Original article

Infant survivorship and occurrence of multiplebirths: A longitudinal community-based study, south west Ethiopia

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Abstract: A one year live-birth cohort was studied in 46 urban and 64 rural 'kebeles' in south-west Ethiopia, in 1992-94. In order to recruit all live-births in each of the study kebeles, pregnant women were identified in their second trimester and monitored by trained TBAs and enumerators using house to house visit. Each infant-mother pair of the cohort was visited soon after birth followed by regular bimonthly visit to the end of their first year or to an earlier death. Infant mortality was calculated as a life tables estimate using the 'survival' programme in SPSS. There were a total of 8162 births (8050 singletons, 111 twins and one set of triplets) of which 856 died, indicating an infant mortality of 104.8/1000 (estimated probability of surviving to 1 year 0.8952, with s.e. 0.004). The occurrence of multiple-births was 13.6/1000 live births. The infant mortality among them was 446.8/1000 (estimated probability of surviving to 364 days .5532, with s.e. 0.0034). This is a matter of serious concern. This study is the first of its kind based on rigorous study design, bigger sample size comprising different population groups and wider areas. The findings could help to formulate policy and health care programmes. [*Ethiop. J. Health Dev.* 1997;11(3):283-288]

Introduction

Vital events registration is non-existent in Ethiopia (1, 2). In such settings, a longitudinal community-based study is needed to generate sound data for formulation of policy and health care programmes. The scanty data available on infant survivorship in the country are mainly based on the preceding 12 months recall period which could lead to bias due to omissions and vaguely defined recall period (1, 3-6). New-born deaths are not reported due to local taboos (1, 7). Reports on the occurrence of multiple-births and survivorship in the country are based on hospital data (8, 9).

In order to generate a reliable data, a community-based prospective follow-up study of live-birth cohorts which incorporates Jimma, Illubabor, and Keffecho administrative zones in South-West Ethiopia was undertaken.

Methods

This study was conducted in 46 urban and 65 rural 'kebeles', with an estimated population of 300,200 in the administrative zones of Jimma, Illubabor, and Keffecho, South-West Ethiopia in 1992-94. Figure 1 shows the sketch map of the study area. The altitude of the study kebeles ranges from 1500 m to just below 2000m. The area's main crops include maize, sorghum and coffee. Trained enumerators and TBAs identify expectant mothers in their second trimester by house to house visits in their respective catchment kebeles. In order to identify all live-births, all the traditional birth attendants (TBAs) in the above mentioned kebeles were involved in the field-work. TBAs are women residents of the kebele they serve and by tradition they visit and assist women during pregnancy and delivery. The

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TBAs had easy access to women in the fertile age group, and were able to assess their pregnancy status. Each TBA was given responsibility for about 300 houses, and went house to house regularly to locate pregnant women in their second trimester. The TBA reported daily in person to the enumerator responsible for her kebele. For each three kebeles one high school completed girl enumerator was assigned. The enumerator registered the address of the expectant mother. After registration both the TBA and the enumerator monitored the expectant mother so as to reach her on time soon after delivery. For each three or more enumerators one supervisor (mainly nurses) was assigned who checked and supported data collection. In each kebele all one year live-birth cohorts were recruited for this study and followed for one year from 1992 to 1994. Data collection was made at birth, on infants anthropometric and mothers socio-economic variables. Then regular follow-up was made bimonthly until their first birthday or to an earlier death. Information was also gathered from mothers, key informants on their views about multiple births. Two high school completed students were trained for computer data entry and two statisticians were responsible for data processing and analysis. Data were entered daily, so as to allow fast feedback for quality control procedures. Details of the study methodology have been given elsewhere (10).

