A Prospective Area-based Study of the Outcome of Pregnancy in Rural Tanzania

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ABSTRACT

A prospective area-based study on the outcome of pregnancy was carried out in the rural village of Ilula in Tanzania. A coverage of 99% (n=719) regarding the ultimate outcome for mother and child was achieved, including deliveries that took place in hospital (9%), at the dispensary (67%) and at home (23%). There were four maternal deaths (6/1,000). The mean birth weight for singletons was 3,070 g and the low birth weight (<2,500 g) rate 13%. From a gestational age of 37 weeks onwards there was a definite slowing of fetal growth. Perinatal mortality rate was 82 per 1,000 born, half of the deaths occurring in low birth weight babies. Twinning occurred in 3.5% and the mean length of gestation at delivery for these pregnancies was 35.5 weeks. Twins constituted 6.8% of newborns but accounted for 23.0% of perinatal losses, making twin pregnancy a major contributor to perinatal mortality. Post-term pregnancies carried no significant increase in mortality. It is concluded that reliable area-based data on the outcome of pregnancy in Tanzania can be obtained at village level, with good coverage of the study population, by properly instructed and motivated local staff with moderate supervisory support.

INTRODUCTION

In obstetric and perinatal epidemiology it is unusual outside the affluent industrialized countries to obtain data from geographically well defined areas. Information regarding obstetric outcome in developing countries is generally based on hospital records. In most of these countries hospital care facilities are limited and are used mainly by selected segments of the population and by patients referred from rural areas.

Such hospital-based data can therefore only be generalized to a limited extent. In the Declaration of Monastir (3), the need for more complete and precise collection of reliable epidemiological data from non-hospital-based populations was emphasized.

The present report is part of a comprehensive investigation aimed at obtaining basic knowledge of factors influencing the course and outcome of pregnancy in a geographically defined rural area in Tanzania, and at studying the effect of the existing antenatal care (ANC) programme on the outcome of pregnancy and the survival of the infant. In this paper the basic design of the study and the main outcome variables of pregnancy are described and discussed.

MATERIALS AND METHODS

The study was conducted in the village of Ilula in Iringa district, Tanzania. The study area was carefully chosen in order to represent a situation typical of many other areas in Tanzania (18). Telephone and electricity are not available in the village. Buses run daily to Iringa town, 47 km away.

The mother and child health care (MCH) and delivery services are run by 2 village midwives under the supervision of a rural medical aide (RMA) at the Lutheran dispensary. Village midwives have had 7 years in primary school followed by on the job training and a 9-month MCH-aide course, and RMAs 3 years of medical and public health training. Doctors and facilities for obstetric operations are available in Iringa.

All pregnant women living in Isere and Mtua villages, henceforth referred to as Ilula, were entered consecutively into the study log-book at delivery (the first 34 women), or when registering for antenatal care (all subsequent women). All were to be interviewed by the female field worker after delivery within 48 hours, at one week and in some cases at 6 weeks. The questionnaires included information about the mother's social and medical history, obstetric history, pregnancy and delivery complications. Through strong community co-operation, we feel confident that we obtained over 99% coverage of pregnancies beyond 28 weeks of gestation.

The collection of data started on June 13, 1983. All deliveries from that day onwards were included. Women included in this report are those registred at ANC up to November 13, 1985, all of whom were delivered by June 2, 1986. For cases
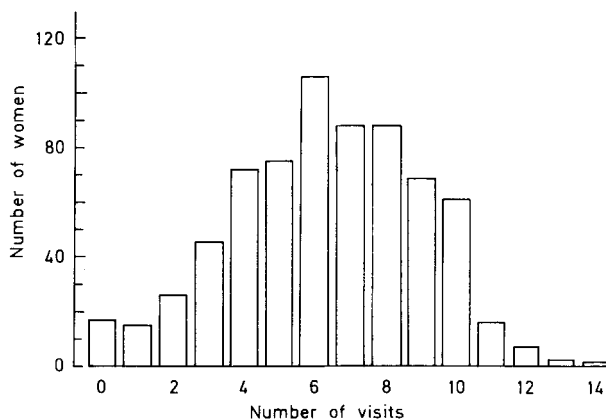
referred to hospital - the Iringa Regional Hospital - and for
follow-up of high-risk children, information was supplemented
through enquiries by the field worker after that time.

