

# Epidemiologic Health Survey of a Rural Peasant Association in Southwestern Ethiopia

[Surafel Kebede\\*](#), [Teferi Fisihatsion\\*](#), [Worksew Tesfaye\\*](#), [Tekleselassie Asres\\*](#), [Nurishek Kemal\\*](#), [Tewodros Dubale\\*](#), [Yonas Tadios\\*](#), [Tadesse Anmaw\\*](#), [Worku Mekonen\\*](#), and [Joel Turner<sup>†</sup>](#), B.Sc., M.Sc.

\* To whom correspondence should be addressed: Jimma Institute of Health Sciences, P.O. Box 378, Jimma, Ethiopia

<sup>†</sup> Faculty of Medicine, McGill University, Montreal, QC, Canada H3G 1Y6

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## ABSTRACT

In many developing countries, health care is either severely inadequate or ineffective. This is especially true in Ethiopia where the rates of infant mortality, child mortality, and maternal mortality are approximately 10-100 times higher than those found in developed countries. However, reliable and comprehensive data on the incidence and prevalence of endemic diseases in many regions of the country are scarce. In the present study, we performed a cross-sectional census survey of a rural peasant association in the Jimma region in southwestern Ethiopia to (i) gather demographic and socioeconomic characteristics of the community and (ii) assess the primary health problems facing the children and women of childbearing age. Our data demonstrate that there was a significant lack of proper sanitation and personal hygiene: 90% of households shared living space with domestic animals, less than 10% of households were equipped with a latrine, and nearly 40% of all water was obtained from unprotected springs and rivers. Of the 166 women of childbearing age (15-49 years), only 13.8% had any knowledge of methods of contraception, and almost 90% had experienced a teenage pregnancy. Less than 2% of all deliveries were aided by trained traditional birth attendants or health professionals. The two-week period prevalence of acute childhood diarrhea was 26.3% and less than 10% of all diarrheal cases were treated with oral rehydration solution. Regarding the nutritional status of children under five years of age, 56.3% were suffering from moderate to severe protein-energy malnutrition based on weight for age, and 57% were moderately to severely stunted based on height for age measurements. Finally, over 90% of randomly chosen individuals were found to be positive for an intestinal parasitic infection. The results demonstrate that there is a great need for improvement in several basic health areas, including the environmental sanitary conditions of the community, as well as the fundamental health status of women and children. Our findings suggest that specific intervention programs must be initiated in order to address the basic health problems facing this rural community.

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## INTRODUCTION

Despite the fact that maternal and child health has been declared a priority health issue by the government of

Ethiopia, the rates of maternal and child mortality in the country are among the highest in the world. Children under 15 years of age and mothers constitute 70% of the country's population and are among the most susceptible groups to disease. Ill health and death are highest in this group, largely from preventable causes (1). An estimated 65% of all deaths in Ethiopia are from pregnant mothers and under-five children, a group that constitutes only 23% of the population (1). A 1992 Ministry of Health report revealed that both the infant mortality rate (111/1000 live births) and the child mortality rate (236/1000) are 10-20 times higher than those found in developed countries. Similarly, the maternal mortality rate in Ethiopia (700/100,000) is about 100 times higher than the same value in developed countries (1).

Diarrheal diseases have long been established as a leading cause of morbidity and mortality throughout the world, where an estimated 3-5 billion diarrheal illnesses and 5-10 million diarrhea-related deaths occur annually among those living in Africa, Asia, and Latin America (2). Children under five years of age are the most vulnerable, where 745 million to 1 billion episodes, and 3-4 million deaths occur each year (approximately 12,000 deaths per day) (3). Consequently, diarrhea-related deaths are second only to respiratory infections as the greatest killer of children in less-developed countries. Currently, Ethiopia is ranked among the top five countries in the world in the absolute number of annual deaths in under-five children (4).

