ORIGINAL ARTICLE

Patterns and determinants of under five mortality in Jimma town, Jimma Zone, South West Ethiopia

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ABSTRACT : A retrospective case-control study was conducted to determine patterns and determinants of under five mortality in Jimma town, Jimma Zone, South West Ethiopia. All under five deaths that occurred between March 12, 1996 and March 12,1997 were recruited in the study and two controls from the nearest neighbors who had one alive under-five child and didn't experience any under-five death were taken. Four medical students and six twelve grade completed students were trained to collect the data using a structured questionnaire. A total of 36 under-five deaths were found. For risk assessment, 72 controls were used. The result of the study shows that most deaths were in infancy and only six neonatal deaths were found. The major probable causes of death were acute respiratory infections, fever alone and gastro-enteritis. Open field garbage disposal, home delivery, breast feeding (lesser duration), low income (<200 birr per month) and maternal illiteracy were the most significant risk factors in their order, associated with under five mortality. Interventions directed to the influencing factors can greatly reduce the under-five mortality rate in the area.

Introduction

Ethiopia has one of the worst health status in the world as could be attested by conventionally accepted health indicators. At the center of the problem is the backward socio-economic development resulting in one of the lowest standard of living, poor hygiene and low social services. The total population is estimated to be 55 million (1). The Infant and under-five mortality rates are one of the highest in the world, 123 per 1000 live births and 208 per 1000 children 0-5 years, respectively. Of the total population, children under 5 years of age constitute about 18% and infants 3.5%. It is estimated that there are half a million under- five deaths annually in this country (2).

Under-five mortality constitutes nearly 50% of all deaths in Ethiopia. The importance of studying under 5 mortality lies not only in its high magnitude but also in its preventability. With government and community commitment towards primary health care and their concerted efforts, most causes of under 5 morbidity and mortality can be prevented (3).

Under 5 mortality is the most important indicator of the state of world children. It is also the best available single indicator of social developments. It can

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also reflect the nutritional status and health knowledge of the mother, the level of immunization and oral rehydration therapy (3).

The common causes of under 5 morbidity and mortality are known to a large extent. These include acute respiratory infections, diarrhoeal diseases and malnutrition (2). These can vary in countries like Ethiopia where there is a great diversity in socio-economic, cultural and geographical conditions. Knowledge about the variation of the determinants/risk factors will enable health authorities to determine and to prioritize health problems and take early action based on local solution.

Population-based data on mortality are not readily available in countries where health services don't cover all segments of the population and where information about vital events is incomplete (4). Most of the studies done regarding mortality are hospital based. This can make large number of population deaths unattended and will ignore factors and processes, which contribute to the health or death of children. This also clearly undermines the community, which should participate in identifying, diagnosing and solving its own problems (5).

Under-five mortality is a major public health problem in Ethiopia. Even though few studies have been done in some areas in the past, local data are scarce. Thus this study was designed to provide information on local risk factors for under 5 deaths and its magnitude. This study is useful as baseline information for other epidemiological researches. It also deals with the assessment of different risk factors which is helpful in deciding the priorities of health interventions. Furthermore, the study makes use of technique called verbal autopsy, which over the past few years is gaining popularity for its validity in measuring mortality.

Therefore, the objective of this study was to determine the causes and associated factors for under 5 mortality.

Methods and materials

Study area and Period:

Jimma is found in Oromiya region southwest Ethiopia. It is approximately 335 kms from the capital, Addis Ababa. The total population of Jimma is about 90,000. The average family size of the town is 4.5. The estimated Infant and under-five mortality rates are 93 per 1000 live births and 132 per 1000 children aged 0-5 years respectively (6).

The study was conducted in Woreda 1 Kebele 03 of Jimma town. The population of the study Kebele was 5148 with 1107 households. The Kebele is within 2 kms from the nearby health center. Kebele is the smallest administrative unity in urban areas of Ethiopia. The study was carried out between March 12-16, 1997.