The date of the last menstrual period (LMP) for the
calculation of the expected date of delivery was obtained from
the antenatal card and checked against statements in the
questionnaire. Also, the mothers were asked about the
"certainty" of their dates and categorized as certain,
uncertain, no period before pregnancy, or ignorant.

Infants delivered at the dispensary were weighed on a
stationary balance scale. Some babies delivered at home were
weighed on a simple, less accurate spring scale, and these
readings tended to cluster around the nearest 500 g value. Low
birth weight (LBW) infants are those with a birth weight of
1,000 to 2,499 g. The classification into livebirths and
stillbirths was made by the midwife.

RESULTS

Coverage and antenatal clinic attendance - Out of 724 registered
women, 5 could not be traced. Sevenhundred and seven had
pregnancies that went beyond 28 completed weeks or resulted in
an infant with a birth weight of 1,000 g or more.
Questionnaires were available for 682 cases, but in a number of
instances they were not complete, e.g. the birth weight was not
known in 61 cases. Knowledge of the ultimate outcome of the
pregnancy was obtained in all cases for the 707 deliveries. Of
the 707 delivered women, only one negated antenatal care. The
average number of visits was 6.3 per pregnancy, with a range
from 0 to 14 (Fig 1).

Fig. 1. Antenatal care attendance of Ilula mothers. "0" indicates no visits (n=1) or an unknown number of visits (n=16).

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Place of delivery - Of the 707 deliveries, 68% took place at the Ilula dispensary, 23% at home and 9% in the Iringa Regional Hospital. Of the women who delivered at home, 45% stated that they did so of their own choice, 40% because they did not leave for the dispensary early enough in labour, and 15% for various other reasons.

Gestational age - LMP was reported as certain by 52% of the women while 35% stated the LMP within 10-14 days. A mean gestational age at delivery for singletons of 39.5 (SD 2.4) weeks was found in the "certain LMP" group. For all singleton pregnancies, including women who were uncertain about their LMP but gave a date, it was 39.4 (SD 2.6) weeks. Of the simplex deliveries (Fig. 2), 16% were preterm. In twin pregnancies the mean gestational age at delivery was 35.5 (SD 3.2) weeks.
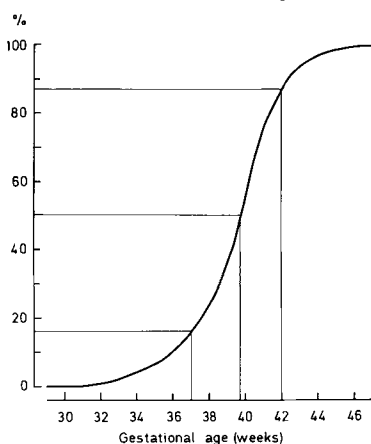
Fig. 2.
Distribution of gestational age at delivery. 16% of deliveries were preterm, 13 "post-term".

Maternal deaths - There were 4 maternal deaths (6/1,000), 2 from postpartum haemmorrhage, one from uterine rupture in a woman who had previously had a Caesarean section, and one death from septic complications after a Caesarean section.

Table 1. Births and perinatal deaths by birth weight for singletons and twins births. (Ilula, Tanzania 1983-86. n=707). (PMR=perinatal mortality rate; SB=stillborn; END=early neonatal deaths [within 1 week]). For comments on the group "not weighed", see text.