Results

In this study a total of 8162 deliveries (8050 singletons and 111 twins, one set of triplets) were recruited in one year period in the study areas. The overall incidence of multiple-births was 13.6 per thousand deliveries. The incidence for twins and triplets was 13.5 and 0.12 per thousand deliveries, respectively. By the end of the one year follow-up 450 infants were known to have moved out of the study area, 40 infants were withdrawn from the study by their mothers, 106 infants were lost for follow-up and 856 infants have died. Of 8275 infants about 92.8% were successfully followed up to their first birthday or to an earlier death. Infant mortality was calculated as life tables estimates using the survival program in SPSS/PC+ (11) and presented in Tables 1 and 2. For singletons it was

Table 1: **Infant Mortality Rate per 1000 live - births by Age (in days), Birth Type and Sex**

Age	Si ngle			Multiple			All Birth	
	Male	Female	Both	Male	Female	Both	male	Female
7	14.0	12.2	13.1	151.5	169.4	161.4	17.2	17.0
28	29.6	22.7	26.2	222.2	233.9	228.7	34.1	29.2
90	53.3	43.9	48.7	333.3	282.3	304.9	60.0	51.2
180	74.7	61.2	68.0	394.3	347.9	368.5	82.3	70.0
364	103.7	86.6	95.3	477.8	417.9	446.8	112.8	96.8

95.3/1000 live-births (estimated probability of surviving to 364 days .9047, with s.e. 0.003). For multiple-births it was 446.8/1000 live-births (estimated probability of surviving to 364 days .5532, with s.e. 0.034). Mortality rate was higher for males (103.7 and 477.8) compared with females (86.6 and 417.9) for singletons and multiple-births. For all types of births, infant mortality rate for the whole study area was 104.8/1000 (estimated probability of surviving to 364 days .8952, with s.e. 0.004). It was 96.1/100 (estimated probability of surviving to 364 days .9039, with se. 0.005) for urban and 112.5/100)estimated probability

Table 2: **Infant Mortality Rate per 1000 live-births at Different ages at Urban and Rural Settings**

Age (in days)	Rural		Urban		Total	
	p	q	p	q	p	q
7	.9814	18.6	.9846	15.4	.9829	17.1

	(.002)		(.002)		(.001)	
28	.9643	35.7	.9730	26.0	.9683	31.7
	(.003)		(.003)		(.002)	
120	.9269	73.1	.9465	53.5	.9358	64.2
	(.004)		(.004)		(.003)	
180	.9137	86.3	.9360	64.0	.9238	76.2
	(.004)		(.004)		(.003)	
364	.8875	112.5	.9039	96.1	.8952	104.8
	(.005)		(.005)		(.003)	

of surviving to 364 days .8875, with s.e. 0.005) for rural (Table 2). The mean age of mothers was found to be 26.34(6.29) for singletons and 27.87(6.10) for multiple-births (Table 3).

The peak age for occurrence of maximum frequency of multiple births was 25 to 29 years. As shown in table 3 most mothers were in the low income group, married, delivered at home and illiterate. In this cohort data collection was mainly conducted in the field. Anthropometric measurements, gathered within seven days of birth, were considered as reflecting birth measurements. It should, however, be borne in mind that newborns lose up to 10% of their weight in this period (12). Accordingly birth-weight was collected for 7426 singletons and 126 (each) of the multiple

Table 3: **Socio-demographic Characteristics and Fertility History of Mothers by Birth Type**

Birth type				
Characteristics	single	%	multiple	%
Age group				
15-19	962	12.0	7	6.3
20-24	2158	26.9	22	19
25-29	2090	26.0	34	30.6
30-34	1475	18,4	24	21.6
35-39	1076	13.4	20	18.0
40-44	215	2.7	4	3.6
45-49	51	0.6	0	0.0
Mean	26.34		27.87	
SD	6.29		6.1	
Marital Status				
Married	7467	92.9	100	90.1
Single	297	3.7	6	5.4
Divorced	204	2.5	3	2.7
Widowed	70	0.9	2	1.8
Ethnic group				
Oromo	5387	67.1	68	61.3
Amhara	650	8.1	11	9.9
Tigre	110	1.4	3	2.7
Daworo	492	6.1	11	9.9
Keffa	601	7.5	6	5.4
gurage	410	5.1	8	7.2
Yem	289	3.6	3	2.7

