Maternal and Fetal Characteristics in an Obstetric Cohort in Mozambique

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ABSTRACT

A sample of 908 Mozambican pregnant women with gestational age ≤ 21 weeks (as measured by ultrasound) were followed fortnightly from their first antenatal clinic visit until the end of the perinatal period. All women attended two suburban/semirural antenatal clinics in Maputo. Only 9% were lost to follow-up. Pre-term delivery occurred in 15.4% of women and low birthweight (LBW) in 16.2%. Mean birthweight was 2.91kg. Perinatal death occurred in 4.7%. This obstetric cohort provides valuable baseline data to be used as reference. With substantial efforts, the non-compliance with follow-up at birth could be kept at a low level. (*Afr J Reprod Health* 2000; 4 [1]:110-119)

RÉSUMÉ

Les caractéristiques fetales et maternelles chez une cohorte obstétrique. Un échantillon de 908 femmes mozambicaines enceintes ayant un âge gestationnel de 21 (comme l'a indiqué l'ultrason) ont été suivies à l'intervale de quinze jours dès leurs première visite antenatale jusqu'à la période périnatale. Toutes les femmes fréquentaient des clinques anténatales sub-urbaine/rurales situées à Maputo. Il n'y avait que 9% qui ont été perdues de vue. 15, 4% des femmes ont accouché avant terme alors que chez 16,2% il y a eu l'incidence de faible poids de naissance (FPN). Le poids de naissance moyen était 2,91kg. La mortalité périnatale a été enregistré chez 4,7% des femmes. Cette cohorte obstétrique fournit des données de ligne de base utiles qui peuvent servir de référence. Il sera possible de maintenir à un bas niveau la non-conformité à la surveillance à la naissance, si nous faisons beaucoup d'effort. (*Rev Afr Santé Reprod* 2000; 4 [1]:110-119).

KEY WORDS: *Cohort, maternal, fetal, obstetric, Mozambique*

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Introduction

In low-income countries, studies on maternal and neonatal health are predominantly hospital-based, while community-based studies are rare. Hospital-based studies on pregnant women are not prospective and cannot give information on pregnancy development in a representative sample of women in a community. The need for prospective pregnancy monitoring over time in such countries requires the establishment of obstetric cohorts, and identification of pregnancies as early as culture and tradition allow. Cohort studies are, however, difficult to follow up due to a number of circumstances such as social instability, migration and poverty. Few such studies on pregnant women have been carried out in low-income countries. In Pune District of India, Hirve et al[1] performed a study with the intention of following a representative sample of pregnant women. They were able to show that maternal socioeconomic status, pre-pregnancy weight, height and severe anaemia in pregnancy were risk factors for low birthweight (LBW) in the setting studied. A prospective study performed in Nigeria described the relationship between maternal weight gain during each trimester of pregnancy and birthweight.[2] Prospective, longitudinal studies have been used to study the interaction between socio-demographic factors, attitudes to pregnancy, women's mental health and lifestyle and how they contribute to the outcome of pregnancy.[3] In such study of a cohort of pregnant women in Mozambique, Liljestrand et al[4] managed to follow 84% until after birth and were able to show that 96% of women labeled as at-risk women had uneventful pregnancies. In a parallel study on maternal height, they concluded that maternal short stature is associated with an increased risk of perinatal mortality.[5]

In order to compensate for the paucity of data from obstetric cohorts in poor countries, this study was conducted to establish the feasibility of conducting such cohort studies in Mozambique. An obstetric cohort was created with the intention of providing baseline data for subsequent studies on maternal and neonatal outcome of pregnancy over time.

Subjects and Methods

Study Population

In Maputo City, more than 80% of pregnant women are enrolled at 16 antenatal clinics. Two such clinics, Malhangalene and Primeiro de Maio, both predominantly suburban/semirural, were selected for the study. In Malhangalene, an average of 30 antenatal clients is seen everyday, while the corresponding number in Primeiro de Maio is 25. In both clinics a research unit was established, where training of the nurses/midwives was undertaken in all parameters of antenatal care, from booking until follow-up at the end of the perinatal period. It was necessary to train special staff who would conduct home visits to retrieve dropout women who did not return after delivery. Portable ultrasound equipment was made available in both clinics. From October 1993 to November 1994, 908 pregnant women were enrolled in this cohort. The deliveries occurred until March 1995.

