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THE ETHIOPIAN JOURNAL OF HEALTH DEVELOPMENT

Addis Ababa University Faculty of Medicine Department of Community Health

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PRIMARY HEALTH CARE APPROACH**

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MASS TREATMENT OF ONCHOCERCIASIS WITH IVERMECT AT BEBEKA COFFEE PLANTATION IN ETHIOPIA

I. Operational aspects for drug distribution and adverse reactions observed.

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ABSTRACT: A longitudinal study of mass treatment of onchocerciasis with ivermectin is going on at Bebeke Coffee Plantation in Ethiopia. In this paper we report findings of a pilot study conducted at the initial stage of the project to assess safety and feasibility of launching mass-therapy using this drug. Of 2083 persons examined between 23 and 30 April 1990, in two sub-localities, Berhane and Olme, in Bebeke Coffee Plantation, 826 (39.7%) persons were diagnosed as cases of onchocerciasis by clinical and skin snip examinations. Ivermectin was then administered to 640 persons eligible for treatment. Following treatment no severe adverse reactions were observed and only 51 cases, (8%), sought treatment for mild to moderate mazzoti type reactions and 7 of them (1%) had temporary incapacitation. In addition, 27 cases were systematically selected, among those treated on the first and second day, and examined daily for 4 days and pattern of adverse responses were noted. Over all therapy was well accepted.

INTRODUCTION

The presence of onchocerciasis (river blindness) in Ethiopia was first confirmed from Keffa Administrative Region in 1939 by Italian scientists (1). It is now estimated that more than one million people are suffering from this disease (2), mainly in the southern and north-western part of the country (Fig. 1). The major vector *Simulium damnosum* S.I. and members of this species complex are however widely distributed even outside the onchocerciasis belt (3).

Large scale development activities are being established in onchocerciasis endemic areas of the country. Therefore, control of this and other tropical diseases should be an important component of the development endeavour in these areas. Ivermectin, the new microfilaricide, has been shown to result in a prolonged reduction in microfilarial density and once or twice yearly administration of this drug in mass therapy programme either alone or in combination with vector control measures is considered to be a possible strategy for interrupting transmission (4,5,6).

Studies targeted at measuring the effect of regular community-based administration of single doses of ivermectin with respect to long term adverse effect, reduction in morbidity and transmission are underway in many African countries (7).

Similarly, studies on the long term impact of ivermectin on microfilarial load, morbidity as well as the determination of

* National Research Institute of Health

** Bebeke Coffee Plantation Enterprise

frequency of treatment are also presently undertaken by the Ethiopian National Research Institute of Health (NRIH).

In this paper observations made concerning adverse reactions and safety of ivermectin (mectizan), in the population at Bebek Coffee Plantation Enterprise in Keffa Administrative region in Ethiopia is reported and operational aspect of drug distribution is discussed.

STUDY AREA AND POPULATION

Bebek Coffee Plantation is found in Keffa Administration, 590 kms south west, from Addis Ababa.

The area has an altitude of 900 to 1000 m and annual rainfall of about 1728 mm. According to the census taken by the health center in Bebek in January 1990 the total population is 18,884.

There are 5 farm sites and most workers live in apartments built by the project. All houses are numbered. Under the supervision of a central clinic, there are health stations at each farm site and health care is given free of charge.

METHODOLOGY

Of the 5 farm sites, Berhane and Olme-Gojeb were selected for this study, because of the availability of a relatively well organized health facility to handle possible reactions.

About 50 households were asked to come to the clinics per day and all persons reporting to the clinics were registered and subjected to skin snip examination for microfilariae. They were then presented to a physician for clinical examination and determination of eligibility for treatment.

Clinical diagnosis was made after examining skin lesions and checking for the presence of elephantiasis, hydrocele, hanging groin and nodules. Ophthalmologic examination was not included since a previous study by an ophthalmologist did not indicate presence of eye lesions attributable to onchocerciasis in the area.

Examination for the presence of *Onchocerca* microfilaria was made by skin snip biopsies taken from both buttocks using Holth type punches. Previous observation (8) has shown that the buttocks are the best anatomical parts for sniping in Bebek. The snips were weighed on a torsion balance and then immersed in 0.5 ml of physiological saline in microtitre plate wells and kept closed for a maximum of four hours. Microscopic examination was done under dissecting microscope and the microfilarial count was recorded.

Those positive for onchocerciasis either by skin snip examination or clinically or by both methods and eligible for treatment were provided with a treatment card and asked to return to the clinic next morning fasting, to receive treatment.

Before administering the drug they were told about the disease and plans of the programme and about the possible adverse reactions following therapy as well as the availability of help for any untoward reactions. They were then weighed and asked to swallow ivermectin (150 micgm/kgm BWT) on the spot.

Data on adverse reactions from all treated were collected by recording the type of complaints for which they returned to the clinic. Among those treated on the first and second day 27 people were systematically selected and followed in-depth for 4 consecutive days.

RESULTS

The total number of persons examined was 2083, and male to female ratio was 100/74. According to the 1990 census, male to female ratio of the population in the area was 100/77.

The overall prevalence rate of onchocerciasis in the two villages was 39%. Of the total 826 persons determined as cases 17% and 53% were positive clinically and by skin snip examination, respectively, while 30% were positive both by skin snip examination and clinically. It should be noted that fewer women and children were positive both clinically and by skin snip examination (Table 1).

Of those determined as cases, 85% of the males and 58% of the females received treatment.

Among the untreated cases 111 (13.4%) were the illegible ones and of the eligible also 75 persons (10%) did not appear for treatment. Reasons for the illegibility were lactation, pregnancy, age (<5 years) and illnesses.

8% of the total cases treated with

Table 1. Number of persons diagnosed as cases of onchocerciasis by age, sex and methods of diagnosis

Age group	Sex	No. Diagnosed	Percent Positive			
			SS*	Clinical	Both	Total
			(a)	(b)	a & b	
<5	Male	2	100	0	0	100
	Female	5	80	20	0	100
5-14	Male	26	80	12	8	100
	Female	18	78	6	16	100
15-44	Male	541	44	17	39	100
	Female	175	74	17	9	100
45+	Male	48	40	19	41	100
	Female	11	55	35	10	100
Total	Male	617	46	17	37	100
	Female	209	73	18	9	100
Total	Male & Female	826	53	17	30	100

*SS = Skin Snip

ivermectin, (i.e. 10%, 6%, and 9% of those diagnosed clinically, by skin snip examination and both, respectively) returned to the clinic seeking treatment for various types of adverse reactions (Table 2). Most of them responded well to Aspirin and/or Antihistamine therapy and only 7 (1%) persons required 3 to 5 days sick leave.

Table 3 shows pattern of adverse reaction recorded through the four day follow up of the 27 cases treated on the first and second day of the mass therapy. In addition, 6 of them (22%) expelled adult ascaris after the ivermectin treatment. Most of the reactions lasted less than 4 days.

DISCUSSION

Ivermectin a macrocyclic lactone produced by an actinomycete, *Streptomyces avermetilis*, introduced first as an antiparasitic agent in livestock (4), has undergone extensive trials, including comparative (9-12) and dose finding studies (13-15) in onchocerciasis patients. According to these studies ivermectin has been found to have important properties that make it suitable for mass treatment, and for many reasons it is found superior to formerly used drugs, such as Diethylcarbamazine (DEC) and Suramin. Ivermectin is given in a single dose but DEC is given over an extended period and Suramin requires parenteral administration. The mazzoti type reactions are milder in ivermectin and it causes no damage to the eye while ocular changes have been associated with DEC (9,16). The dermal microfilarial density remains low for a longer time after ivermectin therapy than with DEC (9-13).

It is also established that ivermectin does not kill the adult worm but inhibits production of new microfilariae for several months and retreatment every 6 or 12 months is necessary (17). For this reason besides study of the safety of the long term use of ivermectin, cost effective methods of its delivery needs to be determined.

Major options for the distribution of the drug in community-based therapy of onchocerciasis are 1) to treat skin snip positive cases only, 2) to treat skin snip positives and clinically suspected cases, 3) to treat entire population except the illegible ones.

The options involving skin snip examination would be expensive and time consuming, and a significant proportion of infected individuals, especially those with low microfilarial densities could be missed (8,18). This study has shown that among those who had mazzoti type reaction, there were those diagnosed on clinical bases only (Table 3), which indicates that they were false negatives.

The prevalence rate of onchocerciasis in Bebek is very low in women and children but

Table 2. Persons treated for adverse effect of ivermectin by method of diagnosis

Types of Reaction	Clinical n=10		Skin Snip n=20		Both n=21		Total n=51	
	No	%	No	%	No	%	No	%
Pruritis	8	80	7	35	14	67	29	57
Oedema	4	40	8	40	8	38	20	39
Headache	1	10	4	20	1	5	6	12
Vomiting	1	10	2	10	2	10	5	10
Dizziness	2	20	2	10	4	19	8	16
Myalgia	2	20	7	35	5	24	14	27
Diarrhea	0	0	1	5	2	10	3	6
Other	1	10	2	10	1	5	4	8

high among the males above 15 years of age (8). Accordingly, male field workers, who are nearly 40% of the total population, could receive mass treatment. The risk associated with ivermectin administration in uninfected individuals, especially adult males, is minimal, since most side effects are caused by the death of the microfilariae. On the other hand, some individuals will benefit from its deworming effect.