Birth weight	S I N G L E			T W I N S			A L L			
	Births	Deaths	PMR rate per 1,000	Born	Deaths	PMR rate per 1,000	Born	Deaths SB	END	PMR rate per 1,000
1,000-1,999	15	10	660	12	7	580	27	6	11	630
2,000-2,499	27	3	111	21	5	240	48	1	7	170
2,500-5,000	583	14	24	13	0	0	596	10	4	24
Not weighed	57	19	333	4	2	500	61	14	7	344
All	682	46	67	50	14	280	732	31	29	82

Perinatal mortality - As shown in Table 1, the perinatal mortality rate (PMR) in singleton pregnancies was 67 per 1,000 and in twin pregnancies 280 per 1,000 born children. Total PMR was 82. Twins constituted 6.6% of newborns but 23% of the perinatal deaths. Estimation of the true PMR relative to birth weight is hampered by the frequent reluctancy to weigh a dead child. Table 1 shows birth weight specific mortality with unweighed infants separately. In the 1,000-1,999 g group another 4 infants died between the ages of one and 6 weeks, giving a cumulative mortality of 78% at 6 weeks. In the 2,000 to 2,499 group, 8 of 48 were dead at one week and 3 more at follow-up at 6 weeks, bringing the losses to 23% at that time. Follow-up at 6 months of all liveborn with a birth weight of 2,500 g or less revealed 2 more deaths, one at 3 and one at 5 months. Of all deliveries, 13% took place after 42 completed weeks. PMR in this group was 50 per 1000, as compared with 40 in women delivered after 37-41 completed weeks.

	Primipara	Parous	All women
Girls	2,723	2,974	2,931
Boys	2,955	3,104	3,075
Total	2,869	3,044	3,011

Table 2. Mean birth weight of newborns by sex and maternal parity. Twins included.

Birth weight - The birth weight in relation to the parity of the mother and the sex of the child is given in Table 2. Fig. 3 shows the birth weight distribution for singleton babies. The mean birth weight of singleton newborns was 3,070 (SD 485) g.
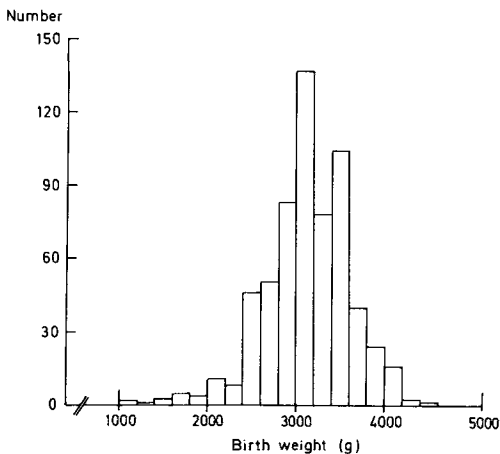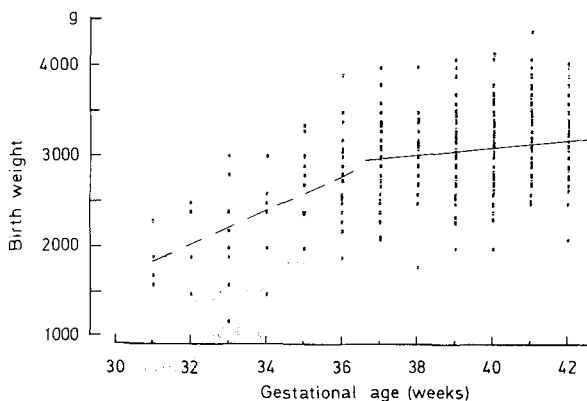

Fig. 3. Birth weight distribution among 615 singleton deliveries.

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Taking into account the effect of the clustering of weight readings to the nearest 500 g and the fact that some of the 61 unweighed children undoubtedly were LBW, the rate of LBW infants was estimated to be 13 per cent.

Fig. 4. Birth weight by gestational age in 522 singleton deliveries. Lines indicate best fit for linear regressions.

In Figure 4 the birth weight for gestational age is plotted for 522 cases with a known date of LMP. Observations before 37 weeks of pregnancy are few. Linear regression for this period showed a mean increase in birth weight near 0.2 kg per week. Towards the end of pregnancy there was a markedly slower increase in mean birth weight, in total about 0.25 kg during the five weeks from 37 to 42 weeks, or 50 g/week.