All households with alive or dead under five children were covered and those with alive or dead under-five child were interviewed using a structured questionnaire. No sampling was done. Those families who had under-five death in the period of one year prior to the study period (March 12, 1996 and March 12,1997) were taken as cases. Those families who didn't have any under-five death and had alive under five children were taken as controls (selected from the nearest neighbours). The proportion of females and males in cases and control was nearly the same. Two controls were selected for each case.

Data collection and analysis:

Relevant data were collected by using a structured questionnaire, which was pre-tested on households in a neighboring

kebele. The questionnaire included, among others, parental age, sex, family size, income, literacy, occupation, availability and use of latrine and water supply. Maternal pregnancy conditions and duration of labor were also included. Regarding children, age, sex, birth order, breast feeding, symptoms and duration of disease prior to death were the variables included in the questionnaire.

Permission was granted from local officials. Six ,12th grade students and four medical students collected data. Training was given for all of them. Data was collected by going from house to house. They interviewed each household with under five children alive or dead. Visits were repeated in case of absence of respondents. The probable causes of death were diagnosed by the clinical symptoms which mothers perceive as a cause of death of their under-five child. Data was analysed using SPSS/PC statistical package. Frequency distributions and rates were calculated. Further statistical analysis was done by employing relevant statistical methods.

Results

A total of 318 under-five children (186 male and 132 female) were registered in the Kebele. Thirty six under-five child deaths occurred in one year period (March 12, 1996 to March 12,1997). There were more male deaths than females. Most deaths were seen in infancy, which accounted for 55.5% of all under five deaths. Only 6 neonatal deaths were found (Table 1). The under-five mortality rate was calculated to be 113 per 1000 children. Symptoms seen prior to death were cough and fever, fever alone and diarrhoea in that order of frequency.

The probable causes of death order were acute respiratory infections (33.4%), acute febrile illness (30.5%) and gastro-enteritis (16.6%). Fever alone and diarrhoea were common in infancy (Table 2).

Most of the deaths occurred in illiterate families and in those with monthly income of less than 200 Birr. The majority of mothers with under five mortality were above 35 years of age. The majority of families in the study area had latrine and pipe water. Garbage disposal system was found to be very poor since 65.2% of families practised unhygienic waste disposal.

Table 1- Age and sex distribution of cases and controls, Woreda 1, Kebele 3, Jimma town, 1997.

Variables	Cases (No.)	Controls (No.)
Sex:		
. Male	20	42
. Female	16	30
Age (in months)		
. <1	6	2
. 1-11	20	23
. 12-48	10	47
Total	36	72

Table 2- Symptoms reported for under-five deaths, Woreda 1, Kebele 3, Jimma town, 1997.

Symptoms prior to death	Age in months			Total (%)
	< 1	1-11	12-48	
Cough and fever	-	6	6	12(33.4%)
Fever alone	3	8	1	11(30.5%)
Diarrhoea and vomiting	2	5	1	6(16.6%)
Others@	-	1	3	7(19.5)
	5	20	11	36(100%)

@ Others include: Breathing difficulty (3), leg swelling (3), and accident (1).

Table 3: Distribution of Determinant factors in cases and controls Woreda 1, kebele 3, Jimma Town, 1997.