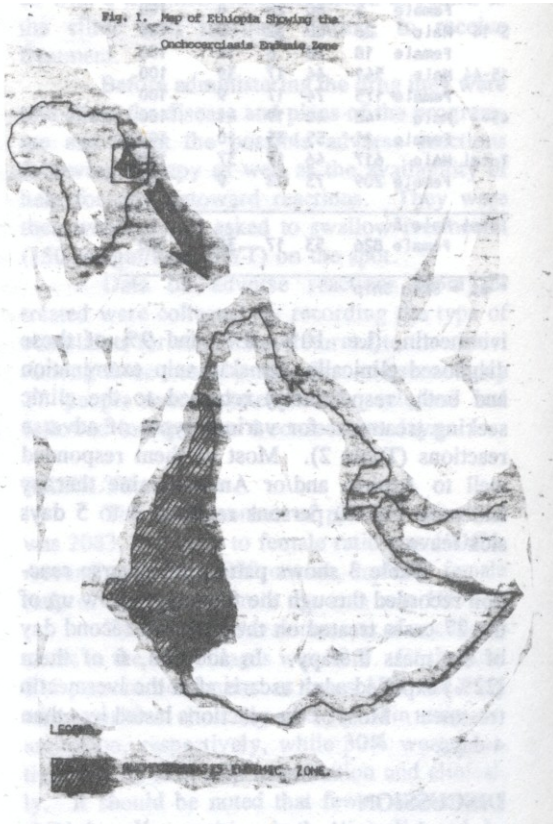
Table 3. Adverse effects recorded during first 4 days on 27 onchocerciasis patients treated with mectizan

Type of	Before treatment	1st day	2 day	3rd day	4th day
Pruritis	5	12	10	7	-
Myalgia	4	8	9	4	2
Dizziness	1	9	6	3	-
Headache	1	5	6	1	-
Oedema Facial or Peripheral	-	7	9	5	2
Abdominal pain	3	4	5	3	1
Nausea	-	4	2	-	-
B/P lowered	-	2	3	-	-
Temp. increased	-	-	3	-	-

In this study it has been shown that most reactions occur on the next day of the therapy. Therefore, if the drug is given to field workers on Fridays or Saturdays it is possible to minimize the number of workers requiring leave for the visit to the clinic and the temporary incapacitation seen in some patients after therapy. Screening by skin snip examination, would however be imperative in children and women because, besides the prevalence rate being low, most of the contraindications also concern these sectors of the population.

The safety of a drug and its acceptance by the community is very important for the success of a mass therapy. Adverse reactions observed in this study are similar to those observed elsewhere (7). The mild to moderate reactions and the deworming effect of ivermectin have rather demonstrated its effect in a short period and its acceptance by the community had been clearly observable in the study area.

Subsequent reports will be given on further findings of this on-going study and it is hoped that after obtaining more experience on the cost-effective methods of delivering treatment and determining optimal retreatment interval an extended treatment programmes will be launched in collaboration with the health services in the endemic areas of the country.



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ELECTROPHORETIC STUDIES ON ENZYMES OF THE SNAIL INTERMEDIATE HOSTS OF *SCHISTOSOMA MANSONI* FROM ETHIOPIA.

Tilahun Woldemichael*, MSc.

ABSTRACT: Enzyme patterns of three populations of *Biomphalaria pfeifferi* and two populations of *Biomphalaria sudanica* from Ethiopia were studied by starch gel electrophoresis. The preliminary results indicated that four of the six enzyme systems investigated appeared potentially useful in discriminating between these closely related species. Acid-phosphatase, esterases, 3-hydroxybutyrate dehydrogenase and xanthine oxidase showed distinguishing characteristics either in terms of mobilities, or number of bands. The migration of acid-phosphatase was consistently faster in the *B.sudanica* populations than in any of the *B.pfeifferi* populations. Unlike acid-phosphatase, intraspecific variation among the populations of a species was observed for the esterases, 3-hydroxybutyrate dehydrogenase and xanthine oxidase although clear differences were still apparent among these enzymes between *B.sudanica* and *B.pfeifferi*. The geographically closely located populations of *B.pfeifferi* from Wollo exhibited similar enzymatic activities but differed in most enzymes from the geographically separated population from Harar region. Further investigation is recommended to strengthen the present observation.

INTRODUCTION

In Ethiopia, both intestinal and urinary schistosomiasis are endemic. The former caused by *S.mansoni* is represented in nearly all of the administrative regions (1,2) while the urinary form is limited to some low and arid areas of the Awash Valley (3,4) in the Wabeshebel valley (5) and a recently found focus in the western region bordering the Sudan (6).

The proven snail intermediate hosts are *Biomphalaria pfeifferi* and *Biomphalaria sudanica* for *S.mansoni* (7) and *Bulinus abyssinicus* (8) and *Bulinus africanus* (6) for *S.haematobium* in the Awash valley and in the western region respectively. The initial studies on the local fauna were conducted by Wright and Brown (9) followed by a thorough distribution study mainly on the intermediate hosts by Brown (7). Consequently, it is now known that *B.pfeifferi* is found in a wide range of habitats including small streams, rivers and lakes. *B.sudanica* on the other hand appears to be commonly reported from the southern Ethiopian Rift Valley lakes of Margherita, Awasa and Zeway (7,10,11).

A number of taxonomic features have been investigated for the identification of fresh water snails. Commonly, they are described on the basis of their shell morphology and internal anatomy.

* National Research Institute of Health

According to the initial guidelines of African snail identification by Mandahl-Barth (12) and a later review and compilation meant to suit local species by Meskal (13), the fully grown *B.sudanica* measures about 22 mm in diameter and *B.pfeifferi* about 15 mm. In practice, however, these measurements often overlap particularly when viewing young and young adults. With progressive age, many of the shell characters are also subject to change (12). The difficulties of the identification of snails on morphological and anatomical grounds have been adequately discussed elsewhere (14,15).

This project was designed to establish whether enzyme patterns could be utilized for species identification. To our knowledge, this diagnostic approach has not been employed on Ethiopian species for this purpose. Traditionally, identification has been based mainly on the nature of habitats following the initial studies on their distribution, because additional proven discriminating characters are lacking. Yet, the possibility of the snail species colonizing a variety of new habitats is not remote. For instance, experience in Tanzania (16) indicated that *B.sudanica* was spreading out into man-made dams, permanent and seasonal water courses and seepages around lakes. A similar spread of the Ethiopian *B.sudanica* to habitats other than the Rift Valley lakes is highly probable because of the extensive human migration, intensive and increased water related development schemes and resettlements that are presently being undertaken. Confirmation of the proper identification by enzyme characters could help towards the understanding of the ecological conditions that may favor the snail intermediate hosts and eventually may have a bearing on the choice of appropriate control approaches. As there is no documented experimental evidence on the comparative degree of susceptibility of the two species, the enzymatic pattern studies may also serve as a background information for a possible long term future work on the differential compatibility, if any, of the two species with Ethiopian strain(s) of *Schistosoma mansoni*.

MATERIALS AND METHODS

Three populations of *B.pfeifferi* were examined; two of these were from streams of Bati and Kemisie, Wollo region, and the third group was from the irrigation canals of Amibara along the Middle Awash Valley, Harar region.

The other species consisted of *B.sudanica* populations collected from Lake Zeway, Shoa region and from Tikurwoha, Sidamo region. The latter specimen was originally collected by David Brown in 1969 and has been maintained in the laboratory of the Department of Zoology, the Natural History Museum, London where this investigation was carried out. The other snail samples were collected at different times between 1986 and 1988 and colonies established at aquaria of the Zoology Department of the Museum. The snails were kept under identical laboratory conditions and fed on boiled and dried lettuce together with *Oscillatoria* spp. The aquaria temperature was maintained at 26 degree centigrade.

Bulinus truncatus from Dezful, Iran, which has been cultured at the Zoology Department of the Museum since 1977 and whose electrophoretic mobility has been determined, was used as an internal standard in the present work.

Each specimen used in the study was greater than 4 mm in diameter and all were free of schistosome infection. Water soluble extracts of snails were used for electrophoresis. Usually, five individuals of each population representing each species were processed at a time.

The enzyme systems analyzed were, esterases (Est), Acid-phosphatase (Acp), 3-hydroxybutyrate dehydrogenase (HBDH), Glucose-phosphate isomerase (GPI), Diaphorase (DIA) and Xanthine Oxidase (XO).