Immunization is one of the most cost-effective preventive health services. Each year more than 330,000 children die from immunizable diseases (5). The six childhood diseases currently preventable in Ethiopia through routine immunization include measles, pertussis, neonatal tetanus, poliomyelitis, tuberculosis, and diphtheria. Together, these conditions are responsible for causing a high proportion of morbidity and mortality among Ethiopian children. In 1980, only 3.4% of children under two years of age had completed the diphtheria, tetanus toxoid, and pertussis (DTP) vaccination. Consequently, in 1980, the Ministry of Health established an Expanded Programme of Immunization (EPI) with the goal of increasing EPI coverage by 10% yearly, to eventually reach universal child immunization by 1990. Though considerable progress has been made in providing vaccines, the full potential of immunization remains unfulfilled. The coverage is much lower than expected: in 1990, the coverage in Ethiopia was reported to have reached 59% (6).

An important policy of the World Health Organization (WHO) is to develop an education program for health professionals that will enable them to respond directly to the specific health needs of the communities that they serve. The Jimma Institute of Health Sciences (JIHS), located 335 km southwest of the Ethiopian capital of Addis Ababa, is Ethiopia's first innovative community-oriented health institution of higher learning (Fig. 1). Established in 1983, this fully accredited institute encompasses the Schools of Medicine, Nursing, Pharmacy, Clinical Laboratory, and Environmental Health. The philosophical commitment of the JIHS is to undertake community-oriented training of health professionals through community-based training and education. The School of Medicine, which opened in 1984, endeavors to contribute to the health of all Ethiopians by producing general practitioners who will ultimately serve the health needs of the neighboring communities (7). Consequently, students use the community as a learning environment throughout their studies, joining with Institute staff, government representatives, and community members to ensure the development and delivery of well-rounded community health care services.

The objectives of this study were to assess the basic health status of children and mothers in a rural peasant association located within the Jimma zone. Specifically, the first component of the study involved the gathering of demographic and socioeconomic characteristics of the peasant association (also referred to as a kebele) of Ketchema. This involved collecting data regarding housing conditions, accessibility and availability of water, methods of waste disposal, and the presence of arthropods and vermin in the community.

The second component concentrated on the area of maternal and child health and family planning practices (MCH/FP). This included gathering information regarding the general status of the mothers in the kebele,

their knowledge, attitudes and practices (KAP) concerning contraception, as well as the occurrence of teenage pregnancy. Further, regarding the health conditions of the children, we assessed the prevalence of diarrheal disease among children under five years of age, the immunization status of children under two years of age, and the overall nutritional status of these children. Finally, the third component dealt with determining the general prevalence and etiology of intestinal parasitic infection within the community.

Based on our findings, the ultimate objective of this project will be to generate a prioritized list of the basic health problems facing this rural community. This will enable us, as well as the community, to draft a specific plan of action and to organize health intervention programs utilizing the concepts and components of the primary health care system.

## **MATERIALS AND METHODS**

### **Design and Population**

A community-based cross-sectional census survey of 903 inhabitants was used in this study. The number of households surveyed for the environmental health, parasitologic, and nutritional surveys was based upon a desired precision of  $\pm 5\%$ . We selected 108 households from the total of 192 for the environmental health study. From each of these, we used random sample tables to select one individual from each household for the parasitologic survey. We used all children under five years of age found in the sampled 108 households (87 children) to assess their nutritional status. For the surveys on MCH/FP, diarrheal morbidity, and immunization status, we sampled all women in the kebele of childbearing age (15-49 years; 166 women), all children under five years of age (175 children), and all children under two years of age (82 children), respectively.

### **Conduct of Study and Data Collection**

We collected information through house-to-house visits, interviewing the mother or head of each household. In addition, information concerning environmental health issues were obtained by discussions with kebele leaders and by direct observations. Information sought included: housing conditions (nature of the houses, presence of domestic animals, degree of illumination and ventilation), waste disposal techniques (presence and usage of latrines), and water supply.

