

# A community-based study of childhood morbidity in Tigray, Northern Ethiopia

Mohammed Ali<sup>1</sup>, Teklehaimanot Asefaw<sup>1</sup>, Hagos Beyene<sup>2</sup>, Peter Byass<sup>3</sup>  
Mohammed Shishay Hisabu<sup>4</sup>, Freddy Karup Pedersen<sup>4</sup>

## Abstract

**Background:** The study was conducted in preparation for the early implementation of the integrated management of childhood illnesses.

**Methods:** Caretakers of a cohort of 1034 under-five children in two districts of Eastern Tigray, Northern Ethiopia, were interviewed weekly in their homes for a one-year period for symptoms of disease. Possible risk factors for disease in the home were identified during a preceding baseline survey.

**Results:** The overall incidence of perceived illness was found to be 5.26 per child-year, that of ARI 5.53 per child-year and of diarrhea 3.05 per child-year. Recall appears to be influenced by asking caretakers for illness in general as compared to asking for specific symptoms. A lower incidence of overall illness was found in children above 2 years of age, and in those from Christian families, those living in houses with corrugated iron roofs and those from households with 2 or more children under-five. Increased incidence was associated with the use of open pit latrines compared to open air excreta disposal as there were no properly covered latrines.

**Conclusions:** Age, housing factors and water supply and sanitation are important determinants for disease. [*Ethiop. J. Health Dev.* 2001;15(3):165-172]

## Introduction

Information on the morbidity patterns of important childhood illnesses and associated risk factors is essential for proper planning and effective implementation of child health intervention programmers. Household interview surveys have been widely used to obtain morbidity data in industrialized countries. More recently this technique has also been adapted in developing countries to assess the health status of the population (1-2).

In Ethiopia most childhood morbidity data come from health institution based studies done

in urban settings (3). Since 85% of the country's population live in rural areas, information from rural community-based morbidity surveillance is essential for health planners. A one-year community based study of under-fives in rural Butajira in 1991 showed ARI and acute diarrhea to be the most common diseases (3).

Since the epidemiology of diseases vary from country to country and from place to place in the same country, morbidity surveillance in children under five years of age in rural communities of the arid area of Tigray, Northern Ethiopia was conducted. In this study the main objective was to look for patterns of important, common childhood illnesses in under-fives and to assess the burden of illness and associated risk factors in an area where implementation of the integrated management of childhood illness (IMCI) strategy is due to start.

<sup>1</sup>Dept. of Paediatrics, Mekelle Regional Hospital, Mekelle, Tigray, Ethiopia; <sup>2</sup>Defence College of Health Sciences, Addis Ababa, Ethiopia; <sup>3</sup>Dept. of Public Health and Clinical Medicine and Epidemiology, Umeå University, Umeå, Sweden; <sup>4</sup>University Clinic of Paediatrics II, Rigshospitalet, Copenhagen, Denmark

## **Methods**

This study was carried out in two districts of Eastern Tigray, Northern Ethiopia over a one-year period (July 1997 to June 1998). The total population of the two districts was estimated at 186,734.

A base line census covering three semiurban communities and eight rural communities in these two districts was carried out one month prior to the study. Two out of the three semi-urban communities and seven out of the eight rural communities were selected for the study, the two communities not selected being relatively inaccessible.

A sample of 1077 children under-five years of age was defined by including all households where at least one child under-five was residing. Out of 1077 under five children 1034 (96%), in 766 households, were available for the study.

Twelve data collectors who had completed high school education and were residents of the area were recruited and trained on the techniques of interviews and data collection. All of them were conversant with the local language. The questionnaire prepared covered the main symptoms of childhood illness including cough, difficulty in breathing, runny nose, ear pain, ear discharge, fever, diarrhea, vomiting, inability to drink or eat, leg swelling, convulsions, generalized rash, mouth sores and eye discharge, in addition, actions taken whenever these symptoms occurred, immunization status and outcome of illness were covered by the questionnaire. The questionnaire was pre-tested in an area adjacent to the study communities and the data were not included in the study. Data forms were edited daily by data editors on the day of collection and rechecked at data entry. Incomplete forms were returned to team leaders for revisit and completion.

The morbidity survey was based on weekly home visits in which the data collectors asked the child's caretaker (in most cases the mother)

about symptoms experienced by the study child in the previous week and the actions taken to alleviate the child's problem. Sick children who had shown no improvement or got worse were referred by data collectors to the nearest health facility. The investigators supervised the data collectors during weekly visits and were also involved in case management of difficult cases referred from the study area shown no improvement or got worse were referred by data collectors during weekly field visits and were also involved in case management of difficult cases referred from the study area to the nearest health facilities.

