2 500 g (6,8 %). À l'aide d'une analyse multivariée, il a été démontré que les femmes qui ont fréquenté la clinique prénatale quatre fois ou plus étaient moins susceptibles d'avoir un bébé de faible poids à la naissance que les femmes qui l'ont fréquentée moins de quatre fois, OR 0,47 (IC à 95 % : 0,273-0,799). Nous concluons que des visites fréquentes à la clinique prénatale sont associées à de meilleurs résultats. *(Afr J Reprod Health 2022; 26[3]: 20-28).*

Mots-clés: Décès périnatal, mortinaissance, décès néonatal précoce, faible poids à la naissance, Gambie, étude de cohorte, soins prénatals

Introduction

The loss of a baby, whether a stillbirth or a death during the first weeks of life, causes great anguish to parents, families and communities wherever they live. In recent years substantial progress has been made in reducing child deaths in the under 5s worldwide. A reduction in neonatal mortality (death within the first 28 days after birth) has also been observed over this period, but not to such an extent as in older children. The consequence of this is that the proportion of child deaths in the first month of life is now higher than it was 5 years ago[1]. Much of the improvement has been prompted by the Millennium Development Goals (MDGs) set up in 2000 and concluded in 2015. Nonetheless, at the close of the MDG era, stillbirths and neonatal deaths remain much higher in sub-Saharan Africa than in the developed countries in the world. The Sustainable Development Goals (SDGs), building

on the MDGs, have set targets to be achieved by 2030. SDG 3 pledges, amongst other targets associated with wellbeing, to '*end preventable deaths of newborns… with all countries aiming to reduce neonatal mortality to at least as low as 12 per 1000 live births*'[2].

Neonatal deaths are divided into early neonatal deaths (death within the first 7 days after birth) and late neonatal deaths (deaths between 7 and 28 days after birth) but early neonatal deaths are rarely reported separately. In countries with poor vital registration it has been estimated that just under three quarters of all neonatal deaths occur in the first 7 days of life[3,4] and stillbirths are rarely reported in birth statistics. Perinatal deaths (stillbirths after 28 weeks gestation together with early neonatal deaths) might be prevented by better antenatal care, delivery with a trained midwife and care during the first 7 days after birth. Birth asphyxia, intrapartum complications, low birthweight and pre-term deliveries are the most common causes of stillbirths and early neonatal deaths[5] whereas the most common cause of late neonatal deaths is infection (sepsis and pneumonia). Perinatal deaths are closely associated with antenatal, intrapartum and post-partum care, and therefore might be preventable.

Prospective cohort studies are potentially valuable in birth outcome studies in low-resource settings. Not only do they allow a measure of the outcomes of interest, but also enable potential risk factors, recorded at the outset, to be examined with regard to the outcomes. The aim of this prospective cohort study was to measure the rates of preventable adverse birth outcomes (stillbirths, early neonatal deaths and low birthweight) and also examine risk factors associated with low birthweight. These data will provide a baseline against which future improvements can be measured.

Methods

Recruitment into the cohort

The study was conducted in a small government-supported health facility in The Gambia, located close to the largest urban centre, Serekunda. It is a typical outreach clinic and childbirth facility. A prospective cohort of 1611 women was recruited from a total of 1664 consecutive pregnant women attending the antenatal clinic for the first time for that pregnancy. Recruitment continued from the beginning of December 2012 to the end of November 2015, with follow-up to mid-2016.

Informed and signed consent was requested from each woman at the first visit to the antenatal clinic after the study was explained to her in her own language. It was made clear that she was giving consent for her obstetric and socio-demographic data to be used in a research project and, later in the study, telephone follow-up to determine the outcome of the pregnancy.

Follow-up

The women were followed from their first visit to the antenatal clinic until 28 days after delivery. Stillbirths, early neonatal deaths and low birthweight babies were recorded as they occurred. Potential risk factors for low birthweight were recorded throughout the pregnancy from the first visit to the ANC. Each woman was in the cohort from the date of her first antenatal clinic visit until, at the latest, 28 days after the birth of her baby.

Mobile telephone calls were used extensively throughout the study to determine outcomes and only 6% of the women had no access to a mobile telephone. Follow-up telephone calls were not required if the baby was born stillborn at the health centre, or if the baby was liveborn at the health centre and was subsequently seen at the infant welfare clinic at 28 days. However, follow-up telephone calls were required to determine the outcome if the baby was not born at the health centre, or if the baby was born alive at the health centre but the outcomes at 7 and 28 days was not known.