Regarding MCH/FP practices, we prepared a questionnaire dealing with issues of marital status, literacy rate, knowledge and practices of contraception, fertility status (age distribution of pregnancies), and delivery practices to be completed by all selected women during house visits. To assess the health status of children, data were sought using a questionnaire distributed to each child's mother or caretaker. We looked at information dealing with diarrheal morbidity, examining the two-week prevalence of illness, the age distribution, and the management of diarrheal cases.

Nutritional status was obtained through direct, on-site measurements of age, weight, and height of all selected children. Weight was measured using a hanging Salter spring balance for children under two years of age and an upright adult scale for older children. Readings were made to the nearest 0.05 kg. Length was determined with the use of a flat wooden board with which children under two years of age were measured while lying down. Older children were measured using a vertical adult scale with a fixed rod attachment. Readings were obtained to the nearest 0.5 cm.

The extent of intestinal parasitism in the kebele was determined through direct microscopic examination for ova and parasites on unstained smears of fresh stool samples collected from the 108 selected individuals. The four most prevalent intestinal parasites detected within the whole community were recorded.

Finally, immunization status was obtained in one of three ways: through verification of immunization cards,

mother's report, and observation of the child (presence of Bacillus Calmette-Guérin (BCG) scar). Full immunization, as recommended by the EPI is defined as three doses of oral polio vaccine (OPV), three intramuscular doses of diphtheria, tetanus toxoid, and pertussis vaccine (DTP), and one dose of measles, and BCG.

## **RESULTS**

### **Background Information**

The peasant association of Ketchema is found in Jimma Zone, Region 4, about 11 km southwest of Jimma. It covers an area of 560 hectares and is situated at an elevation of approximately 1700 m above sea level; consequently, the climate is described as weyna dega (mid-latitude), where mean annual temperatures range from 16° to 29°C (8). Generally, the landscape is hilly with abundant farmlands, scattered forests and grasslands, streams, and swamp areas (Fig. 2).

### **Environmental Health Survey**

#### *Housing Conditions*

Table 1 summarizes the primary findings of our environmental health survey. Of the 108 households surveyed, virtually all of the houses were tukul-type (circular hut with thatched roofs, mud walls and earth floor) (Fig. 3), with a mean of 4.7 family members living within the same house. Over 90% of the households had domestic animals (dogs, cattle, goat, chickens, etc.) roaming freely within the same house, and all households had problems with insects and other vermin such as flies, lice, bedbugs, and rats. With regard to the degree of ventilation and illumination of the huts, only 10% of households had windows, while just over 20% had dual egresses. More than half of all households inspected were in need of significant maintenance, such as leaky roofs and damaged walls.

#### *Water Supply and Waste Disposal*

None of the houses surveyed had any modern plumbing facilities. All water was obtained from natural water sources such as nearby streams and rivers. Of the 108 households, 90 indicated that they took their water from the nearby spring and 43 from the river (25 houses obtained water from both sources). However, nearly 40% of all water that was used comes from unprotected springs or unzoned rivers (Table 1). In addition, over 52% of households required more than 15 minutes to fetch their water. With regard to the daily water consumption, 28.7% of households consumed more than 30 l/day, 65.7% used between 15 and 30 l/day, and 5.6% used less than 15 l/day.

Less than 10% of the households were equipped with a latrine. As a result, 96.3% of households surveyed indicated that they disposed of their refuse, including feces, in the open field.

### **Maternal and Child Health/Family Planning**

#### *Status of Mothers*

At the time of the survey, there were 166 women of child-bearing age (15-49 years old). This accounted for 18.3% of the total population of the kebele: 157 were married, 7 were widows, 1 was divorced, and 1 woman was single. Of these 166 women, only 8 were literate, representing a literacy rate of only 4.8%.

With regard to the KAP of women pertaining to contraception, only 23 of the 166 women surveyed (13.8%) claimed any knowledge about methods of contraception. Of those 23, only a single mother was using contraception (oral). The reasons the remaining 22 women gave for not using contraceptive techniques

included: a desire for more children (15 women), unavailability of oral contraceptives (5 women), fear of side effects (1 woman), and unawareness of where to obtain pills (1 woman).