The gel was made up with 12% hydrolysed starch and was prepared in accordance with the method of Smithies (17). The gel buffer systems varied according to the enzymes investigated. Jernes B buffer system (18) was employed for DIA and XO. Buffers for the rest of the gels were prepared in accordance to the human buffer system (19). The tank buffers also differed according to each enzyme system. The range of voltages applied and the duration of electrophoresis were 200 to 500 volts for 3 to 3 1/2 hours depending

on the buffer systems and enzyme types.

The activity or mobility of the enzyme on the electrophoretic plate was visualized by a colour reaction after the addition of specific substrates and staining chemicals and incubated at 37°C. Detection methods of the enzyme activities under investigation were as described by Bergmeyer (20) and Harris and Hopkinson (19). The schematic representation of the patterns are drawn to describe their position and numbers. The relative electrophoretic migration of the enzymes on the gels was determined by the distance covered by the enzyme bands from the application line. The relative mobility values (RM) for each snail species was thus calculated as the average electrophoretic mobility of the samples as measured in mms and this divided by the average electrophoretic mobility of the control also in mms.

RESULTS

The table shows the mobility values of the enzymes in both species expressed relative to the standard snail. Figures 1 to 11 also show representative enzyme patterns of one population of a species in relation to the standard.

Consistently, Acp migration was faster in the *B.sudanica* than in the *B.pfeifferi* populations. Each species population was represented by a single enzyme band pattern with a more marked anodic migration in the *B.sudanica* than in the *B.pfeifferi* group. A representative pattern and migration of this enzyme system is shown in figure 1. The migration of HBDH were also faster in *B.sudanica* (figure 2) except between the Tikurwoha population of *B.sudanica* and the Amibara *B.pfeifferi* population where their mobilities were reversed (figure 3).

There was generally poor resolution of the enzyme GPI. The few successful developments were with *B.pfeifferi* from Kemisie and *B.sudanica* from Tikurwoha which appeared to show similar and virtually inseparable band patterns and mobilities (figure 4). Similar mobilities and patterns were also observed in the populations of both species for the enzyme DIA showing differences only in the intensity of the bands (figure 5).

The *B.pfeifferi* populations from Wollo all tended to lack detectable XO actively. The *B.sudanica* populations from Tikurwoha and Zeway, on the other hand, showed consistently a one banded system. This pattern is represented in figure 6. The Amibara *B.pfeifferi* population, unlike the other *B.pfeifferi* populations,

Table. The average relative mobility values (R_m) of the enzymes after electrophoresis of whole snail representative populations of Ethiopian *Biomphalaria pfeifferi* and *Biomphalaria sudanica* with respect to the standard snail, *Bulinus truncatus*.

Snail species	Est	Acp	HBDH	GPI	DIA	XO
<i>B.pfeifferi</i> (Kemisie)	0.53	0.74	0.74	1.03	0.99	=
<i>B.sudanica</i> (Tikurwoha)	0.18	1.02	1.01	0.97	0.96	0.86
<i>B.pfeifferi</i> (Amibara)	1.91	0.61	1.14	+	0.97	0.86
<i>B.sudanica</i> (Tikurwoha)	0.18	1.04	1.07	+	1.00	0.85
<i>B.pfeifferi</i> (Amibara)	A-1.80* B 2.40*	0.69*	1.2*	+	0.96*	0.87
<i>B.sudanica</i> (Lake Zeway)	1.7*	0.8*	1.15*	+	0.98*	0.90*
<i>B.pfeifferi</i> (Bati & Kemisie)	0.54* 0	64*	0.72*	+	1.00*	=
<i>B.sudanica</i> (Tikurwoha)	0.18*	1.02	0.93*	+	1.00	0.89*

Note: * - not repeated, single value
 = - no enzyme activity detected
 + - poor resolution
 A - average value for pattern one
 B - average value for pattern two

showed detectable XO activities (figure 7).

Figure 8 illustrates two band patterns in the Est of *B.pfeifferi* from Amibara and one pattern in *B.sudanica* from Zeway. In *B.pfeifferi* of this population, there were two faster bands in a member of the group (pattern A, fig.8-2) while three faster anodic bands were shown in the rest of the group (pattern B, fig.8-3). A one pattern of four strong anodic bands were observed in the *B.sudanica*. As shown in figure 9, the enzymes in the *B.pfeifferi* from Amibara revealed relatively more faster migrating bands and a moderate cathodal migration while the corresponding *B.sudanica* population from Tikurwoha showed fewer bands and a faster cathodal migration. The pattern for the same enzyme in a population of *B.pfeifferi* from Kemisie in comparison with a population of *B.sudanica* from Tikurwoha is shown in figure 10. One pattern type was observed in both species. Both exhibited cathodal migration but it was pronounced in the *B.sudanica* than in the other species population. The population from Bati and a specimen from Kemisie against *B.sudanica* from Tikurwoha is shown in figure 11. Est patterns with a cathodal migration were present in the *B.sudanica* but absent in the *B.pfeifferi*.

DISCUSSION

On the basis of the present electrophoretic study, four enzyme systems (Est, HBDH, Acp and XO) appear to show differences between the two species.

As shown in figures 8 to 11 major differences in the Est patterns exist between the two species and among members of the same species. Variations in patterns, number of bands and direction of migration were observed. For example, in *B.pfeifferi* from Amibara, two patterns were expressed (one with three and the other with two faster bands) while in *B.sudanica*, there was only one pattern. The marked patterns shown by the cathodal migration of the enzyme fraction (figure 11) also appeared distinctive only to the *B.sudanica* species. Pronounced cathodal migration was also observed in the *B.sudanica* than in the

B.pfeifferi from Kemisie (figure 10). The polymorphism of Est patterns within members of a population such as in the *B.pfeifferi* from Amibara (figure 8) may be due to the existence of genetically distinct individuals. Conversely, the other populations of *B.pfeifferi* and the two populations of *B.sudanica* showed a uniform monomorphic pattern for each population group which indicates similar genetic constitution in the population. Variation in Est patterns among populations of the same species was also observed by previous investigators. Wright and File (21) reported differences of the enzyme patterns in the populations of the genus *Bulinus*. Malek and File (22) studying *Biomphalaria* spp of the Western hemisphere and Wium-Anderson (23) working on African *B.alexanderina* all observed variations of the enzyme patterns within populations belonging to the same species. Clearly there is a need to examine many individuals from each population. Although variable within and between populations, Est may serve in discriminating between the two species. This impression is in line with the opinion of Wright et al (24) who emphasized the validity of electrophoresis of Est for taxonomic purposes of *Biomphalaria* and *Bulinus*. On the basis of Est from the hepatopancreas of African *Biomphalaria* spp, Wium-Anderson (25), using starch gel electrophoresis was able to separate four species among which were *B.pfeifferi* and *B.sudanica*. The proposal put forward by Henrickson and Jernes (26) of the possibility of *Biomphalaria* species identification based on Est patterns is supported by the present observations.

As shown in figure 1, Acp patterns appear to offer a means of separating *Biomphalaria* species. The consistently faster mobility of the enzyme from *B.sudanica* populations, compared with that of the same enzyme in *B.pfeifferi* may prove to be a useful character to distinguish the two species with less ambiguity than the Est.

Discrimination of the two species involving the electrophoresis of XO appeared even simpler since the absence or undetectable activity of the enzyme in all *B.pfeifferi* populations (except that from the Amibara population) was a common feature. In contrast, the presence of detectable single pattern system of this enzyme in all of the *B.sudanica* populations studied under the same conditions indicates a parameter probably useful in separating at least the Wollo populations of *B.pfeifferi* from *B.sudanica* (figure 6). However, separation of the Amibara population, on the basis of XO from *B.sudanica* seems difficult because of the similarity of migration and patterns in both organisms (figure 7).

Failure to detect XO in the Wollo *B.pfeifferi* populations might reflect the scarcity of the enzyme in the entire tissues of the snail.

The HBDH enzyme as investigated in the *Biomphalaria* populations from Wollo showed slightly different patterns with respect to the extent of mobilities. The bands in *B.pfeifferi* resolved near the point of origin whereas the enzyme in *B.sudanica* from Tikurwoha had a slightly faster mobility. As shown in figure 3 however, the difference did not hold good for *B.pfeifferi* from Amibara and *B.sudanica* from Tikurwoha. The enzyme in the Amibara populations showed relatively faster mobility indicating the Amibara population to be different in the HBDH activity as well. These differences may be associated with the geographical locations since the Amibara snails were from a region different from the areas where the other two populations came from.