Socio-demographic data from the baseline census were used to analyze risk factors for morbidity in under-fives. Weekly morbidity data were used to compute individual episodes of illness and incidence rates. Any illness or symptom recorded, even if only occurring for one day, resulted in the individual's week being noted as having morbidity. An episode of illness or of an individual symptom was defined as any period in which at least 75% of consecutive weeks contained positive reports for example 1 isolated week, 2 consecutive weeks, 3 weeks out of 4 etc. Chronic episodes were similarly defined with duration of at least 5 weeks.

In this study the following illness entities were defined as:

### **Acute Respiratory Infection:**

The presence of any of the following. Cough, difficulty in breathing, runny nose, ear pain, ear discharge with or without fever.

**Diarrhoeal disease:** The presence of three or more loose, watery stools in 24 hours with or without either blood or vomiting.

**Febrile rash:** Generalized rash together with fever with without either mouth sore or eye discharge. In some but not all cases this is likely to represent measles.

Based on these definitions acute and chronic

episodes of perceived overall illness and specific disease entities and incidence rates were computed.

### Statistical Analysis

Data were entered using Edi-Info version 6 and subsequently managed using D-base IV. Tables and frequencies were obtained using Edi-Info, and EGRET software was used for Poisson regression analysis of incidence in relation to risk factors, adjusting for individuals' period under observation.

### Results

Data were obtained for a total of 1034 (96%) children during the one year study. During this time 17 died and 25 out-migrated. Two children who refused were excluded. A total of 996 child-years were observed: Children between 3 and 5 years of age comprised the largest proportion (49.5%) while infants comprised 9.4%. Boys and girls were almost equally represented (49.5%) and (50.7%) respectively.

Table 1: Morbidity episodes noted in 958.9 Child-years observed

| Number Episodes             | Morbidity | Chronic Illness | All ARI | Chronic ARI | All Diarrhoea | Persistent Diarrhoea | Measles |
|-----------------------------|-----------|-----------------|---------|-------------|---------------|----------------------|---------|
| 0                           | 55        | 701             | 41      | 564         | 260           | 879                  | 588     |
| 1                           | 84        | 206             | 90      | 300         | 206           | 80                   | 254     |
| 2                           | 112       | 71              | 74      | 110         | 124           | 32                   | 94      |
| 3                           | 114       | 13              | 107     | 19          | 91            | 5                    | 42      |
| 4                           | 115       | 1               | 102     | 3           | 78            | 0                    | 10      |
| 5-7                         | 283       | 1               | 331     | 0           | 182           | 0                    | 8       |
| 8-10                        | 172       | 0               | 201     | 0           | 62            | 0                    | 0       |
| >10                         | 61        | 0               | 46      | 0           | 23            | 0                    | 0       |
| Total Episodes              | 5040      | 396             | 5301    | 589         | 2921          | 159                  | 655     |
| Incidence of Episodes/child | 5.26      | 0.44            | 5.53    | 0.61        | 3.05          | 0.17                 | 0.68    |

### Morbidity patterns

Table 1 shows the distribution of the number of episodes of disease entities and overall illness occurring among all the children in the study. Two hundred thirty-three children (24.3%) had more than seven episodes of overall illness while 55 children (5.7%) were reported to have no illness. The incidence of perceived overall illness was 5.26/child-year. The incidence of ARI was 5.53/child-year and that of diarrhea 3.05/child-year.

### Risk factors for morbidity

Table 2 shows the risk factors for episodes of overall illness. Several factors were shown to

be significantly associated with incidence of overall illness. Multivariate analysis, adjusting ratios for all potential risk factors, showed that children over 2 years of age, from Christian families, living in houses with corrugated iron roofs, and households with two or more under-five children and not using well water showed significantly lower incidence of overall illness. On the other hand, living in semiurban area versus rural, multiple rooms and the use of open pit latrines were associated with increased incidence. Gender, area of residence and absence of ventilation were not significantly associated with the level of incidence.