### *Fertility Rates and Delivery Practices*

At the time of the survey, 157 of the 166 women had at least one child. Table 2 displays information regarding the maternal age at first pregnancy. The level of teenage pregnancy was found to be 89.2%. Of all recorded pregnancies, there were 444 live births (representing 93%), 17 abortions (3.6%), and 16 stillbirths (3.4%). There have been 212 live births within the last five years (52.4% male; 47.6% female); 175 are still alive, while 37 children have since died.

Of the 157 mothers, 156 indicated that they had delivered at home, while 1 mother attended the Jimma Regional Hospital. Of the 156 who delivered at home, 130 did so with the aid of neighboring family members, 23 had a traditional birth attendant (TBA, untrained), 2 had a trained TBA (TTBA), and 1 was delivered by a health professional.

### *Health Status of Children*

#### I. Diarrheal Morbidity

There were a total of 175 children under five years of age (91 males/84 females) in the kebele, representing 19.3% of the total population. At the time of the survey, the two-week period prevalence for any childhood illness was 32.6%, with diarrheal disease representing the most frequent cause. Of the 175 children, 46 had at least one episode of diarrhea within the past 2 weeks, representing a 26.3% prevalence rate. Figure 4 summarizes the prevalence and age distribution of diarrhea in children under five years of age. Diarrheal illnesses were described by mothers as watery (54%), mucoid (26%), or bloody (20%).

Regarding the management of the diarrheal cases, only 44% received treatment, which included traditional home remedies, plant elixirs, and oral rehydration solution (ORS). Of the cases that were treated, only 20% were administered ORS. This represented a total ORS usage rate of 8.8% for all children suffering from diarrhea. This is despite the fact that the proportion of mothers with children under five years of age who have knowledge of ORS is 66%.

#### II. Nutritional Survey

Eighty-seven randomly chosen children (46 males and 41 females) under five years of age were examined for anthropometric nutritional status. Based on weight-for-age, 38 children (43.6%) were found to be normal or suffering from mild protein-energy malnutrition (PEM), 30 children (34.5%) were suffering from moderate PEM, and 19 children (21.8%) were suffering from severe PEM (Table 3A). The results of height-for-age were as follows: 18 children (20.7%) were normal, 25 children (28.7%) were mildly stunted, 22 (28.3%) moderately stunted, and 22 (25.3%) severely stunted (Table 3B). Based on weight-for-height, 31 children (35.7%) suffered from mild PEM, while 16 (18.4%) and 7 (8.0%) children suffered from moderate and severe PEM, respectively.

#### III. Immunization Status

Within the households surveyed, there were 79 mothers with children under two years of age with a total of 82 children. Only 14 of the children had been fully immunized against polio, diphtheria, pertussis, tetanus, measles, and tuberculosis. Twenty-six children had only been partially immunized, while 42 had not been immunized at all. This represents coverage of only 17.1%. The reasons given by the mothers for failure to immunize their children are summarized in Table 4.

## Parasitology Survey

Stool samples from 103 randomly chosen individuals in the kebele were examined and 94 (91.2%) were found to be positive for either a single or multiple parasitic infection (Table 5). Infection with *Ascaris lumbricoides* was most prevalent (76 cases), followed by hookworm (28 cases), *Trichuris trichura* (8 cases), and *Entamoeba histolytica* (3 cases). Single parasitic infection was by far the most common finding, representing 79.7% of all positive cases. Concomitant infection with two and three parasites were observed in 18.1% and 2.1%, respectively.

## DISCUSSION

The goal of our study was to evaluate the basic health status of a rural peasant association in the Jimma region of southwest Ethiopia. Specifically, we wished to gain a sense of the primary health problems facing women of childbearing age and children, in the hopes of formulating a specific plan of action which would enable the community to augment the health of its population.