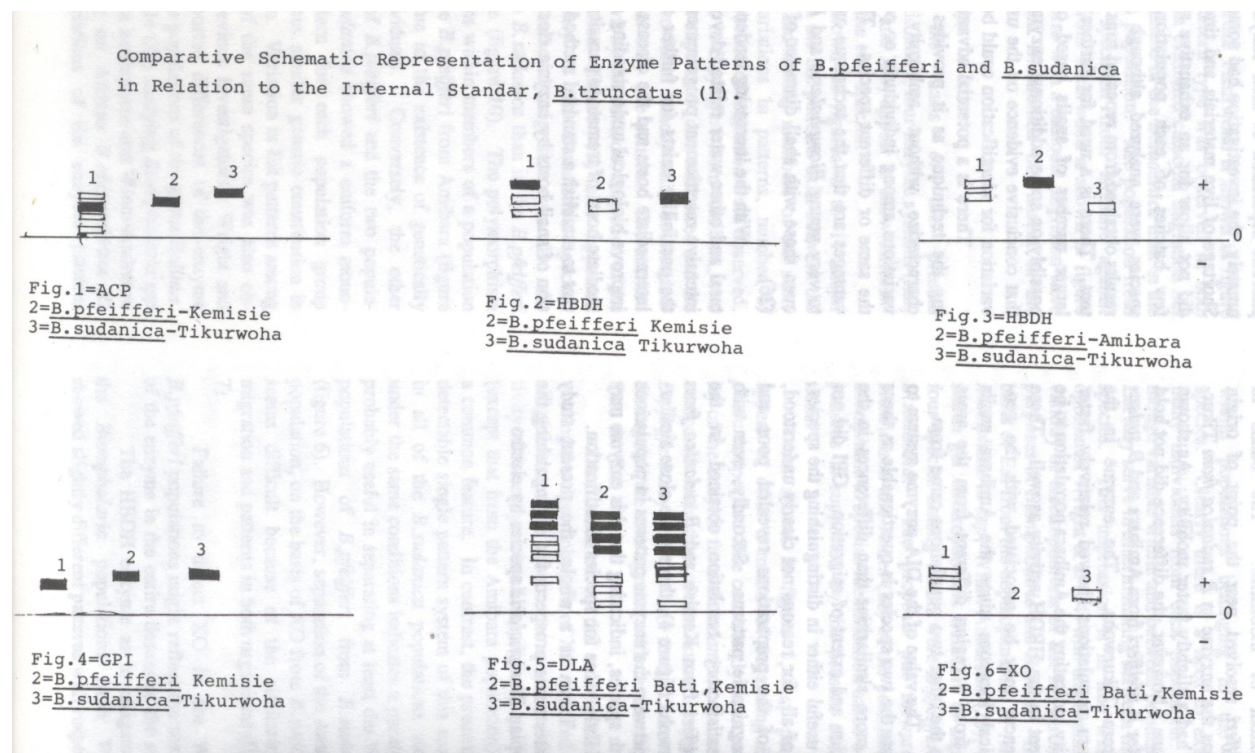
The value of the DIA enzyme system to separate the two species is questionable as there were more similarities than differences in the direction and extent of migration. GPI did not seem useful either in distinguishing the species. First of all, for reasons not clearly understood, most of the preparations revealed poor and unrecognizable patterns. Secondly, even with the satisfactory resolution obtained in the *B.pfeifferi* from Kemise and *B.sudanica* from Tikurwoha (figure 4), there were close similarities between the enzyme patterns in populations of both species, indicating that this enzyme may be of little value for species identification.

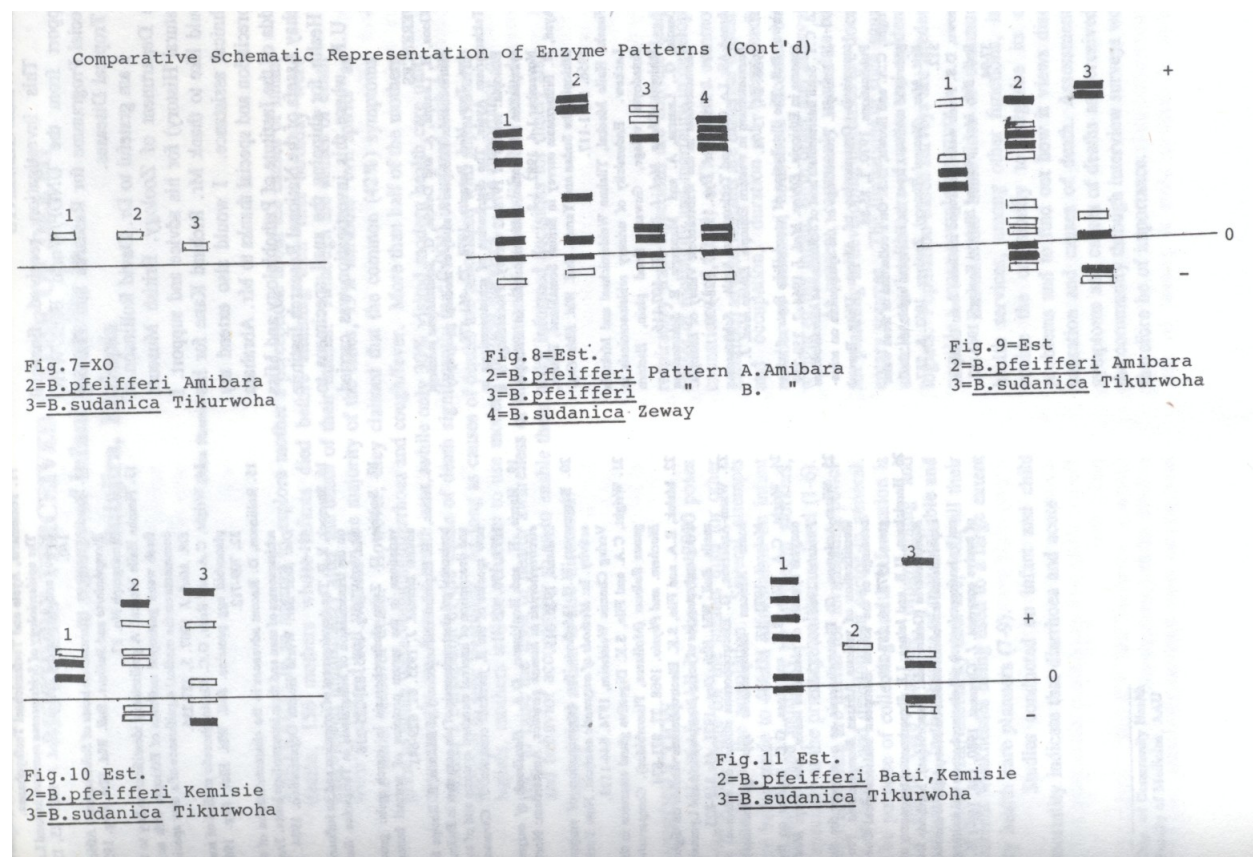
Taken as a whole, the present study indicates some prospects for distinguishing the Ethiopian *Biomphalaria* species by electro-phoretic separation of their enzymes. Unfortunately, the investigation had some limitations. Shortage of live materials and time constraints did not allow for an exhaustive study; only a few batches of each population from each species were analyzed although most of the results

obtained from repeated runs were consistent. There is a need for further studies on a larger number of snails based on these and possibly on some additional enzyme systems so that conclusive evidence on the use of enzyme variation for identification could be provided.

There is a potential advantage in utilizing the technique as it provides a means to characterize without ambiguity the genetic variations among individuals or populations of the same or different species. The added advantages are that the technique can be applied to very young *Biomphalaria* and *Bulinus* snails even those with shell diameter of about 4 mm (26).

With the increasing tendency of agricultural and other water related developments and intensive resettlement programmes in Ethiopia, the possibility exists for further spread of the intermediate hosts and the disease. In order to improve biological understanding of snail intermediate hosts of trematode parasites it is important to establish a standard method of identification of snail hosts by enzyme electrophoresis.





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MOTHERS' PERCEIVED CAUSE OF DEATH

a survey of infant mortality in

Butajira, Ethiopia

Desta Shamebo*

ABSTRACT: In an attempt to explore mother's perceptions about the causes of infant deaths, 156 mothers whose infants died before attaining their first birthday were interviewed immediately after the death of their infants. Although the causes of death were ill defined and vague in the majority of the cases, 19% attribute "evil spirits" as the main cause of death. However, they claimed that the common (42%) symptoms prior to death were vomiting/diarrhoea and cough/fever. More than half of the mothers never sought any form of health care, while only 30% visited modern health care unit. Mother's perception of the cause of death significantly ($p < 0.001$) interfered with her decision to seek treatment. As long as causes of deaths are associated with supernatural beliefs, mothers will be reluctant to use modern medical services. The importance of IEC to raise the level of health awareness of the community and modify their attitude and behavior accordingly so as to enable them make informed decisions for timely and appropriate action is also discussed.

INTRODUCTION

Health for All by the year 2000 poses greater challenge for the infants than for other segments of the population. Several attempts are being made to obtain information on infant morbidity and mortality by all health workers, especially at the primary health care level (1-6). Mortality data are useful for formulating policies in health and development sector in general. The purpose of collecting health information is for health care planning, programming and evaluating. In the absence of more reliable and complete data, mortality data are, with all their current weaknesses being used to a large extent by health care planners (7-9).