Inclusion criteria

All pregnant women coming to these antenatal clinics for the first time with gestational age below or equal to 21 weeks — as estimated by ultrasound measurement of the biparietal diameter — were invited to participate on a consecutive basis.

Exclusion criteria

Those with gestational age above 21 weeks, multiple pregnancy and women without clear addresses were excluded form the study.

Pilot study

A pilot study of 50 cases was performed before the beginning of the main study. During this phase, the midwives were trained in all study parameters in order to foresee logistic and other problems. It was concluded that mothers' compliance to required follow-up visits at the health centres would be a problem. In order to ensure required patient compliance, a system of incentives was introduced to reduce the risk of loss to follow-up. All women were encouraged to come on the 7th day after delivery with the baby. A blanket was given as compensation for participation. Incentives were also given to the midwives for each completed case in order to increase their motivation.

Cohort Compliance and Follow-up

At the first antenatal visit, all enrolled women were given a specially prepared red antenatal card with instructions motivating them to deliver at the

Maputo Central Hospital. On this card, the following parameters were obtained: last menstrual period, weight, height, mid-upper-arm circumference (MUAC), BMI, symphysis-fundus distance (SFD), blood pressure and fetal biparietal diameter (BPD), measured by ultrasound. A complementary questionnaire regarding socioeconomic factors was utilised, and a referral note to the laboratory for haemoglobin determination, VDRL test for syphilis, and malaria test was given to each woman.

High-risk women were defined as those who have had one or more of the following factors: previous birth using forceps or vacuum extractor, haemorrhage at more than 2 previous births, manual removal of placenta at more than 2 births or nullipara height below 1.5m. Others are nullipara age below 16 years, age above 35 years, more than 5 previous births, most recent delivery a stillbirth, recent neonatal death, two or more previous spontaneous abortions or stillbirths, previous newborn's weight more than 4.0kg, hypertension or edema in previous gestations, or convulsions in previous gestation.

At subsequent antenatal visits, particular attention was paid to the SFD measurements[a)]* and to various risk factors for adverse pregnancy outcome[b)]**. In addition, the fetal heart rate was checked and other normal antenatal care routines were followed. The objective was to have one visit every fortnight. For practical reasons, this was not possible for all, and some mothers came at intervals of three weeks and a few at intervals of four weeks.

At delivery, precautions were taken to recognise the red antenatal card and to register birth weight, placental weight and Apgar score. Maternal blood samples were drawn for malaria parasitaemia and serology before delivery. Cord blood specimens for serological tests were also taken.

The newborns were observed again on the seventh day postpartum. All mothers were informed about the objectives of the study and the need for them to return on the seventh day postpartum with the baby and the antenatal card. One problem was the group of women not delivering at the Central Hospital. Antenatal clinic midwives were asked to draw blood for malaria and serological tests if they appeared within seven days after delivery. This group constituted 12% of the cohort.

Of the 908 women enrolled, 9% were lost to follow-up after delivery. Approximately 140 home visits were made in order to trace women not complying with required postpartum follow-up visits. If home visits failed, appeals were made on the local radio, and local authorities were contacted in order to find them. We succeeded in finding about 70% of those not appearing in the Maputo Central Hospital for delivery.

Statistical Methods

The statistical analyses were performed with *SPSS* and *Epi-Info* software.

Ethical Issues

After receiving information regarding the aims and practical performance of the study, all women were asked to give oral consent or to refuse to participate. Only after this procedure were they enrolled in the study. All women invited to participate were assured that refusal to participate would not influence, in any way, antenatal and delivery care to be received. The study had the acceptance of the ethical committees at the Central Hospital, the Ministry of Health, the Medical Faculty at Eduardo Mondlane University in Maputo, and Karolinska Institutet.

Results

The mean age in the cohort was 23.4 years and the age distribution is presented in Table 1. Maternal mean weight at the first antenatal visit was 58.6kg. Of retrieved women in this cohort, 9% gained less than 1kg during pregnancy, whereas 12.5% gained more than 10kg. The mean height was 1.59m, the mean BMI 22.9 and the mean MUAC 26.2cm. An increase of more than 10mmHg of the diastolic blood pressure from first antenatal visit until delivery was encountered in 7.2% of these women.