Other	89	1.1	1	0.9
Religion				
Muslin	5550	69.2	63	56.8
Christian	2476	30.8	48	43.2
Monthly Income (birr)				
<150	6065	75.3	82	73.9
150-299	1017	12.6	21	18.9
300+	968	12.0	8	7.2
Place of delivery				
Health Institutions	1316	16.3	30	27
Home	6734	83.7	81	73.0
Educational status				
Illiterate	4890	60.9	65	58.6
1-6 grade	1806	22.5	30	27.0
7-8 grade	572	7.1	8	7.2
9-12 grade	697	8.7	8	7.2
Higher	67	0.8	0	0.0
Total live birth				
1-3	4592	57.1	40	36.0
4-6	2375	29.5	37	33.3
>7	1073	13.3	34	30.6
# of Abortions				
None	7438	92.4	97	87.4
One or more	612	7.6	14	12.6
# of still births				
None	7882	97.9	107	96.4
One or more	168	2.1	4	3.6

births. For singletons the mean (Sd) birth weight was 3081.8 ± 488 g, and for multiple-births 2140.1 ± 410 g. Babies <2500 g were 9.5%, 76.2% and 9.8 among singletons, multiple-births and all types of births, respectively.

Table 4: **Socio-demographic characteristic and infant mortality rate per 1000 live-births**

Factor	n	Cum Surv Proprn.	Death Incidence	RR	95% C.I
Total	8263	.8952	104.8		
Urban	3792	.9039	96.1	1.17	1.03-1.33
Rural	4471	.8875	112.5		
Population group					
Amhara	671	.9139	86.1	1.27	0.98-1.64
Tigre	116	.9200	80.0	1.41	0.75-2.66
Daworo	513	.8790	121.0	.91	0.71-1.16
Keffa	613	.8919	108.1	1.02	0.80-1.30
Gurage	426	.9215	78.5	1.42	1.01-1.98
Yem	295	.9041	95.9	1.16	0.81-1.16
Oromo	5516	.8904	109.6		
Christian	2560	.9031	96.9	1.12	0.98-1.29
Muslim	5669	.8914	108.6		

Income birr					
300+	983	.9395	60.5	1.87	1.46-2.43
150-299	1060	.9043	95.7	1.18	0.97-1.45
<150	6220	.8869	113.1		
Literate	3230	.9156	84.4	1.39	1.21-1.60
Illiterate	5015	.8823	117.7		
Birth weight					
2500+ gm	6802	.9237	76.3	3.00	2.57-3.51
<2500 gm	8263	.7705	229.5		

Qualitative information was gathered from mothers (multiple-births) to see their views about multiple-births. Majority of mothers feel multiple-births are due to god's will and family trend. Again majority of mothers and their family members were not happy of having multiple-births. Most mothers complain that multiple-births are economic burden and difficult to care for. None wished to have more multiple-births. Discussion with key informants reflect a similar view.

The frequency of births was seen with respect to the months at which the births occurred (Figure 2). Multiple-births most frequently occurred in the months of March, September and December, but it was relatively constant in all the months for singletons.

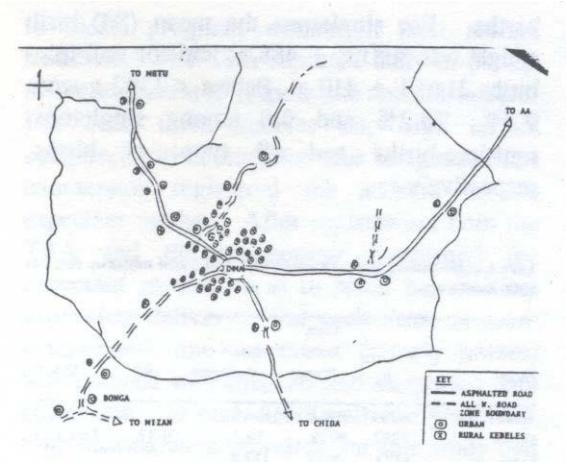

Figure 1: **Sketch map of the study area**

Discussion

In this country mortality reports rely on health services data and on surveys based on the preceding 12 months recall period which could bias due to omissions and vaguely defined period (1, 3, 4, 5, 7). This paper discusses the results of a longitudinal community-based generated data which was undertaken to overcome the above mentioned problems. This study is the first of its kind which covers diversified populations and bigger areas and bigger sample size (Table 3, 4). The estimated infant mortality was 104.8/1000 live-births for the whole study area and 96.1 and 112.5 for urban and rural areas, respectively. As depicted in Table 4, there is variation in infant mortality rates among the different population groups. Those with lower infant mortality rate are mainly residents of urban settings. The proportion of people with better income and education is relatively higher in urban populations compared to rural (13, 14). The observed lower infant death rate among the above