Studies conducted on infant and child mortality indicate that diarrhoea and acute respiratory tract infections are still the leading causes of morbidity and mortality in developing countries (1-5,10,11). The factors commonly identified as determinants are maternal education and occupation, duration of breast-feeding, number of children, household income, birth-weight of the infant, birth order and interval.

At present, commonly used data-bases for planning in developing countries are documentary sources. The limitations of such sources are clear to health care planners and epidemiologists. Population-based surveys are needed to provide a more complete picture.

Because the basic idea of community health services, among other functions, is to enable the community to diagnose its own problems and to find out how it views disease causation and causes of death. Assessment of symptoms and causes of deaths as perceived by the community through interview surveys would therefore be of importance.

OBJECTIVES

The objectives of this study were:

1. to find out what mothers understand about causes of infant deaths;
2. to obtain information on actions taken regarding the infants prior to their deaths.

STUDY POPULATION AND METHODS

The study was carried out in southern Shoa Administrative Region in a sub-district (Woreda), 130 km south of Addis Ababa, where a base-population of 29,000 was enumerated in 9 Peasants' Associations (12). The basic demographic data were collected during February and March 1986. The two Peasants' Associations were excluded because they were under the process of villagization during study, which was conducted between January and July 1987.

Information on infant mortality was collected from mothers using questionnaires. Enumerators who were previously trained and had worked for a census and demographic surveillance were given additional training on the procedure for collecting information on infant deaths from mothers. A procedure known as 'verbal autopsy', which is a method of assessing the most probable causes of death by constructing a standard questionnaire from algorithms of symptoms of common killing diseases, was used (1,10). The nurse in charge of Butajira Health Center went with the team to the field as a supervisor.

The variables for which data were collected were:

For the infant: date of birth, date of death, age at death, sex, weight at birth (assessed as small, normal or big by the mother), shape at birth (assessed as well-shaped or grossly malformed by the mother), symptoms prior to death, duration of the symptoms, assistance obtained, treatment given, admission to health care unit, attendance at Maternal and Child Health clinics immunization status.

For the mother: age in years, age at first marriage, number of marriages, religion, ethnicity, parity, duration of work during pregnancy, number of children ever born alive by sex, number of children alive at present by sex, gestational age, place of delivery, mode of delivery, attendant at delivery, mother's perception of the causes of death.

The study was both retrospective and prospective, in the sense that infants who died before attaining their first birthday and those who were alive but who died at subsequent visits to individual houses, were registered in eight of the ten Peasants' Associations. The occurrence of the deaths was further ascertained by the chairmen or other officials of the Peasants' Associations, as the relatives had to be accompanied to the graveyard or church by elder members of the "Edir" (association of members for death ceremonies). However, there would be a possibility that few of the dead infants might be excluded as they may not be buried in officially designated burial places. Thus, information was obtained on 143 infant deaths and 16 still-births from 159 mothers.

DATA ANALYSIS

Data were processed using the IBM PC. Simple descriptive statistics and contingency tables are used in the analysis. Chi-square test is used to test significance.

RESULTS

A total of 143 infant deaths and 16 still-births were registered during the study period. Three of the deaths that occurred in children over the age of one year, were excluded from the analysis. Thus, a total of 140 infant deaths were analyzed; however, the 16 still-births were included only for the analysis on the causes of death.

Characteristics of mothers

Age: 30% of the mothers were in the age-group 25-29 years, the median being 28.8 years. Eighty-eight percent of the mothers were married between the ages of 15-19 years, 85% of which was their first marriage.

Parity: Fifty percent of the mothers were below parity five.

Literacy, ethnicity and religion: Eighty-nine percent of the mothers were illiterate. Forty-nine percent were Meskan ethnically, and 83% were Muslims.

Eighty-six percent of the mothers had never attended antenatal clinics. Ninety-five percent of them were engaged in heavy work (carrying water from river, cultivating, cutting enset, going to a market carrying goods on the back and the like) till delivery of the infant.

Place of delivery and birth attendant: Ninety-seven percent had delivered at home assisted by untrained traditional birth attendant (88.3%) and self/neighbor (8.7%). An insignificant proportion (3.1%) had delivered at health care units.

Average number of children born alive was 4.7% per woman, while the average number of surviving children was 2.9 per woman, the number surviving being higher for females than males.

Characteristics of infant deaths

Sex, gestational age, birth-weight and shape: Fifty-seven percent of the infants who died were males; most were born at term. Thirty-one percent were considered as small, 55% as normal and 14% as big babies. Thirteen percent of the small babies were pre-term. Overall, 96.5% were well-shaped (normal) compared to 3.5% who were grossly-malformed. Of the well-shaped babies, 15.5% were born pre-term. Infants classified as small were more likely to be grossly malformed than others (Table 1). There is a slight preponderance of grossly malformed babies born to mothers in the age group 15-19 years. Big babies were also born more to mothers of parity 4 and below, compared to those para-5 and above.

Table 1. Percent distribution of infant deaths by weight and shape

Weight	Well Shaped	Grossly malformed	Total
Small	28.0	2.8	30.8
Normal	55.2	0.0	55.2
Big	13.3	0.7	14.0
Total	96.5	3.5	100.0

Mode of delivery: Ninety-two percent of the deliveries were vaginal vertex.

Age at death, symptoms and duration: Fifty-nine percent of the deaths occurred under the age of one month. Median age at death was 15 days. Major symptoms prior to death are as indicated in table 2 with a preponderance of cough and fever (21.4%) and vomiting/diarrhoea (20.7%). A significant number (25%) were also classified as others, which includes neonatal tetanus, prematurity, malaria, accidents, sudden death of infant, and the like.

Table 2. Number and percent distribution of symptoms prior to death

Symptoms	Number	Percent
Vomiting/diarrhoea	29	20.7
Cough/fever	30	21.4
Swelling of body	11	7.9
Loss of weight	6	4.3
Others	35	25.0
Do not know	29	20.7
Total	140	100.0

For the majority (77.3%) of the cases the symptoms lasted less than 15 days, 80.3% of these occurring in those less than two months of age at death (Table 3). Of the deaths which occurred below the age of two months, the highest rate (23.4%) occurred for mothers in the age group of 25-29 years and for parity below five (36.6%). 80% of the deaths of the grossly-malformed also occurred under the age of two months.

Table 3. Percent distribution of duration of symptoms by age at death

Age at death in months	Duration of symptoms in days				Total
	0-14	15-29	30-44	45+	
0-2	62.1	4.1	0.7	1.4	68.3
3-5	7.6	4.1	0.0	1.4	13.1
6-8	4.8	2.1	2.1	0.7	9.7
9-11	2.8	3.4	0.7	2.1	9.0
Total	77.3	13.7	3.5	5.6	100.1

Assistance sought: Attempts were made by mothers to get assistance from health personnel in 30% of the cases. However, in the majority (51.4%) of the cases, nothing was done. No significant association was observed between mother's perception of symptoms and treatment sought.

Of those who visited health personnel, 69% were given treatment of one kind or another. In addition to treatment given by health workers, some 9.3% had also given roots/leaves of trees. The overall application of such treatment was 20%. Only 9.4% of the cases were admitted to a health care unit and 3.8% were partially immunized.

Cause of death: Evil spirits accounted for 18.6% of the causes according to them. The "bird of the sky", which the mothers believed was different from evil spirits, accounted for 13.5% of the causes (Table 4). The causes of

Table 4. Distribution of causes of death - Mothers' view

Causes of death	Number	Percent
Allah's willing	4	2.6
Labor difficulty	14	9.0
Evil spirit	29	18.6
Diarrhoea/vomiting	3	1.9
Cough/fever	10	6.4
Refusal to suck	6	3.8
ARI	3	1.9
Bird of the sky	21	13.5
Others	48	30.8
No idea	18	11.5
Total	156	100.0

death as perceived by mothers were very diverse and ill-defined and therefore coded as 'others' (30.8%). A significant association ($p < 0.01$) was observed between mother's perception of the causes of death and treatment sought. Most mothers did not seek treatment for causes of death they attribute as supernatural ("evil spirit" or "bird of the sky").

Leka & Jorge: Survey of the knowledge & application of essential drug lists

Causes of deaths as assessed from the verbal autopsy showed that 21.1% were due to ARI, followed by neonatal tetanus (15.4%) and diarrhoea (13.5%). Still-births accounted for 10.3% of the cases (Table 5).

Table 5. Causes of death as assessed from verbal autopsy

Causes of death	Number	Percent
Still-birth	16	10.3
Prematurity	15	9.6
Neonatal tetanus	24	15.4
Malaria	5	3.2
ARI	33	21.1
Measles	8	5.1
Diarrhoea	21	13.5
Malnutrition	7	4.5
Accidents	11	7.0
Others	16	10.3
Total	156	100.0

The major causes of deaths, ARI, neonatal tetanus and diarrhoea mainly occurred below the age of two months at death (Table 6).