Determinant Factors	Cases	Controls	OR	95% CI	P-value
Maternal age (years)					
<20	12	10			
20-35	14	60	0.78	0.64-0.95	NS
>35	10	12			
Literacy status					
Illiterate	14	16			
Grade 1-6	12	14	2.45	1.39-4.37	<0.01
Grade 7-12	8	38			
Grade 12 +	2	4			
Income (Birr/month)					
<200	22	25			
200-500	10	37	2.95	1.32-6.57	<0.01
>500	4	10			
Family size (persons)					
≤5	20	46	0.72	0.32-1.63	NS
>5	16	26			
No. of children					
≤3	31	55	0.52	0.34-0.64	NS
>3	5	17			
Birth Order					
1	14	26			
2	10	21	2.3	0.89-2.56	NS
3	8	9			
≥4	4	16			
Breast feeding					
. Exclusive Breastfeeding	3	-			
. Weaned at <4 months	13	12	2.95	1.2-7.25	<0.01
. Weaned at ≥4 months	22	60			
. Total Duration of breastfeeding					
<1 year	18	17			
1-2 years	11	30	3.38	1.2-9.4	<0.001
>2 years	4	25			
Place of delivery					
Health institution	16	50	2.84	1.26-1.82	<0.01
Home	20	22			
Duration of labour					
≤18 hours	26	61	0.43	0.146-1.26	NS
>18 hours	10	16			
Instrumental delivery					
Present	3	7	0.84	0.29-7.79	NS
Absent	33	65			
Latrine					
Present	32	65	0.86	0.73-1.02	NS
Absent	4	7			
Water supply source					
Pipe/protected	28	66	0.32	0.09-1.07	NS
Others/unprotected	8	6			
Garbage disposal					
Open field	26	35	2.67	1.14-6.27	<0.001
Pit/burning	10	37			

NS=Not significant

Different risk factors were assessed with regard to their distribution among cases and controls and also their association with under-five mortality (Table 3). A significant proportion of under five deaths were found in families with illiterate mothers who were nearly 2.5 times more likely to have under-five deaths than those who went to school (OR=2.45, 95% CI=1.4-4.4). They were also 3.5 times at greater risk of under five deaths than those in secondary school (OR=3.52). The frequency of under five deaths decreases as the school grade of the mother increases. However, this trend was not statistically significant, (χ^2 for trend=5.56, p>0.1).

Under-five mortality was also significantly associated with low income (<200 Birr per month) with odds ratio of 2.95 (95% CI=1.32-6.57). The trend of decreasing in number of under-five deaths with increasing family income was not statistically significant (χ^2 for trend=1.48, P>0.1).

Shorter duration of breast feeding is found to be another important risk factor. Children breast fed for less than one year were 3.4 times more likely to die before age of 5 years (OR=3.38, 95% CI=1.2-9.4). Early weaned (before 4 months of age) infants were 3 times at increased risk to die before 5 years as compared to those weaned later (OR=2.95, 95% CI=1.2-7.3). As is shown in table 3, the number of under-five deaths decreases as the duration of breast feeding increases. This trend was found to be statistically significant (χ^2 for trend =6.85, p<0.01). Open field garbage disposal was significantly associated with under-five mortality with odds ratio of 2.674 (95% CI=1.14-6.27). No significant association was found between latrine and water supply with under-five mortality.

Among reproductive risk factors, home delivery was significantly associated with under five mortality. Children born at home were nearly 3 times more likely to die before the age of 5 years (OR=2.84, CI=1.26-1.82).

No significant association was found between under-five mortality and maternal age, family size, number of children, latrine and water supply. There was also no association with duration of labour, instrumental delivery and birth order. No significant difference in under five deaths was found between males and females.

The relative importance and contribution of different risk factors to under five mortality was also assessed through attributable risks. The attributable risks were 0.26 for duration of breast feeding, 0.24 for income and place of delivery, 0.21 for garbage disposal, 0.15 for weaning and 0.11 for literacy.

Discussion

The calculated under-five mortality rate of is 113 per 1000 children was low compared to the national figure of 208 per 1000 children or even to the zonal figure of 132 per 1000 children. This low under-five mortality rate can be attributed to the urban nature of the study area with access to health care services and safe water supply.

The patterns of under five mortality which are found in this study are similar to the findings of some other studies. In Butajira rural health project, malaria and vaccine preventable diseases were common next to acute respiratory infections and diarrhoeal diseases (7,8). Malnutrition and tuberculosis were common causes of under-five mortality in Jimma Hospital (9). Generally, most studies show acute respiratory infections and gastro-enteritis as the most common causes of death in under-five children. This study didn't show malnutrition as a

significant cause of death of under-five children. The reason could be that since the study is symptom-prompted approach, it is quite difficult to diagnose malnutrition with symptoms alone and deaths in malnourished children are usually due to secondary infections not due to malnutrition itself.