Calculation of rates

The calculation of rates was limited to singleton births as twins have a higher neonatal mortality rate than singletons[6].

A stillbirth was defined as a baby dying in utero, or immediately before the delivery, after 28 weeks gestation. The stillbirth rate was calculated as the total number of stillborn singleton babies born after 28 weeks gestation divided by the total number of singleton births after 28 weeks gestation, expressed per 1000 births. Early neonatal death was defined as a live birth with death within 7 days and

the early neonatal death rate was calculated as the number of deaths within the first 7 days divided by the total number of singleton livebirths for whom the outcome was known at 7 days. Perinatal deaths were calculated as the sum of all stillbirths and early neonatal deaths and the denominator was as for stillbirths. Neonatal death was defined as a live birth with death within 28 days and the neonatal death rate was calculated as the number of deaths within the first 28 days divided by the total number of singleton livebirths for whom the outcome was known at 28 days. Low birthweight was defined as a live baby born weighing less than 2500 grams.

Results

A total of 1664 consecutive women attended the antenatal clinic between the beginning of December 2012 and the end of November 2015 and were considered for entry into the cohort. Three women did not give consent, and a further 32 women who either did not sign the consent form or had incomplete registration details were excluded. Six girls under the age of 16 were also excluded. Three women who were living temporarily in The Gambia, and nine women who were identified as pregnant at an earlier out-patient visit but were no longer pregnant at their first antenatal clinic visit, were also excluded. In total 53 women were excluded (3.2%).

From December 2012 onwards 1611 pregnant women were recruited into the cohort. The majority of the women were over 20 years of age but 170 (10.6%) were 16-19 years of age. The gestational age of the baby at the first visit to the antenatal clinic was not recorded for two women. For the remaining women the gestational age of the baby at the first visit was estimated as they did not have access to an early ultrasound examination. Of these women, 384 (23.9%) first attended in the first 16 weeks, 846 (52.6%) first attended between 17 and 27 weeks and 379 (23.5%) first attended 28 weeks or later.

Of the 1611 women who entered the cohort 239 (14.8%) were lost to follow-up before birth, in some cases perhaps due to an unreported miscarriage. The women for whom the outcome was known and those lost to follow-up were compared in terms of age, number of previous pregnancies of 28 weeks gestation and the trimester at the first antenatal visit. There were no significant differences in loss to follow-up between different age groups or the number of previous pregnancies over 28 weeks. Women who first attended in the third trimester were more likely to be lost to follow-up than those who attended earlier.

Birth outcome

The immediate outcome at birth was known for 1366 women (84.8%), 1345 singletons and 21 pairs of twins. The rate of twin births was 15.4/1000 deliveries. As low birthweight was to be one of the outcomes of interest in the cohort analysis, and is disproportionately higher in twins than in singletons, the birthweights of the twins were recorded but the twins were not followed beyond the immediate birth.

The remaining data relates to the 1345 singleton babies only. There were 20 stillbirths and 1325 livebirths, giving a stillbirth rate of 14.9/1000 births after gestation of 28 weeks (95% CI: 8.3-21.4).

The outcome at 7 days was known for 1328 of the pregnancies (82.4%) and there were 12 early neonatal deaths. The early neonatal death rate was 9.4/1000 (95% CI: 4.1-14.7). In this cohort 57% of the total neonatal deaths were early neonatal deaths. There were 32 perinatal deaths (the combined stillbirths and early neonatal deaths), and the perinatal death rate was 23.8/1000 births after gestation of 28 weeks (95% CI: 15.5-32.0).

The overall outcome at 28 days was known for 1152 of the pregnancies (71.5%). There were 21 neonatal deaths in total, 12 early neonatal deaths and 9 late neonatal deaths. The overall neonatal death rate was 19/1000 (95% CI:10.9-27.1). The women who gave birth in hospital had all been referred with complications and the percentage of neonatal deaths in babies born in hospital (4.3%) was higher than the percentage of neonatal deaths in babies born in the Health Centre (1%).