Table 2: Poisson regression analysis of overall illness with possible risk factors

| Factor                    | Characteristics | Number | Univariate OR▲ | Multivariate Adjusted OR▲ |      |               |
|---------------------------|-----------------|--------|----------------|---------------------------|------|---------------|
|                           |                 |        | O.R.           | 95% CI                    | O.R. |               |
| Age group                 | <12 months      | 94     | 1.00           | -                         | 1.00 | -             |
|                           | 12-35 months    | 406    | 0.94           | 0.86-1.03                 | 0.93 | 0.85-1.02     |
|                           | 36-59 months    | 496    | 0.67           | 0.61-9.74                 | 0.67 | 0.61-0.0.73** |
| Sex                       | Male            | 491    | 1.00           | -                         | 1.00 | -             |
|                           | Female          | 505    | 1.01           | 0.95-1.06                 | 0.99 | 0.04-1.05     |
| Religion                  | Muslim          | 118    | 1.00           | -                         | 1.00 | -             |
|                           | Christian       | 878    | 1.04           | 0.96-1.14                 | 0.88 | 0.80-0.97*    |
| Distance to health center | ≤30 minutes     | 456    | 1.00           | -                         | 1.00 | -             |
|                           | >30 minutes     | 540    | 1.15           | 1.09-1.20                 | 0.93 | 0.85-1.02     |
| Roof type                 | Thatched/mud    | 653    | 1.00           | -                         | 1.00 | -             |
|                           | Corrugated I.   | 433    | 0.80           | 0.76-0.85                 | 0.81 | 0.71-0.92     |
| Ventilation               | None            | 182    | 1.00           | -                         | 1.00 | -             |
|                           | Some            | 814    | 0.98           | 0.92-1.06                 | 0.93 | 0.86-1.00     |
| No. of people in home     | 1-3             | 160    | 1.00           | -                         | 1.00 | -             |
|                           | 4-6             | 518    | 0.96           | 0.98-1.04                 | 1.01 | 0.93-1.11     |
|                           | ≥7              | 318    | 1.05           | 0.96-1.14                 | 1.09 | 0.98-1.21     |
| Under - fives in home     | 1               | 389    | 1.00           | -                         | 1.00 | -             |
|                           | ≥2              | 607    | 0.92           | 0.87-0.97*                | 0.88 | 0.83-0.94**   |
| Animal in home            | None            | 866    | 1.00           | -                         | 1.00 | -             |
|                           | Some            | 130    | 1.08           | 1.00-1.17*                | 0.98 | 0.90-1.07     |
| Fuel                      | Wood/Dung       | 240    | 1.00           | -                         | 1.00 | -             |
|                           | Smokeless       | 756    | 0.90           | 0.85-0.96*                | 1.01 | 0.94-1.08     |
| Water source              | Well            | 131    | 1.00           | -                         | 1.00 | -             |
|                           | spring          | 164    | 0.82           | 0.75-0.90*                | 0.81 | 0.74-0.89**   |
| Water source              | River/dam       | 334    | 0.64           | 0.95-0.70**               | 0.68 | 0.61-0.75**   |
|                           | Pipe            | 367    | 0.78           | 0.72-0.85*                | 0.88 | 0.80-0.97*    |
| Excreta disposal          | Open            | 909    | 1.00           | -                         | 1.00 | -             |
|                           | Pit latrine     | 87     | 1.02           | 0.93-1.13                 | 1.20 | 1.08-1.34**   |
| Location of Residence     | Semi-urban      | 451    | 1.00           | -                         | 1.00 | -             |
|                           | Rural           | 545    | 1.24           | 1.17-1.31*                | 1.09 | 0.93-1.27     |

▲OR: Observed Risk

\* Significant at 5% level

\*\* Significant at 1% level

Table 3: Effect of various risk factors (multivariate poisson regression analysis) on the relative incidence of specific disease entitles