The poor housing conditions seen in our kebele depict what is common in most rural villages throughout Ethiopia. The transmission of a multitude of diseases such as typhus, one of the major health problems in Ethiopia, is greatly facilitated by the high prevalence of vermin, such as flies, lice, bedbugs, and rats, as seen throughout the village. The propagation of lice and fleas and the transmission of typhus are even further promoted by persistent poverty and lack of adequate hygiene (9). In addition, as was seen in this kebele, most of the houses are not well-ventilated or illuminated, contributing further to the poor hygienic environment.

The mean number of family members living within each household was 4.7. This value is substantially higher than what has been reported in Gamogofa, Hararge, and Gondar regions in the 1984 Census. In these areas, the values ranged from 3 to 3.8 people/house (1). This problem of overcrowding, together with the severe need of maintenance of the houses we inspected, as well as the high number of households sharing living space with domestic animals, can only further lower the hygienic conditions.

In Ethiopia, as in many developing countries, the availability of safe water and proper sanitation is sparse and considerably worse within the rural population (10). Almost no households have access to modern plumbing facilities. Again, this is especially true for rural villages, where populations are frequently exposed to unsafe water. Twenty-nine percent of the population in Kefa region (where our kebele is situated) obtained their water from unprotected springs and unzoned rivers (11). In the surveyed kebele, this value was as high as 40%, demonstrating an even lower access to safe water compared to the rest of the region. Some of the endemic diseases related to the unsafe water sources include the water borne diseases (typhoid and dysentery), water-washed diseases (trachoma and scabies), and vector-borne diseases (malaria, schistosomiasis, and onchocerciasis) (12).

Yet another problem regarding the use of water in the country is the low rate of consumption. The majority of the population in the kebele consumed between 15-30 l/day, which is lower than the WHO- and USAID-recommended target of 20-40 l/person/day for water project programs in developing countries (11). This could be explained in part by the longer time that it takes the majority of the inhabitants to fetch water, and the shortage of containers for collection and storage.

As a whole, the availability of suitable sanitary coverage is very low in this kebele. Only 10% of the households had access to a latrine. The number of latrines that were in working condition, or that were actually used by the population, was undoubtedly even lower. The common practice of indiscriminate defecation and urination in the open space further increases the risk of contaminated ground water. The poor housing conditions, the high levels of vermin, together with the poor supply of safe water and sanitary services all have a detrimental effect on the health status of the community, and can have a tremendous

impact on morbidity and mortality patterns. A vicious cycle sets in where the increased rates of communicable diseases increase the rate of diarrheal illnesses, intestinal parasitosis, and malnutrition, which ultimately lead to death (12).

The importance of clean water cannot be overemphasized. The percentage of people that obtain their water from contaminated sources can be minimized through the construction of protected springs and through the designation of larger areas of rivers zoned for human consumption. In addition, there is a need for increased construction of new latrines using community resources. Perhaps just as important is the need to encourage the use of already available latrines through health education, with the hope of bringing about behavioral changes concerning attitudes and practices (i.e. the use of the open field as refuse disposal).

Only 13.8% of mothers of childbearing age (15-49 years) claimed to have knowledge about contraception. This is significantly lower than the 62% reported in the 1990 Fertility and Family Survey (13). The rate of contraceptive use in the kebele among those who claimed to know about contraception was only 4.3%, similar to the rates reported in the above study. This may indicate that women have not received an appropriate broad base of information about the importance of contraception. The low rate of contraceptive use might also reflect the social prestige and economic security identified with having large numbers of children, and a negative attitude toward limiting family size, as seen in many Ethiopian societies (14). In some areas of the country, children are judged as part of the family's wealth without considering the burden of such a large family. Since there is evidence that literacy is strongly associated with contraceptive use, the 4.8% literacy rate among the women of our kebele may play an important role in the lack of use of modern contraceptive methods.