Low birthweight

There were 1325 live, singleton births and the birthweight was recorded in grams for 1252 of the babies (94.5%). Birthweights were not available for home births, and it was not always possible to obtain birthweights for babies born in hospital. Of the 1252 singleton babies with known birthweights 85 babies

Table 1 Determinants of Low birthweight 1252 singleton babies

Variable	Descriptive			Univariate analysis			Multivariate analysis		
	Total sample	No. LBW	%	ORs	95% CI	P value	ORs	95% CI	P value
Age in years	1252	85	6.8						
<20	130	14	10.8	1			1		
20-29	773	54	7.0	0.62	0.335 – 1.156	0.134	0.91	0.439 – 1.904	0.811
≥ 30	349	17	4.9	0.42	0.203 – 0.888	0.023	0.86	0.348 – 2.142	0.75
Gravida	1252								
Primigravida	347	38	11.0	1			1		
Multigravida	905	47	5.2	0.45	0.285 – 0.696	<0.000	0.47	0.26 – 0.833	**0.01***
Trimester at first visit	1252	85	6.8						
1 (including 16 wks)	318	26	8.2	1			1		
2-3 (17 wks and over)	934	59	6.3	0.76	0.469 – 1.223	0.256	0.66	0.383 – 1.141	0.137
No. ANC visits	1251	85	6.8						
<4 visits	716	56	5.4	1			1		
4 or more	535	29	5.4	0.67	0.424 – 1.071	0.095	0.47	0.273 – 0.799	**0.005***
Marital status	1213	85	7.0						
Single	88	8	9.1	1			1		
Married polygamous	185	8	4.3	0.45	0.164 – 1.247	0.125	0.93	0.296 – 2.905	0.898
Married monogamous	940	69	7.3	0.79	0.368 – 1.706	0.552	1.12	0.467 – 2.66	0.803
Maternal education	1149	81	7.1						
No education	472	33	7.0	1			1		
Primary	118	9	7.6	1.10	0.510 – 2.364	0.810	0.95	0.418 – 2.173	0.909
Secondary	368	25	6.8	0.97	0.566 – 1.661	0.911	0.96	0.531 – 1.738	0.895
Tertiary	191	14	7.3	1.05	0.550 – 2.014	0.878	1.15	0.501 – 2.645	0.741
Paternal education	1110	80	7.2						
No education	288	20	6.9	1			1		
Primary	47	4	8.5	1.25	0.406 – 3.823	0.700	0.99	0.274 – 3.541	0.982
Secondary	404	35	8.7	1.27	0.718 – 2.251	0.411	1.25	0.679 – 2.293	0.476
Tertiary	371	21	5.7	0.8	0.427 – 1.515	0.499	0.74	0.342 – 1.583	0.433

were born weighing less than 2500 grams (6.8%). Of the 12 early neonatal deaths the birthweight was known for nine, four of which were low birthweight whereas of the nine late neonatal deaths the birthweight was known for eight, only one of which was low birthweight.

The results of the low birthweight analyses are shown in Table 1. The majority of the women were aged between 20-29 years and in a monogamous marriage. Over half of the women had none or very little education: 472 (41.1%) had no education at all and a further 118 (10.3%) only primary education. The men were better educated but still 288 (26%) had no education at all and 47 (4.2%) had only primary education. In this cohort only 25.4% of the women attended the antenatal clinic in the first trimester, and only 42.8% of the women attended the antenatal clinic four or more times. After multivariate analysis multigravidae were less likely to have a low birthweight baby than

a primigravidae (OR=0.47 [95%CI: 0.26-0.883]). The women who attended the antenatal clinic four times or more were also less likely to have a low birthweight baby than women who attended the antenatal clinic less frequently (OR=0.47 [95% CI: 0.273-0.799]). We monitored the birth weights of singleton babies born at the health centre after the cohort study had finished until December 2019 and continued to record an average of 7% singleton babies weighing less than 2500g a year.

After multivariate analysis multigravidae were less likely to have a low birthweight baby than a primigravidae (OR=0.47 [95%CI: 0.26-0.883]) and those women who attended the antenatal clinic four times or more were also less likely to have a low birthweight baby than those women who attended the antenatal clinic less frequently (OR=0.47 [95% CI: 0.273-0.799]).

Discussion

This study is one of the early cohort studies of birth outcomes from The Gambia, and was conducted in a small government-supported health facility located close to the largest urban centre, Serekunda. Over 600 women now attend the antenatal clinic for the first time every year. In this study every woman was recruited at her first visit. The study commenced in December 2012, with 1611 women entering the cohort at their first visit to the antenatal clinic and they were followed through pregnancy, delivery and the 28 days thereafter.

The exponential rise in mobile telephone access across the country coincided with the initial planning stage of the study and this is the first birth cohort study to use mobile telephone follow-up from The Gambia. The greatest risk in prospective studies is the rate of attrition, in this case between the participant's first visit to the antenatal clinic and the birth outcome. This was relatively low due to telephone follow-up which enabled the determination of the outcomes for the mothers who did not give birth at the health centre. Telephone follow-up also enabled determination of the outcomes at 7 days and 28 days, long after the mothers and babies had been discharged from the health centre[7].