The maternal socioeconomic characteristics are presented in Table 2. In this setting, only 1.9% of

* a)Challis et al, unpublished

** b) Bique Osman et al, unpublished

the cohort population smoked and 5.2% drank alcohol. In the cohort, 12.6% had never been to school. The mean household size was 6 and only 21% were employed. Being married referred not only to formal marriage but also to cohabitation. Together, both categories constitute the majority of this cohort (72.3%).

Obstetric histories are presented in Table 3. Nulliparous women constituted 41.7% of the cohort. Of those who had at least one previous pregnancy, 9.5 had previous stillbirth and 6.3% had previous caesarian sections.

Table 1 **Physical Characteristics of an Obstetric Cohort of 908 Mozambican Women**

Item	Data retrieved[a]		Missing data		Mean
	No.	%	No.	%	
Age (yr.)	897	98.8	11	1.2	23.4
≤19	305	34.0			
20–34	537	59.9			
≥ 35	55	6.1			
Weight (kg)	899	99.09	9	1.0	58.6
< 49	82	9.1			
49–69	733	81.5			
> 69	84	9.4			
Height (m)	887	97.7	21	2.3	1.59
1.35–1.51	75	8.5			
1.52–1.67	716	80.7			
1.68–1.87	96	10.8			
MUAC (cm)	872	96.0	36	4.0	26.2
< 23	43	4.9			
23–28	689	79.0			
> 28	140	16.1			
BMI	880	96.9	28	3.1	22.9
< 18.5	52	5.9			
18.5–26.5	730	83.0			
> 26.5	98	11.1			
Weight gain (kg)	831	91.5	77	8.5	7.8
< 1	75	9.0			
1–10.9	652	78.5			
> 10.9	104	12.5			
Increase in diastolic BP (mmHg)	829	91.3	79	8.7	6.0
0–10	769	92.8			
< 10	60	7.2			

[a]*The distribution of values (outcomes) within each item is presented as percentages of the number of women, from whom data were retrieved; this concerns Tables 1–6.*

Risk scoring in current pregnancy according to the national antenatal card is presented in Table 4. High risk scoring occurred in 18.9% of the cohort population. The mean number of antenatal visits was 7.8, which is artificially high, as all women were asked to return every two to three weeks for symphysis-fundus measurement. The mean haemoglobin level at antenatal enrolment was 11g/L. Logistic problems made malaria testing to fail in 10.4% at first visit and 32.4% at delivery. Similar problems made VDRL testing inconclusive. The caesarian section rate in the cohort population was 6.8% (Table 5).

Two-thirds of the women knew their last menstrual period (LMP). For inclusion reasons the gestational age was estimated by fetal BPD measurement. The correlation was fairly good; LMP on average indicating one week more advanced gestational age than calculated by ultrasound measurement.

Table 2 **Socioeconomic Characteristics of an Obstetric Cohort of 908 Mozambican Women**

Item	Data retrieved[a]		Missing data		Mean
	No.	%	No.	%	
Smoking	899	99.0	9	1.0	
Smoker	17	1.9			
Alcohol	899	99.0	9	1.0	
Drinker	47	5.2			
Education (yr.)	881	97.0	27	3.0	4.5
0	111	12.6			
1–6	584	66.3			
≥ 7	186	21.1			
Housing	896	98.7	12	1.3	
Hut	270	30.1			
Other	626	69.9			
Individuals per household (no.)	893	98.3	15	1.7	6.0
0–9	794	88.9			
≥ 10	99	11.1			
Employment	898	98.9	10	1.1	
Housewife	709	79.0			
Employed	189	21.0			
Marital status	900	99.1	8	0.9	
Unmarried	249	27.7			
Married	651	72.3			
Latrine	897	98.8	11	1.3	
Yes	823	91.8			
Electricity	900	99.1	8	0.9	
Yes	342	38.0			

[a] *See footnote in Table 1.*

Pre-term delivery occurred in 15.4% and LBW in 16.2%. There was one case of maternal death 10 days after a normal delivery due to high fever and sudden coma and death at home. She was a 17-year-old single woman in her first pregnancy, delivering a male newborn, 2.8kg, Apgar 10, who was healthy in the perinatal period.