The percentage of mothers experiencing a teenage pregnancy was 89.2%. This figure is comparable to studies done in other rural regions of Ethiopia (15). Young primigravidas are at increased risk for obstructed labor, ruptured uterus, sepsis, and the subsequent development of fecal and urinary fistulae. In addition, illegal abortions, post-partum depression, and child abuse are commonly reported in teenagers who become pregnant (15).

The home delivery rate in our kebele was almost 100%. Of these, only 1.3% were aided by trained traditional birth attendants (TTBA). Delay in seeking obstetric care, resulting from lack of transport and the lack of TTBA, profoundly raises the morbidity and mortality risk of the mother as well as the neonate. Our data indicate that there is a need to improve maternal and obstetric health services in the kebele, through education and the prevention of unwanted teenage pregnancies, and through the continual campaign of improving obstetric facilities by increasing the number of deliveries attended by TTBA.

Acute childhood diarrhea (ACD) is a major contributor to malnutrition and growth retardation (4), and predisposes the child to subsequent severe illnesses that endangers his/her life. ACD is the leading cause of death in children under three years of age and accounts for over 200,000 deaths per year in Ethiopia. Current estimates of the two-week period prevalence of ACD in Ethiopia ranges from 10-14%, and that of Kefe region are at 16.9% (16). The prevalence in our kebele was as high as 26%. This could partly be explained by the overall decline in the general health status of the kebele, as compared to others in the region, as well as to the close association of malnutrition, intestinal parasitism, and low immunization coverage with diarrheal disease. Poor access to safe drinking water, the general lack of latrine use or garbage disposal sites, and the abundance of unsanitary food handling practices greatly influence the incidence of ACD (17). In addition, it was found in the kebele that of all children under five years of age, 72% were currently being bottle fed; this would undoubtedly have an additive effect on the prevalence of diarrheal illnesses due to the contamination from dirty bottles and unclean foods.

With regard to the management of ACD, the cornerstone of most diarrheal-control programs, including the program in Ethiopia, is the use of ORS. First implemented in the 1980's, ORS has been shown to significantly



enhance fluid reabsorption and decrease childhood mortality (18). However, the use of ORS in the kebele was only 8.8%, which is much lower than the 23% usage reported from the National Control of Diarrheal Diseases (CDD) Programme (19). A number of factors may have played a role in this phenomenon, including the shortage of supply of ORS, inadequate health education regarding the proper use and function of ORS to combat diarrheal-related dehydration, the lack of training in the home preparation of ORS, and the general misconceptions that feeding the child during diarrheal illnesses will only aggravate the condition and should therefore be stopped. This point is supported by the fact that although 66% of mothers were aware of ORS, only 8.8% actually used it.

Famine has ravaged Ethiopia for hundreds of years, most recently in 1984-85 when an estimated one million people died. Mortality rates of children under five years of age reached as high as 300/1000 children per month in some refugee camps (20). The most common form of malnutrition reported was protein-energy malnutrition (PEM), where health sequelae included stunted growth, body wasting, retarded mental growth, and ultimately, death (21).

Recent anthropometric studies in rural Ethiopia have found that over 50% of children suffer from moderate to severe PEM (22). In our kebele, the value reached 56.3%. These figures indicate that, despite living in an area with adequate rainfall and fertile land, the children in this kebele are as affected by malnutrition as others from less productive regions of the country. This attests to the gravity of the problem and the need for a greater understanding of the issues involved. The possible lack of food, as opposed to cash crops in this region, may partially contribute to the problem. There has been a long history of cash crop production in the kebele (e.g., coffee). The great dependence on it at the expense of food crops may have resulted in a more vulnerable food security situation.

A major cause of high morbidity and mortality of children in Ethiopia relates to the six preventable childhood diseases which are the focus of the Expanded Programme of Immunization (EPI): measles, pertussis, neonatal tetanus, poliomyelitis, tuberculosis, and diphtheria (6). The immunization status of children under two years of age in our kebele was only 17.1% for fully immunized (three doses of oral polio and DPT, and one dose of BCG and measles), while 31.7% were partially immunized. These values are very low when compared to a study done in 30 randomly selected communities serving as EPI sites in the Kefe region. In that study, 65.6% of children were fully immunized while 29.2% were partially immunized. The main reasons for the low level of coverage observed in our kebele were primarily based on a lack of proper knowledge by the mothers concerning the importance and the scheduling of specific vaccinations.