DISCUSSION

The study area represents a rural area. Its development is probably above the average for rural Tanzania in some respects, such as communication and education, but nevertheless the Ilula situation is representative of many areas in Tanzania.

As is often the case in Tanzanian health institutions, medical supplies are frequently inadequate, emergency transport is sometimes not available and the referral centre is hard pressed for resources (8,19). This clinic was judged to be in a better category, well organized and esteemed by the local society. At the time of the study the registration rate for antenatal care in the Iringa region was judged to be 97% by the Ministry of Health (8). This is much higher than is reported from villages covered by mobile services (15) and also above the national estimate of 95% registration. The mean number of visits was 6.3, which is above the national mean of 4.3 visits.

Although numbers in this study are small, the case histories for the maternal deaths are typical (4,10). They suggest that hospital-based reports on maternal mortality in developing countries, including Tanzania, do not exaggerate the situation (7,11,16) even when they include many referred cases.

At 82 per 1,000 born, the perinatal mortality rate is over ten-fold that of Sweden. In Table 3, data available for one area in west Africa, for Saudi Arabia and for Sweden are shown.

Table 3. Comparison of some common measures of the outcome of pregnancy in Ilula, two other developing countries, and Sweden. Missing data = -, PMR = perinatal mortality rate, LBW = low birth weight.

Area Ref	Year	PMR	Mean birth weight	LBW rate	Twin rate	Sex ratio M/F	Primi-para rate	Maternal mortality /100,000
Ilula [13]	1985	82	3,011 g	13%	3.5%	119	16%	600
Abijan [14]	1975	-	2,953 g	19%	2.0%	102	25%	-
Riyadh [20]	1985	40	3,226 g	9%	1.1%	102	19%	21
Sweden	1984	7	3,500 g	4%	1.0%	106	41%	2

Economic conditions are reflected in the perinatal mortality rates. It can be seen that there are differences in the proportions of primigravidae and in the rates of twins and low birth weight infants, factors that all influence the perinatal mortality rate.

The distribution of birth weights in Ilula is similar to that reported from previous studies (1), and shows a shift to the left of 500 g when compared, for example with Swedish material (20). Low birth weight occurs three times as often in Ilula as in Sweden, and in the face of prevailing conditions, is a major determinant of perinatal mortality.

Knowledge of the very high perinatal mortality rate for the smallest infants in the rural areas is important as a reference when judging results of different forms of care for these infants. The high twinning rate, one in thirty pregnancies, as is also found in other reports from Africa (7,12), contributed heavily both to prematurity and to perinatal mortality. Identification of twin pregnancies and development of appropriate methods for the care of low birth weight infants,

also at primary levels of care, should be a priority in a strategy for better perinatal survival.

Information on the last menstrual period is the best estimate of gestational age in the foreseeable future (5), but it has to be realized that it leads to a falsely increased number of pregnancies classified as postterm, i.e. after 42 full weeks. Recent studies (2) indicate that expectant management of post-term pregnancy is as safe as induction of labour in these women. Postterm pregnancy does not seem to be of clinical importance as a risk factor for adverse perinatal outcome, as is also indicated from our data.

In singleton pregnancy birth weight for gestational age under optimal conditions increases in a linear fashion (17). In our material there is a levelling off of growth after 36 weeks of gestation. This slowing of fetal growth, which has also been found in other studies (6,9), is pronounced and probably cannot be ascribed entirely to inaccurate determination of gestational age, but seems to be real and a sign of less than optimal conditions for fetal growth.

In developing countries, where a large proportion of births take place at home or in small rural institutions, area-based studies with full coverage of the pregnant population are necessary to relate the outcome in the rural areas to the outcome in hospitals. Prospective area-based studies are also needed for general and detailed health planning (3). Possibly the most important experience from this investigation is that such studies can be implemented in rural areas with the help of properly instructed, trained local health personnel who are given the support of the political infrastructure.

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