Table 6. Percent distribution of causes of death by age at death in months

Cause of death	Age at death in months				Total
	0-2	3-5	6-8	9-11	
Still-birth	10.3	0.0	0.0	0.0	10.3
Pre-maturity	9.6	0.0	0.0	0.0	9.6
Neonatal tetanus	15.4	0.0	0.0	0.0	15.4
Malaria	0.6	1.3	0.6	0.7	3.2
ARI	14.5	3.8	1.3	1.5	21.1
Measles	0.0	0.0	1.3	3.8	5.1
Diarrhoea	6.6	3.0	2.9	1.0	13.5
Mal- nutrition	0.6	1.3	1.3	1.3	4.5
Accidents	1.9	2.7	1.7	0.7	7.0
Others	8.8	0.9	0.6	0.0	10.3
Total	68.3	13.0	9.7	9.0	100.0

DISCUSSION

Identifying health problems is one of the most important steps in the planning of health care interventions. As there are serious limitations of the use of routine statistics for health care planning (13), a shift to information gathering through community-based surveys becomes not only mandatory but a necessity, especially when supported by local community participation.

Routine reporting systems even in established health care units are often inaccurate and incomplete. While 100% accuracy can not be guaranteed in such studies, at least completeness could be.

Given these shortcomings, the classification used for verbal autopsy, mothers' perception of the symptoms and causes of death, however crude, fairly accurately represents the nature of infant mortality that prevails in the community. It also indicates the mothers' understanding of what constitutes an illness and her choice of actions to be taken regarding the infant.

Low birth-weight as an important indicator of the risk of survival of a baby and its healthy growth and development is an already established fact (14,15,16). Low birth-weight rate for East Africa is reported as 12% (17). From various hospital statistics in Ethiopia, this rate is between 9-11% (18). When expected number of live-births and low birth-weight rates are calculated for the study area, the 31% of the babies described by mothers as small at birth yields a low birth-weight rate of 21% which is almost twice of those

reported from institution-based systems. Of course, the birth-weight in this study was as assessed by the mother and it may not be accurate; thus the difference could be due to the methodology. However, we do know that the birth-weight measurements taken within health care units are also subject to many errors. In a similar but larger survey (1), the low birth-weight rate was 12.2% and was the probable cause of death in 17.9% of the cases of infant mortality.

Illiteracy rate is high by any standards. Several studies have shown an association between literacy of mothers and infant mortality (4,19-22). The utilization of antenatal clinics is almost non-existent. In addition, almost all mothers (95%) were engaged in a heavy work till delivery of the infant. The deleterious effect on the foetus of heavy work during pregnancy is already documented (23,24).

Of the 140 infant deaths, 68.3% occurred under the age of two months. Median age at death was 15 days indicating high and early loss of life.

Major symptoms prior to death were cough and fever, vomiting and diarrhoea. Mothers also gave diverse, often unclassifiable symptoms on several (25%) occasions. Although this calls for further refinement of the questionnaire, the symptoms of the three diseases most commonly associated with mortality still predominate. It is an indication that the Peasants' Associations have not fully benefited from the several crucial programmes launched in the country to improve child survival. Accelerated Child Health Development (ACHD), the components of which are Expanded Programme of Immunization, Control of Diarrhoeal Diseases, Acute Respiratory Tract Infections, Maternal and Child health & Family Planning, and Health Information System, are examples of such programmes (25). The programmes have remained within the institutions.

The symptoms lasted less than 15 days for 77% of the cases, pointing to the acuteness of the conditions. This probably did not give the mothers enough time to look for alternative sources of health care as only 30% took their infants to health personnel. It could also be a reflection of what constitutes an illness for them, when and what action to take then. Mother's perception for causes of death seems to play a major role in deciding whether or not to take the infant for treatment.

The admission rate to a health care unit represented only 9.4% of the deaths, an extremely low rate of utilization even for a terminal case. The goal of "Immunization For All by the year 1990" is also at stake for children in this community as only 3.8% were partially immunized.

Mothers still believe that evil spirits prevail. This raises questions as to how far we have been and are penetrating into the community to raise health awareness. This is an indication that insufficient progress has been made in enabling people to take their own health into their own hands. Certain essential activities could be undertaken by people in the community in their own homes. There is sound evidence to suggest the need for intensive educational effort through appropriate means and methods in order to positively influence health behavior in such communities. This is an important intervention that will promote improved mother and child health care including increased utilization of available health services and programmes.

Neonatal tetanus as a cause of death accounted for 15.4% of deaths. Only five of the studied Peasants' Associations have Traditional Birth Attendants. As most (88.3%) of the deliveries are attended by these cadres of health workers, it casts doubt as to how the umbilicus has been handled. The possibility of infection after circumcision can not also be ruled out.

The age at death and causes seem to correlate very well. Causes of death at different ages are definitely of greater importance for age-specific health care intervention planning

The present survey has provided information, although crude, which would be useful for planning of programmes for the improvement of infant survival. Where diagnostic tests can not be carried out, where the majority can not make use of the available resources due to various reasons, and where available service records and information systems can not give a true picture of the non-users, such means of arriving at probable causes of death would serve to plan relatively appropriate health care interventions for infants in particular and children in general.

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The census carried-out in 1986, covering a population of 29,000, would serve as an epidemiological study-base, the potentials of which would be great for related studies on infant and child mortality. With the introduction of continuous surveillance of vital events, it would be possible to do analytical studies on such issues in the near future and thus build firm foundation for intervention programmes.

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PRESCRIPTION PATTERN OF ANALGESIC DRUGS IN 13 RURAL & REGIONAL HOSPITALS OF ETHIOPIA

Teodros Leka*, Mohammed Abadir*

ABSTRACT: Analgesics are among the most prescribed categories of drugs. They are mostly prescribed in combination with other classes of drugs and rarely alone. A study covering 13 hospitals in 7 regions (50% of the total Ministry of Health hospitals in those regions) was conducted to assess the pattern, extent and type of analgesics prescribed and to suggest the possible ways by which drugs could be used more rationally. The study showed that of all patients seen in out-patient departments, (in one day) 34.2% received analgesics. Little variation in prescribing patterns was seen among the hospitals. In the majority of cases there was only one analgesic per prescription and 6.3% with 2 analgesics. On the other hand, more than 90% of analgesics were prescribed in combination with other classes of drugs. The four popular analgesics prescribed were dipyrone 34.2% , acetylsalicylic acid (Aspirin) 28%, paracetamol 19.1% and avafortan (camylofin and dipyrone) 17.7%. Analgesics (pain killers) in most cases should only be used when the cause of pain can not be removed. Further, as most of them are toxic and potentially dangerous for use, it is an area in which improvement could and should occur.

INTRODUCTION

Drugs play a major role in the delivery of health care and in the patient-doctor-disease relationship. Their widely increased use (in the present world) has drawn the attention of medical personnel and health authorities throughout the world. In the last 50 years there has been a remarkable increase in their use in medical practice (1). Too many countries are being affected by the steady increase in drug consumption (2).

The number of drugs per-prescription ranges from 2 to 8 in different parts of the world and varies by level of health institutions (2). On the other hand, the extent of some specific category of drugs and their rational use have not been given due concern. Though antibiotics are believed to be widely used and mis-used, analgesics are also equally used and misused. Analgesics are prescribed in almost all existing levels of health institutions. Among the great number of analgesics on the market the majority are considered to be dangerous, ineffective, irrational or needlessly expensive (3). Therefore they are supposed to be used rationally and prescribed only when necessary.

Some of the commonly occurring types of pain to which analgesics are prescribed or used can be relieved by alternative mechanisms, such as cold water applied to skin burns, heat or massage to relieve muscle pain and alkali mixtures to relieve the pain of peptic ulcer (3). The purpose of this paper was to analyze the extent and type of analgesics prescribed among hospitals in Ethiopia. Along with the above main objectives the following were also assessed; the number of drugs prescribed per patient among hospitals, the trend of prescribing drugs in generic or brand name among prescribers, and the type and number of drugs prescribed by therapeutic category.

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BACKGROUND

The 13 hospitals in seven regions covered in this study have more or less the same level of health services. Except one which serves as a national referral the rest are regional or district hospitals. In most of the hospitals surveyed, general practitioners, nurses and health officers are authorized to diagnose and prescribe drugs. In one hospital health assistants are also engaged in such activities. However, the extent to which the latter are exercising such activity is not well known.

Each of the hospitals renders the following kinds of health services polyclinic, maternal and child health care, Expanded Programme on Immunization, delivery service etc. The number of patients attending out-patient departments daily ranges from 55 to 147. The number could be high if special programmes and follow ups are included.

The pharmacy section responsible for drug purchase, storage, and dispensing is under the control of pharmacist in 11 of the hospitals. Drugs are sold at the cost price in 50% of the hospitals. Six hospitals mark up a profit: 25% mark up 3 hospitals and 2% mark up at the other three. No hospitals dispense drugs free of charge unless a patient has an exemption paper.