To increase the coverage of immunization for the kebele, we have sought means to encourage health stations to increase the number of outreach sites in the kebele, mobilize community health workers to motivate mothers in the kebele, and provide health education regarding immunizable diseases and their burden in the community.

Intestinal parasitism is widespread in Ethiopia, caused mainly through the ingestion of fecally contaminated food or water. It is a condition seen mainly as a result of poverty and poor environmental sanitation (23). Most intestinal parasites in Ethiopia live within specific climatic and geographical conditions. In our kebele, the overall prevalence of intestinal parasitism was 91.2%. This extremely high rate of infection is comparable to the 93% prevalence of intestinal parasitism reported in a representative population of 14,465 Falasha immigrants in Israel (24). The four most prevalent parasites documented in our sample population included a protozoan (*E. histolytica*) and three nematode helminths (*A. lumbricoides*, hookworm, and *T. trichura*).

*Ascaris* is one of the commonest and most widespread human parasites in the world, estimated to infect a quarter of the world's population (22). As a soil-transmitted parasite, *Ascaris* is most closely associated with poverty, crowding, and poor sanitation (23). Ascariasis was by far the most common parasitic infection observed in the kebele (81% prevalence), underlying the need for profound improvements in the general



health status of the community. Our study was conducted during the rainy season which may have contributed to the high prevalence rate of *Ascaris* infection since rain and moisture increase the survival rates of the ova and larvae in the soil. However, the values in our kebele were much higher than in other midlatitude regions of the country, where infection rates were approximately 45% (25). Similar comparisons can be made with the other parasites, where the rates of infection in our kebele were similar or higher than comparable regions throughout the country (26,27).

In summary, we have obtained data regarding the overall health status of a rural peasant association located within the Jimma zone in southwestern Ethiopia. First, our findings show that the environmental conditions of the community are in great need of improvement, especially in the area of personal hygiene, sanitation, uncontaminated water sources, and vermin eradication. The construction and use of garbage pits and pit latrines, and the availability of a safe water supply in the community are of paramount importance. Second, we have determined the basic health status of the women of childbearing age and have established the need for improvements in maternal and child health care, decreases in teenage pregnancy through education and increased acceptance of contraception, and increases in trained traditional birth attendants to help in childbirth. Third, concerning the health status of the children, a great deal is needed to lower the prevalence of ACD, improve their nutritional status, and increase the rate of immunization. Furthermore, we need to educate the caregivers about the correct use of ORS. Finally, our data indicate that the rate of intestinal parasitism is much higher than in similar regions elsewhere in the country. Intervention programs must now be initiated and carried out through full community participation, the cooperation of health institutions, including the community department of the JIHS, government, and other non-governmental organizations, in order to address the specific health issues of the community.

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## **BIOGRAPHY**

**Surafel Kebede, Teferi Fisihatsion, Worksew Tesfaye, Tekleselassie Asres, Nurishek Kemal, Tewodros Dubale, Yonas Tadios, Tadesse Anmaw, and Worku Mekonen** are currently in their fourth year of medical studies at the Jimma Institute of Health Sciences (JIHS) School of Medicine (Jimma, Ethiopia). Their research was performed as part of the JIHS Community-Based Training Program and was supported by the Community Health Department of the JIHS. Many of the authors' research interests are in community health. **Joel Turner** received his Master's degree in the Department of Neurology and Neurosurgery from McGill University in 1995. He is currently a third-year medical student at McGill. His work in Jimma was conducted while doing a research elective in Ethiopia in the summer of 1995. His work was funded, in part, by the Osler Medical Aid Foundation. He is interested in pursuing a career in general surgery.

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