In this cohort we have recorded the rates of stillbirths, early neonatal deaths, late neonatal deaths and low birthweights. As we knew the denominator, the number of women who entered the cohort, it was possible to accurately report the rate of stillbirths. It was also possible to distinguish, and count separately, the early neonatal deaths. In this study there were 32 perinatal deaths (20 stillbirths and 12 early neonatal deaths), a rate of 23.8/1000. There were only nine late neonatal deaths. The most common causes of stillbirths and early neonatal deaths (pre-partum and intrapartum complications, pre-term births, birth asphyxia and low birthweight) are all associated with the pregnancy, delivery and first few days of life. The common causes of late neonatal deaths (sepsis, pneumonia, diarrhoea and malaria) are not so closely associated with the pregnancy, delivery or the first few days. Presenting the outcomes separately, but in the same report, is rarely done and highlights the areas where timely intervention might reduce the adverse outcomes.

There is one other cohort study from The Gambia of 829 birth outcomes[8], commencing in 2013. This smaller study was not restricted to singleton births and did not report the number of early neonatal deaths separately although they reported 16 neonatal deaths overall. None the less, the two studies complement each other, the perinatal death rate in the study reported here is 23.8/1000 and 26.1/1000 in the smaller study.

A much larger study of birth outcomes from The Gambia was the retrospective Demographic and Health Survey from The Gambia[9] conducted between 2008 and 2013. The cohort spanned several regions, included 7900 pregnancies of 28 weeks or more and reported outcomes for both single and multiple pregnancies. The stillbirth rate was 11.1/1000 births over 28 weeks gestation. The stillbirth rate reported here, for singleton pregnancies, is 14.9/1000. The Demographic and Health Survey[9] also reported an overall perinatal death rate of 30/1000 births over 28 weeks. The corresponding perinatal death rate reported here, but restricted to singleton births, is 23.8/1000 births after gestation of 28 weeks.

Neonatal death rates in The Gambia are usually reported in much larger UN estimates or Demographic Surveillance studies. Early neonatal deaths are rarely mentioned separately and in the UN estimates are included with the neonatal deaths.

A comprehensive report of neonatal deaths from the UN Inter-Agency Group for Child Mortality Estimation suggested the 2016 rate of neonatal deaths in the Gambia to be 28/1000 live births[1]. The neonatal mortality in this cohort, again restricted to singleton pregnancies, was 19/1000 live births.

Country-wide neonatal mortality estimates are different from mortality rates recorded by a more local Demographic and Health Survey. The estimates will also differ according to the calendar period of the study as neonatal mortality has been falling during the years covered by the MDGs. The outcomes will also be influenced according to whether the study was conducted in a rural or urban area, and whether the study was conducted in a hospital or health centre. In addition, and only recently addressed in the literature, is whether the reported rates include twin births or are restricted to singleton births. Twins usually weigh less than singletons and have a higher neonatal mortality rate[6].

In an attempt to reduce deaths of both mothers and newborns the World Health Organisation, in 2001[10], published recommendations for pregnant women which included: first attendance to the antenatal clinic in the first trimester, at least four visits to the antenatal clinic and delivery with a trained midwife. In a previous publication, we have recorded compliance with these recommendations[11]. Only 24% of pregnant women attended during the first trimester, and 42% attended the antenatal clinic for four or more visits. Most of the women, 95 %, delivered with a skilled attendant, the majority at the health centre and most of the others at one of the local hospitals. Despite the WHO recommendations the rates of maternal and perinatal deaths remain high in sub-Saharan Africa.

In addition to reporting all the outcomes together, a cohort enables us to examine risk factors (recorded at the outset) for the outcome of interest, in this case low birthweight. We recorded potential risk factors for a low birthweight baby at the mother's first visit to the antenatal clinic or during the pregnancy prior to the birth and examined the effect of these risk factors, collected before the delivery, on the subsequent birthweight. Women who attended the antenatal clinic four times or more were less likely to have a low birthweight baby than women who attended the antenatal clinic less frequently.