It is known that teenage mothers have more risks in their pregnancy and child practice. However, this study showed no association between under five mortality and age of mother. The Butajira rural health project showed that mortality was associated with younger (<25 year) and older (≥ 35 year) mother (8). Child health status is affected by literacy of the parents. Female education is one of the strategies for better child survival (8). This study showed that illiterate mothers have high risk of under five mortality. A study conducted in Tanzania in 1994 showed that the risk of under five mortality was 1.3 times more likely for mothers with no primary education, even when other socio-economic variables are controlled (10). Literate mothers were not only at low risk of under-five mortality but also were 12 times more likely to seek medical care (8). This shows the impact of literacy on behaviour of the mother in her child care practice.

Family income is linked with child survival. Its impact on child health is invariably modulated by different factors like literacy, family size and culture. This study showed higher risk for low income families (<200 Birr per month) but more income doesn't guarantee low mortality since no significant trend was seen. Family size and number of children were not important risk factors as only few families had more family size than five and more children than three.

Almost all families in the study population used latrine and pipe water supply. The impact of open field garbage disposal on child death was significant (odds ratio=2.67). Since nearly half the control children are in families who use open field garbage disposal system, on population basis, this unhygienic waste disposal may play a role in increasing the risk of under five mortality. Hygiene affects the overall child health status. One of the commonest causes of under five death is diarrhoeal disease which is caused by poor hygiene, among other factors (8).

Breast feeding is the vital part of child health. It interacts with socio-economic, reproductive and environmental factors to result in better child survival. Appropriate breast feeding with clean and adequate supplementary feeding prevents malnutrition thereby helping in fighting against infections. This study shows significant association of under-five mortality with lesser duration of breast feeding (<1 year) and early weaning (<4 months). The deaths of under-five children decrease as the duration of beast feeding increases. This magnifies the impact of breast feeding on under-five mortality in the study area.

The increased risk of under-five mortality with home delivery can be attributed to the significant maternal illiteracy in families with under five deaths. Furthermore, low-income families don't afford costs of health institution. Open field garbage disposal has modest odds ratio (OR=2.67) and nearly 12 under five deaths out of 100 under five deaths could be prevented if the community used safe disposal system. Improving the income of poor families would eliminate 10 out of 100 under-five deaths. Breast feeding has highest OR=3.38 but at population basis it may only eliminate 8 per 100 under-five deaths if all mothers breast fed their child for more than one year. The problem of home delivery in

the study area should be interpreted cautiously. Home delivery by itself is not a health problem provided that it is attended by well trained birth attendants appropriately. Even it is helpful in reducing the burden of health institutions. Though this study shows health institution delivery could prevent 1 out of 100 under five deaths. Further research is needed to determine the safety and quality of home delivery in the area. Only then we can underline its importance to affect child survival. Literacy has the least effect on child survival when it is considered on population basis. Only 5 out of 100 under five deaths would be prevented if the mothers were literate. This might be due to low prevalence of illiteracy in the community.

In conclusion the study showed that the leading causes of under-five deaths are acute respiratory infections, febrile illnesses and diarrhoea. Infants were the most vulnerable. The major determinants of under-five mortality in the study area were open field garbage disposal, home delivery, lesser duration of breast feeding (< 1 year), low income (<200 Birr per month), and maternal illiteracy in that order of importance.

Safe waste disposal system should be encouraged through health education, community participation using local resources and also collaborating with governmental, like the city council, and other non-governmental organizations.

Problems related to home delivery can be tackled by training of traditional birth attendants in adequate number and skill. The delivery service given by the nearby health centre should also be strengthened. Encouraging breast feeding needs continuous and effective health education.

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