| Factor                      | Characteristics | Chronic illness | All ARI | Chronic Cough | All Diarrhoea | Chronic Diarrhoea | Febrile Rash |
|-----------------------------|-----------------|-----------------|---------|---------------|---------------|-------------------|--------------|
| Age group                   | <12-35 months   | 1.00            | 1.00    | 1.00          | 1.00          | 10.00             | 1.00         |
|                             | 12-35 months    | 0.82            | 1.13    | 1.13          | 0.75          | 0.49              | 0.95         |
|                             | 36-59 months    | 0.38            | 0.93    | 0.84          | 0.25          | 0.05              | 0.57         |
| Sex                         | Male            | 1.00            | 1.00    | 1.00          | 1.00          | 1.00              | 1.00         |
|                             | Female          | 0.88            | 1.01    | 0.97          | 0.96          | 0.77              | 0.89         |
| Religion                    | Muslim          | 1.00            | 1.00    | 1.00          | 1.00          | 1.00              | 1.00         |
|                             | Christian       | 1.17            | 0.89    | 1.35          | 1.00          | 1.14              | 1.28         |
| Distance from health center | < 30 minutes    | 1.00            | 1.00    |               | 1.00          | 1.00              | 1.00         |
|                             | ≥ 30 minutes    | 1.21            | 1.02    | 1.05          | 0.82          | 1.39              | 1.11         |
| Roof type                   | Thatched        | 1.00            | 1.00    | 1.00          | 1.00          | 1.00              | 1.00         |
|                             | Corrugated      | 0.72            | 0.81    | 1.13          | 0.74          | 0.46              | 1.11         |
| No. of rooms                | 1               | 1.00            | 1.00    | 1.00          | 1.00          | 1.00              | 1.00         |
|                             | ≥ 2             | 1.03            | 1.05    | 1.11          | 0.99          | 0.92              | 0.88         |
| Ventilation                 | None            | 1.00            | 1.00    | 1.00          | 1.00          | 1.00              | 1.00         |
|                             | Some            | 0.95            | 0.98    | 0.90          | 0.97          | 0.79              | 0.96         |
| No. of people in home       | 1-3             | 1.00            | 1.00    | 1.00          | 1.00          | 1.00              | 1.00         |
|                             | 4-6             | 1.25            | 1.00    | 0.97          | 1.00          | 0.91              | 1.09         |
|                             | 7+              | 1.56            | 1.98    | 0.98          | 1.20          | 1.23              | 1.41         |
| Under - fives in home       | 1               | 1.00            | 1.00    | 1.00          | 1.00          | 1.00              | 1.00         |
|                             | ≥ 2             | 1.06            | 0.93    | 0.94          | 0.90          | 1.20              | 1.07         |
| Animal in home              | None            | 1.00            | 1.00    | 1.00          | 1.00          | 1.00              | 1.00         |
|                             | Some            | 0.79            | 1.01    | 1.11          | 0.90          | 0.59              | 0.97         |
| Fuel                        | Wood/dung       | 1.00            | 1.00    | 1.00          | 1.00          | 1.00              | 1.00         |
|                             | Smokeless       | 0.99            | 1.03    | 0.99          | 1.01          | 0.83              | 1.08         |

Table 3: Continued

| Factor           | Characteristics | Chronic illness | All ARI | Chronic Cough | All Diarrhoea | Chronic Diarrhoea | Febrile Rash |
|------------------|-----------------|-----------------|---------|---------------|---------------|-------------------|--------------|
|                  | Well            | 1.00            | 1.00    | 1.00          | 1.00          | 1.00              | 1.00         |
| Water source     | Spring          | 1.06            | 0.99    | 1.16          | 0.98          | 0.92              | 1.03         |
|                  | River/dam       | 0.49            | 0.93    | 0.26          | 0.70          | 0.40              | 0.80         |
|                  | Pipe            | 1.01            | 1.06    | 0.92          | 0.97          | 1.16              | 1.04         |
| Excreta disposal | Open            | 1.00            | 1.00    | 1.00          | 1.00          | 1.00              | 1.00         |
|                  | Pit latrine     | 0.79            | 1.01    | 0.588         | 1.05          | 0.54              | 0.93         |
| Location         | Semi urban      | 1.00            | 1.00    | 1.00          | 1.00          | 1.00              | 1.00         |
|                  | Rural           | 1.25            | 0.93    | 0.76          | 0.78          | 0.33              | 0.76         |

\* Numbers in each cell indicate the relative incidence or odds ratio of specific diseases or symptoms by factor. Eg. the relative incidence for rural and semi urban residences is 1.25 times for chronic illness, 0.93 times for all ARI, 0.76 times for chronic cough, 0.78 times for all diarrhoea etc.

In table 3 adjusted relative risks of specific disease entities are shown in relation to risk factors. Belonging to Christian families, living in corrugated iron roof house had lower risk of ARI. The occurrence of chronic illness decreases with increasing age as do diarrhoeal diseases. The incidence of febrile rash significantly increased among children of Christian families and in families with 7 people and above living together.

## Discussion

Community based morbidity surveys have been carried out in several developing countries using different methodological designs to gain information on the occurrence of major public health problems and their determinants. Our study used the baseline census data of an initial demographic survey for risk factor analysis. Two out of three semiurban and seven out of eight rural communities were selected based on their accessibility. The two communities not selected were inaccessible and with very scattered households and were thus not convenient for longitudinal studies for longer periods.