mentioned groups could be explained by income and education factors as shown in Table 4. The influence of these factors has also been shown in other studies (15, 16, 17).

According to the Central Statistical Authority's 1984 census, based on the preceding 12 months recall period, the infant mortality rate was 105/1000 for the whole country (1). In Butajira district, Southern Shewa, a survey involving nine rural and one urban kebeles, from 1987 to 1990, based on follow-up approach, reported infant mortality rate of 114/1000 (18). According to the 1994 National Census, for regions 3 and 4 which comprise the major bulk of the nation's population, the infant mortality rate was 116 and 118 per 1000, respectively (13, 14). The same census result also showed 102 for urban and 117 for rural (region 3), and 93 for urban, 121 for rural (region 4). Based on hospital data, the occurrence of multiple-births vary. In Addis Ababa deliveries in health facilities in 1973 and 1982 showed 43 and 33 per 1000, respectively (8). It was 14.9 per 1000 deliveries in Gondar, based on the hospital deliveries between 1977 and 1985 (9). The above findings are mainly for urban settings. In the present study the finding of 13.6 multiple-births per 1000 live-births is based on both rural and urban community data of one year live-births cohort follow-up study. Reports from other African countries (Nigeria, Tanzania, Zimbabwe) is about or over 30 per 1000 live -births (19, 20). For this paper, in all 46 urban and 65 rural kebeles, the rigorous method we followed to recruit all live-birth cohorts has helped to avoid omission and recall bias.

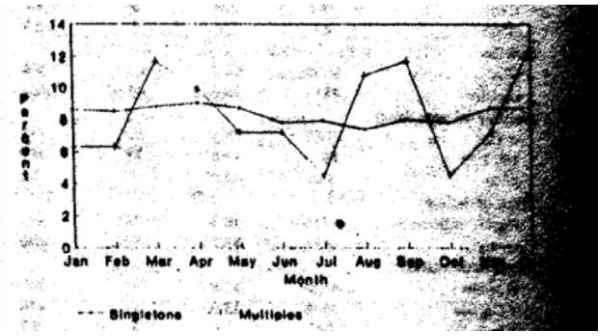

Figure 2: **Percent distribution of births by month of birth, South West Ethiopia**

The infant mortality of 446.8/1000 among multiple-births is over four folds compared to singletons in this study. This is a very high death toll and a matter of serious concern. The contributing factors could be both social and biological. As mentioned in the results section, the attitude of people (including the mother and her family) is not favourable towards multiple-births. The low birth-weight, among this group could also partly explain the high mortality. Previous studies (17,21) had clearly indicated birth-weight as an important factor for survival differentials as is also shown in this study (Table 4). This entails better approach and care for multiple gestation during antenatal and early infancy periods.

The seasonality of births, as shown in figure 2, was relatively constant in all the months for singletons but there was a peak in the months of March, September and December for multiplebirths. Reviews of studies on seasonality of births showed agricultural cycle, economic variables, marriage rate, weather..... as possible proximate influencing factors (22).

The review of studies clearly showed that there is birth seasonality in different countries like South Africa, USA, India, Japan (22) but the relative constant birth in all the months for singletons in this study seems a unique pattern. It would be better to have serial data on births over the years to make a meaningful discussion.

The experience of this study on vital events registration using the existing grass-root level human resources could lend itself for a wider practice. The high death toll among multiple-births needs the concerted effort of the different sectors. The sound and concrete findings of this study on infant mortality and survivorship could help for proper policy formulation and health care planning. This study will also be a base for further analytical study on the influencing factors of survival differentials.

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