Newborn characteristics are presented in Table 6. The mean birthweight was 2.91kg. Perinatal death occurred in 4.7% of the cohort women while 4% were stillborn. Congenital malformations were recognised in 0.5%

Table 3 **Obstetric History of an Obstetric Cohort of 908 Mozambican Women**

Item	Data retrieved[a]		Missing data		Mean
	No.	%	No.	%	
Gravidity	899	99.0	9	1.0	2.8
1	348	38.7			
2-6	493	54.8			
≥ 7	58	6.5			
Parity	898	98.9	10	1.1	1.6
0	374	41.7			
1–5	477	53.1			
≥ 6	47	5.2			
Children alive[b]	513	97.9	11	2.1	1.3
0	35	6.8			
1–5	449	87.5			
≥ 6	29	5.7			
Previous stillbirth[b]	514	98.1	10	1.9	
Yes	49	9.5			
Previous Caesarian[b]	507	96.8	17	3.2	
Yes	32	6.3			
Age at first delivery[b]	493	94.1	31	5.9	18.4
< 16	55	11.2			
16–21	384	77.9			
> 21	54	10.9			

[a]*See footnote in Table 1.*

[b]*Refers only to women with at least one previous delivery.*

Table 4 **Current Pregnancy of an Obstetric Cohort of 908 Mozambican Women**

Item	Data retrieved[a]		Missing data		Mean
	No.	%	No.	%	
Alleged risk factor	892	98.2	16	1.8	
High risk	169	18.9			
Low risk	723	81.1			
Antenatal visits	838	92.3	70	7.7	7.8[b]
> 6	128	15.3			
6–10	625	74.6			
≥ 11	85	10.1			
Haemoglobin (g/l)	816	89.9	92	10.1	11
> 10	32	3.9			
≥ 10	784	96.1			
Malaria (first visit)	814	89.6	94	10.4	
Positive	36	4.4			
Malaria (at delivery)	614	67.6	294	32.4	
Positive	37	6.0			
VDRL (first visit)	378	41.6	530	58.4	
Positive	41	10.8			
VDRL (at delivery)	328	36.1	580	63.9	
Positive	13	4.0			

[a] *See footnote in Table 1.*
[b] *It should be noted that cohort women were asked to return every two to three weeks for symphysis-fundus distance measurement.*

Table 5 **Pregnancy Outcome of an Obstetric Cohort of 908 Mozambican Women**

Item	Data retrieved[a]		Missing data		Mean
	No.	%	No.	%	
Delivery	835	92.0	73	8.0	
Normal	774	92.7			
Vacuum extraction	4	0.5			
Caesarian section	57	6.8			
Gestational age at delivery (wk.)	832	91.6	76	8.4	38.14
Pre-term (> 37)	128	15.4			
Term (37–42)	676	81.2			
Post-term (< 42)	28	3.4			
Placental weight (g)	610	67.2	298	32.8	482
< 320	61	10.0			
320–640	480	78.7			
< 640	69	11.3			
Maternal death	1				

[a] *See footnote in Table 1.*

Table 6 **Fetal/Newborn Characteristics of an Obstetric Cohort of 908 Mozambican Women**

Item	Data retrieved[a]		Missing data		Mean
	No.	%	No.	%	
Birthweight (kg)	821	90.4	87	9.6	2.9
< 1.0	16	1.9			
1.0–2.5	117	14.3			
≥ 2.5	688	83.8			
Sex	820	90.3	88	9.7	
Male	413	50.4			
Fetus	835	92.0	73	8.0	
Abortion	15	1.8			
Stillborn	35	4.2			
Perinatal mortality	831	91.5	77	8.5	
Yes	39	4.7			
Fetal growth	817	90.0	91	10.0	
SGA	79	9.7			
AGA	657	80.4			
LGA	81	9.9			
Newborn Malformation	795	87.6	113	12.4	
Yes	4	0.5			
New-born infection	797	87.8	111	12.2	
Yes	18	2.3			

[a]*See footnote in Table 1.*

Discussion

Establishment of an obstetric cohort of 908 antenatal attendees in a semi-rural/semi-urban setting in Mozambique was analysed with emphasis on the logistics of enhancing compliance and reducing patient loss. This study has shown that it is possible to recruit an obstetric cohort at the primary care level and follow its women through pregnancy and birth in a poverty-stricken setting.