All interviewers spoke the local language as recommended by Kroger A. (1). Our questionnaire included a "list of tracer condition" like public holidays and religious calendars to

improve the yield of morbidity episodes. An appropriate "list of tracer conditions" have been found to be the most sensitive instrument for measuring perceived morbidity (4,5). Recording of perceived morbidity was based on weekly recall rather than day-by-day recall at weekly intervals. Byass et al (6) have shown that weekly interviews using daily diaries of morbidity gives more information than a weekly point-prevalence technique. Two-weekly visit was not chosen in an attempt to improve recall.

The definitions of episodes and some illness entities used in this study are arbitrary and may not necessarily be identical to the commonly used public health definitions. The incidence of overall illness found was higher compared to the study done in Butajira (3), but was in agreement with the study done in the arid rural areas in Southern Ethiopia(7).

The incidence of ARI in children under five years of age in urban areas both in developed and developing countries is estimated to range from 5 to 8 episodes annually. By contrast children living in the rural areas are estimated to have 3 to 5 episodes annually (8). The incidence of ARI in our study was found to be 5.53 episodes/child-year for children living in both rural and semi urban communities. Other studies in rural communities in Ethiopia (3,7,9)

and Kenya (10) showed relatively lower incidence rates than ours. In this study, the incidence of ARI (5.53/child-year) is higher than the incidence of overall illness (5.26). The questionnaire was so designed that the interviewer first asks whether the child has been ill at all and later asks for specific symptoms. This unexpected result may be accounted for by the fact that recall may be influenced by asking for specific symptoms versus illness in general. It is also possible that bias is introduced by asking probing questions for specific symptoms.

The incidence of diarrhoeal diseases in this study was found to be 3.05 episodes/child-year. This is higher than the studies done in southern Ethiopia (3,7). By contrast, bigger community based studies on the occurrence of acute childhood diarrhoea in Ethiopia showed that Ethiopian children under five years of age experience about five episodes/child-year (11).

The analysis of risk factors showed that the most important factor associated with under-five morbidity was the child's age. The older the child, the lower the incidence of overall illness, diarrhoeal diseases and febrile rash. This finding is in agreement with studies done in Addis Ababa (11,12). This is conceivably explained by the improvement in host defence mechanisms and improved nutritional status with age. Among parental factors, children of Christian parents had lower incidence of overall illness and ARI. This may be explained on the basis of the lesser household sizes of the Christian families and relatively better utilization of health services compared to Muslim families. Among household factors, corrugated iron type of roof was shown to be associated with lower incidence of overall illness, ARI and diarrhoeal disease. This has also been shown in the study done in Butajira, southern central Ethiopia (3). The possible explanation may be, that having corrugated iron type of roof could indicate better socio-economic status. In this study crowding was found to be significantly associated with increased incidence of overall illness and diarrhoea. This finding is against

the common understanding that morbidity increases with increasing number of children, especially in less privileged societies. An in-depth Study, however, is required to look into the effect of the number of under-five children in a household on morbidity. Households with more than one room unexpectedly were found to be associated with increased incidence of under-five overall illness. This again contradicts with common knowledge. In these communities bedroom sharing is a common practice regardless of availability of space, especially when children are younger. But again an in-depth study is required to look in to this aberrant finding of association.

Of the water supply and sanitation factors, not using well water was found to be significantly associated with lower incidence of overall illness. Using open pit latrines was significantly associated with increased incidence of overall under-five morbidity and chronic respiratory illness. This unexpected finding was also true in the study done in the arid area of southern Ethiopia (7). This can be explained on the basis of the disadvantage of open pit latrines as permanent breeding sites for flies and sources of bad odour. This can be improved by constructing more appropriately designed latrines. Children living in rural areas experienced less frequent diarrhoeal diseases than those living in semi urban areas. This may be explained by the relatively increased use of open pit latrines in semiurban areas from which the flies transmit enteric pathogens.

In conclusion our study has shown the magnitude of important, common childhood illness in children under five years of age that can be of importance to public health planners and the envisaged IMCI strategy in the prevention of childhood illness. It has shown that age, housing factors such as type of roof, crowding, water supply and sanitation are important determinants for disease. Both the water supply and sanitation as well as housing factors may be amenable to properly designed community interventions.

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