METHOD

A study was carried out in 13 hospitals located in seven regions. These were selected randomly out of hospitals found in 14 administrative regions excluding Eritreia and Tigray. One hospital from each of two regions (Arsi & Bale), two from each of the other four regions (Sidamo, Illubabor, Gojjam & Wollo), and 3 from the remaining one region (Hararghe) (Table 1). The regions are considered to be representative of the geographical location and cover the eastern, southern, south-west and north-west zones of the country. In regions where there is only one hospital it is directly included in the study. From regions where two or more hospitals are available priority was given to one regional and one or two rural hospitals.

Data was collected from the medical records of out-patients treated for one day. For each patient the following information was recorded: patient's name or card number, age, sex, diagnosis, name, strength and quantity of drug prescribed. A total of 1284 patient records were collected. Of all patients those who received analgesic drugs were recorded on a separate format irrespective of the diagnosis. The information recorded for analgesics prescribed were: type of analgesics (brand & generic name), strength, dosage form, quantity, number of analgesics in combination with other classes of drugs, and analgesic injections. Brand name products, for certain drugs, were recorded under their generic name. Few combination analgesics were taken as they appeared in the original record. In addition to the above information drugs prescribed in that particular day in all the 13 hospitals were categorized therapeutically.

RESULTS

A total of 1284 patients were treated in one day in the 13 hospitals covered under the study. To these patients 2610 drugs were prescribed. This makes the average number of drugs per-patient to be 2.0. There is almost no significant difference among the hospitals in the average number of drugs prescribed per-patient (Table 2). On the other hand, the trend in prescribing drugs in generic name seems to be encouraging; 70% (1837 of 2610) of drugs were written in generic name.(Figure 1 & 2).

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Table 1. Name and location of the 13 hospitals.

Ser. No.	Name of hospital	Region
1	Asella Hospital	Arsi
2	Asebe Teferi Hospital	Hararghe
3	Debre Markos Hospital	Gojjam
4	Dessie Hospital	Wollo
5	Dilla Hospital	Sidamo
6	Felege Hiwot Hospital	Gojjam
7	Gambela Hospital	Illubabor
8	Hiwot Fana Hospital	Hararghe
9	Jijiga Hospital	Hararghe
10	Metu Hospital	Illubabor
11	Thasas 11 Hospital	Bale
12	Woldia Hospital	Wollo
13	Wolayita Hospital	Sidamo

The analysis of the recorded data showed that 34.2% (439 of 1284) of patients were given analgesics.

More than 90% of these prescriptions had only one analgesic. The number of analgesics per-prescription revealed the existence of a similar trend in all the hospitals (Figure 3).

The tendency to prescribe analgesics in combination with other classes of drugs was also similar among the hospitals surveyed. 90.4% (397 of 439) of patients were given an analgesic in combination with other classes of drugs. In two hospitals the percent is as high as 100 i.e. all who were given an analgesic had also taken other classes of drugs (Figure 4).

When looked into the kind of dosage forms prescribed tablets were found to be prescribed in the majority of cases. The use of injection is limited. 10% (44 of 439) of patients were only given analgesic injection. However, in some cases both the tablet and the injection dosage forms had been prescribed for a single patient.

Table 2. Average number of drugs per patient in 13 surveyed hospitals.

Hospital	Region	No.out patient seen/day presc.	Total no. of drugs	Average of drugs/pt
Dessie	Wollo	95	176	1.9
Woldia	Wollo	102	218	2.1
Ass.Tef.	Hararghe	55	80	1.5
Hiw.Fana	Hararghe	90	214	2.4
Jijiga	Hararghe	90	194	2.2
Thasas 11	Bale	127	301	2.4
Assela	Arsi	100	181	1.8
Dilla	Sidamo	147	336	2.3
Wolayita	Sidamo	120	246	2.1
Metu	Illubabor	70	126	1.8
Gambella	Illubabor	90	170	1.9
Deb.Markos	Gojjam	84	151	1.8
F.Hiwot	Gojjam	114	217	1.9
Total		1284	2610	2.0

The four popular analgesics prescribed were: dipyron 34.2%, acetylsalicylic acid (asprin) 28%, paracetamol 19.1% and avafortan (camylofin and dipyron) 17.7% (Figure 6).

Drugs prescribed in one day in the 13 hospitals were categorized therapeutically into analgesics, GIT, CVS, respiratory, vitamins, antibiotics and antimicrobials, antihelmenties and other like drugs for eye, ear, throat, skin and hormones.

Table 3. Abbreviations used for the name of hospitals.

Ser No	Abbreviations	Name of hospitals
1	A	Assela Hospital
2	AT	Asebe Teferi Hospital
3	DM	Debre Markos Hospital
4	D	Dessie Hospital
5	DI	Dilla Hospital
6	FH	Felege Hiwot Hospital
7	G	Gambela Hospital
8	HF	Hiwot Fana Hospital
9	J	Jijiga Hospital
10	M	Metu Hospital
11	T	Thasas 11 Hospital
12	W	Woldia Hospital
13	WO	Wolayita Hospital

The analysis showed that antibiotics were prescribed in high frequency and stood first 27% (711 of 2610) followed by analgesics 19% (498 of 2610). Antihelmentics and anti-parasites taken as one, vitamins, respiratory and CVS drugs were the fourth, fifth and sixth respectively (Figure 7).

DISCUSSION

Prescriptions these days are seen to be the necessary outcome of a patient-doctor relationship. It remains important factor where improvement should be made in the rationalization of health care delivery. The practice of "poly pharmacy" or multiple prescribing is an additional problem of rational drug therapy. Nowadays few patients are observed returning home without receiving one or more drugs as a result of a visit to a hospital or other health care institution. This survey revealed that the average number of drugs prescribed per patient was 2.0. No marked difference was observed among hospitals surveyed.

The result was found to be more or less similar and or less when compared with the practices seen in other countries. The number of drugs per-prescription is around two in Switzerland, in hospitals of South Brazil it is 8.6, three as a minimum in Tunisia and Kenya and five in most health centers in Cameroon (2). The dangers and negative effects of multiple prescribing include exposing a patient to the side-effects of many drugs and being as main factor in minimizing patient compliance to drugs prescribed. Under the essential drug policy prescriptions are recommended to be written in generic name to the benefit of patients and realization of the policy. The fact that generic drugs are less costly than but as active as their brand counter parts is sufficient enough to force one to use the generic name in prescribing. The results obtained in this aspect are quiet encouraging. However, further orientation and education is still required as 30% adhere to brand names.

Antibiotics were the first (27%) and Analgesics (19%) were the second most frequently prescribed category of drugs. Because infectious diseases are the major causes of illness and death in Ethiopia, there is some justification in the extensive use of antibiotics. However, studies indicate that they are misused and indiscriminately prescribed, resulting in the development of bacterial resistance and abnormal consumption. Analgesics are also believed to be drug where misuse and over-consumption are observed.

Although pain is the major concern of patients in most clinical situations, the rational use of analgesics (pain killers) in hospitals and other health care institutions could be improved and calls for the attention of prescribers. A significant percent of patients seen in one day were given analgesics, i.e. 34.2% (439 of 1284). Of those given analgesics, 93.6% were given one and 6.3% were given two analgesics. On the other hand, more than 90% of such patients received an analgesic in combination with other class of drugs. In two hospitals, 100% of such patients were given an analgesic in combination with other class of

drugs. One can conclude that one third of the patients who came to the hospital are likely to get one or more analgesics irrespective of the illness or complaint. The indiscriminate use of these drugs, besides exposing patients to their side-effects, also uses up a significant amount of the drug budget of health institutions. In the assessment of drug use of all health institutions in one region of the country it was reported that the actual expenditure on analgesics was two times greater than the expected expenditure (4). The situation calls for the development of a standard treatment schedule to which prescribers should adhere, thereby managing properly the small drug budget available.

Unless the condition of the patient calls for an injection because it is an emergency case, tablets are recommended due to their advantages over injections. Tablets are less costly and easy for the patient to self administer. In this respect, the results obtained in the survey are quite satisfactory and should be encouraged. Only 6 of the 13 hospitals used analgesic injections and although in one hospital injections accounted for about 50% of the analgesics (Figure 5).

Contrary to the great number of analgesics on the market only a few are considered to be safe, effective and therapeutically useful. "Three quarters of the 356 analgesics on the market should not be recommended for use because they are dangerous, ineffective, irrational or needlessly expensive" (3). Although no drug is said to be safe there are some whose risk: benefit ratio requires that they be removed from the market. The results of the survey showed that four distinct types of analgesics were used with high frequency in all the hospitals surveyed. Dipyrone (brand and generic) was the leading analgesic which accounted to 34.2%. This finding agrees with the survey carried out over a six-month period at a pharmacy in Addis Ababa, where Hoechst's brand of the pain killer dipyrone was one of the "most commonly prescribed individual drug" (5). The continuance of its widespread use both in and out of health care institutions is attributed to the previous publicity and promotion performed by manufacturers.