No other prospective cohort study has reported an association between antenatal attendance and low birthweight, but a number of other studies have reported the association using cross-sectional or case control studies[12-17]. Although most of the studies did not distinguish between singletons and twins, some studies were done almost a decade ago, and the studies were from countries all over Africa, the risk factor mentioned most frequently to be associated with low birthweight was attending the antenatal clinic less than 4 times, or not at all[12- 17]. Other risk factors frequently reported associated with low birthweight were maternal education[12,15,16,18], poverty[19], primigravida[24,27] and being unmarried or being very young[23,28]. Low birthweight is closely associated with early neonatal deaths, but not with late neonatal deaths. In this study 44% of the early neonatal deaths with known birthweight weighed less than 2500g at birth. Of the nine late neonatal deaths only one weighed less than 2500g at birth.

The value of antenatal care at the heart of many evidence-based maternal and child health programmes cannot be overstated. Despite the WHO[10] recommending early and frequent visits to the antenatal clinic, poor attendance is the risk factor most often associated with insufficient uptake of antenatal care. In this study the women were recruited at their first visit to the antenatal clinic and were therefore representative of women who valued at least some antenatal care, but the majority of the women attended late and only just under a quarter of the women attended for the first time during the first trimester. This use of antenatal facilities reflects most urban pregnancies in The Gambia. The Gambia Bureau of Statistics[9] estimates that 98% of women attend an antenatal clinic at least once – but attending only once is not sufficient.

There are a number of reasons why pregnant women in The Gambia are reluctant to attend the antenatal clinic. In a previous study[22] we showed that intentional concealment of early pregnancy is common to avoid adverse social consequences or for fear that malign interventions would cause a miscarriage, and in the absence of symptoms many women consider it unnecessary to attend the antenatal clinic until well into the second

trimester. Towards the delivery, practical barriers to attendance, such as conflicting domestic demands, prevent some women to attend.

Recently we conducted a quantitative study to determine factors associated with compliance to the WHO recommendations for pregnant women: attending the antenatal clinic in the first trimester and attending the antenatal clinic at least four times[11]. Women with partners who had completed education levels beyond primary schooling were more likely to comply with the WHO recommendations than women with less educated husbands.

The WHO has worked tirelessly to improve the survival and well-being of newborn babies. A fact sheet released in 2020 states 'Women who receive midwife-led continuity of care, provided by professional midwives…. are less likely to lose their baby and less likely to experience pre-term birth'[23]. The study here reports rates of stillbirths, as well as early neonatal deaths. These perinatal deaths cause considerable anguish and some, although not all, could be prevented with improved antenatal care. In The Gambia almost all pregnant women attend an antenatal clinic at least once, but our quantitative studies, published previously[11], indicate that the WHO recommendations are not adhered to. We also report in this report that women who attend the antenatal clinic four times or more are less likely to have a low birthweight baby than women who attend the antenatal clinic infrequently, supporting the WHO recommendations and demonstrating that early and regular visits to the antenatal clinic are beneficial. If the WHO guidelines were adhered to during the pregnancy, delivery and the first week of life, many of the perinatal deaths might be prevented.

Ethical approval

Ethical approval was received in The Gambia from the combined Ethics Committee of the Medical Research Council and the Gambian Government. The Gambia Government/MRC Joint Ethics Committee SCC 1268v2 (21st February 2012). Each participant understood the nature of the study and a signed consent form was essential for inclusion in the study.

Conclusion

This is the first prospective cohort study of birth outcomes from the Gambia and, as well as reporting stillbirths, has distinguished between early and late neonatal deaths and therefore able to report perinatal deaths. Perinatal deaths are rarely reported separately but these are the babies who, with better care during pregnancy, delivery and the first week of life, might survive.

Mobile telephone follow-up has been essential to this study. Mobile telephone calls from the midwives were made if the mother did not deliver at the health centre, or if the baby was not seen at 7 or 28 days after delivery. Without telephone calls the only information about the delivery was from the health centre records as most of the women leave the health centre within a few hours of the delivery. Telephone calls were also made if the woman did not deliver at the health centre, or if the woman delivered at the health centre but was not seen at 7 days or 28 days after delivery.

Attendance at the antenatal clinic in the first trimester, and frequent visits thereafter, not only enables the early detection and treatment of existing complications such as anemia, hypertension, malaria and HIV-AIDS but also enables the detection of complications such as pre-eclampsia and breech presentation later in the pregnancy. Regular antenatal visits provide plenty of opportunities to receive general advice for a safe pregnancy.

In this paper we report that frequent visits to the antenatal clinic are associated with better outcomes: women who attend four or more times are less likely to have a low birthweight baby than women who come less frequently. We anticipate that improved uptake of antenatal care in countries such as The Gambia will, in turn, be associated with improved outcomes and prevent perinatal deaths.

Availability of data and material

The datasets used and analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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