Compliance was hampered by the fact that women in the setting frequently changed their residence and moved from one clinic to another. Since one of the principal objectives was to establish an SFD graph with frequent SFD measurements, it was necessary to introduce incentives. It may be considered ethically controversial to remunerate poor pregnant women for returning for repeated obstetric observation. Pilot experiences had, however, indicated that remuneration was a prerequisite for minimum compliance. In spite of all efforts, our dropout rate at delivery was 8%. The dropout was even higher for laboratory results, especially for VDRL tests due to shortage of reagents at clin-

ics but also due to the difficulty in maintaining accurate quality in all antenatal visits.

In a population-based prospective cohort study in Sweden by Håkansson et al[6], the dropout rate was 4.6% in a cohort of 444 pregnant women. In Guatemala, the corresponding rate was 3.7% in a prospective follow-up study of 15,786 pregnant women.[7] A prospective study in the USA by Hickey et al in a cohort of 19,988 pregnant women had a dropout rate of between 1.4% and 19.5% in different variables.[8] In a prospective study of 1,860 pregnant women in London, the dropout rate was 11.3%.[9]

The dropout problem requires culture-specific measures to limit losses to follow-up. In the current study, antenatal health care staff were sent for home visits to look for the mothers who did not come back after delivery. Frequently, they had moved to another address, which made them difficult to trace by the mobile teams. If home visits failed the local radio and local authorities were contacted. By such efforts we succeeded in finding about 70% of defaulters.

The age distribution in this cohort is similar to the one described in a national survey,[4] in which the mean age was 25 years. Our mean was 23.4 years. The mean height, 159cm, is the same with that of a previous study.[5] In comparison with women in other African settings, women in the study setting were slightly taller than the ones from various areas in Kenya (154cm),[10] Tanzania (157cm),[11] Egypt (155cm)[10] and Nigeria (157cm)[2]. The mean BMI was closer to that of a Kenyan (21.2)[10] than to that of an Egyptian study (25.3)[10].

The schooling pattern may have changed over the last decade. In the study referred to above,[4] 41% of a national sample in the early 1980s were without schooling. In this cohort, 12.6% were without schooling. Even if these samples are not directly comparable, previous figures for Maputo ANCs indicate significantly lower average schooling.[4]

Smoking and alcohol are not significant problems among pregnant women in the study setting when compared with industrialised countries.[6,9] The average household size described in the study by Liljestrand et al[4] was 5.2, which is close to that in the current cohort.[9] In our cohort, there were more nulliparas than in the previous study, which can be explained by the exclusion criteria. Multiparous women have a tendency to book late, and some of them were excluded if their gestational age was over 21 weeks. The bias introduced by our study design (early booking to allow for ultrasound dating) implicitly means under-representation of multiparous women. Our proportion of nulliparous is similar to the Swedish population (41.5%).[6] In a Nigerian study,[2] 27.6% were nullipara.

The prevalence of pre-term delivery in this study was 15.4%, which is higher than that in other settings. A multicentre trial of pre-term birth prevention in different geographic areas in the USA described pre-term delivery prevalence rates of 10.3% in black, 7.3% in white and 4.8% in Hispanic women.[8] In a Swedish cohort study, there were 7.1% pre-term births.[6]

In this cohort, the mean birthweight was 2.9kg and the LBW proportion was 16.2%. In rural Tanzania, a hospital-based study found 14% of LBW.[11] A study done in Vietnam showed the LBW prevalence of between 7.9% and 12.5% in different areas.[12] In India, the LBW proportion was 29% in Pune District.[1] In the Swedish cohort referred to,[6] only 7% had LBW.

In conclusion, much valuable obstetric information can be obtained in low-income countries by establishing cohorts of pregnant women and following them until birth. The logistic hurdles to enhance compliance over time and to reduce final loss are substantial but possible to overcome.

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