The use of dipyrone as stated in extra pharmacopeia is justified only in serious or life-threatening situations where no alternative antipyretic is available or suitable (6). Agranucytosis (loss of white blood cells due to bone marrow damage) is the main toxic effect of dipyrone. Dipyrone has been banned or restricted or withdrawn from the market or prohibited from importation in Australia, Singapore, Norway, Greece, Sweden, Philippines, Federal Republic of Germany, Israel, Peru, USA, Venezuela, Denmark, Saudi Arabia, Bangladesh, Egypt and Mexico (7). Can there be a kind of dipyrone devoid of this side effect? If not, what justification can be given for its high use among health institutions surveyed?

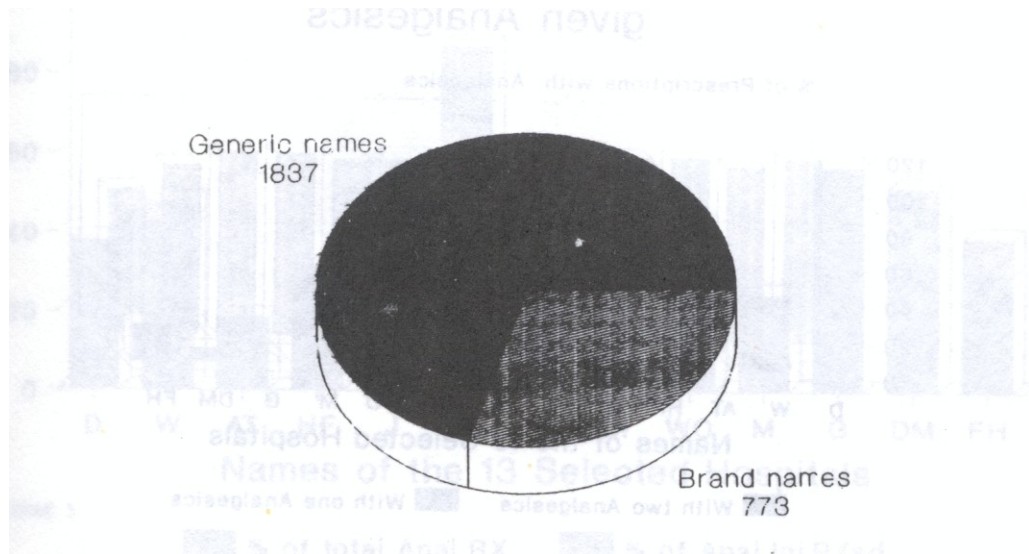
At present, warnings against the most widely used analgesics like aspirin in children under one year, due to the development of Reye's Syndrome, and paracetamol, which is believed to cause liver and kidney damage when used regularly for prolonged period, are appearing from various corners. The fact that in any drug therapy where the risk outweighs the benefit, and no alternative drug is available, even the toxic ones are justified for the benefit of the patient. However, the proliferation of drugs on the market has given us the opportunity to select the least toxic ones and therapeutically advantageous drugs.

In conclusion to produce a clear picture of the pattern of drug use in different health institutions, we recommend surveys to be conducted on the following issues:

- the number of drugs per prescription or patient at different levels of health institutions,
- a survey on whether the prescriptions from any health institution would also provide information on the pattern and prevalence of disease,
- whether treatment is appropriate or there exists a mis-match between the diagnosis and the drugs prescribed, a survey on factors contributing to this irrational use of specific categories of drugs.

FIGURE 1

Total percent of drugs prescribed in generic and brand names



Percent of drugs prescribed in generic and brand names

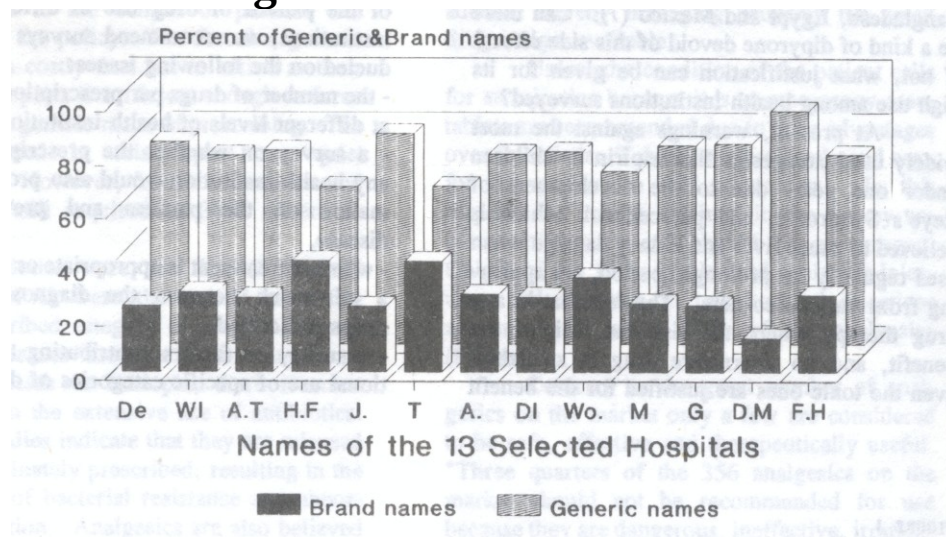
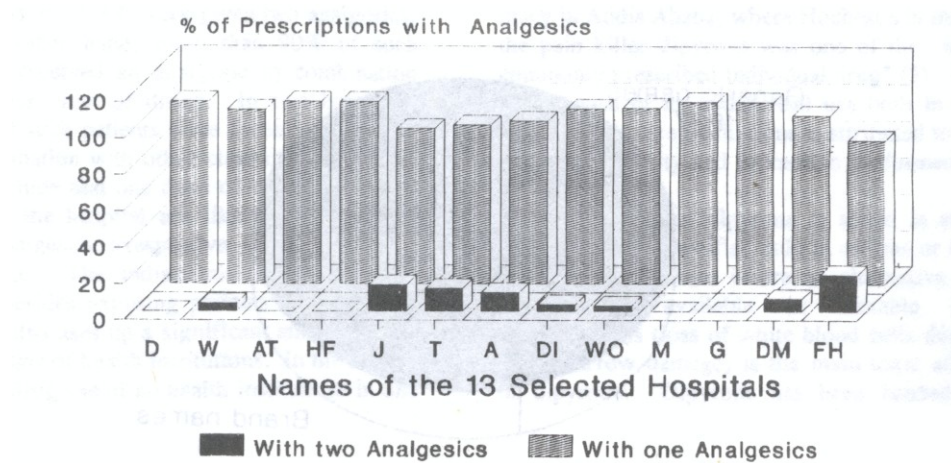


Figure 3

Percent of Prescriptions with on or two Analgesic (s) Pf all patients given Analgesics



Anagesics RXed in combination with other classes of Drugs

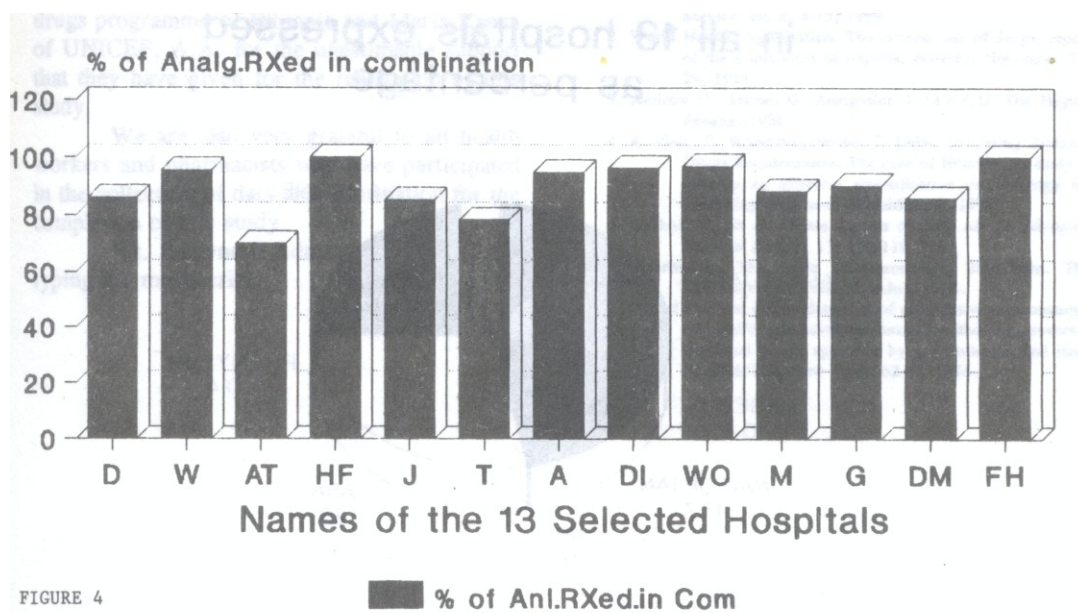
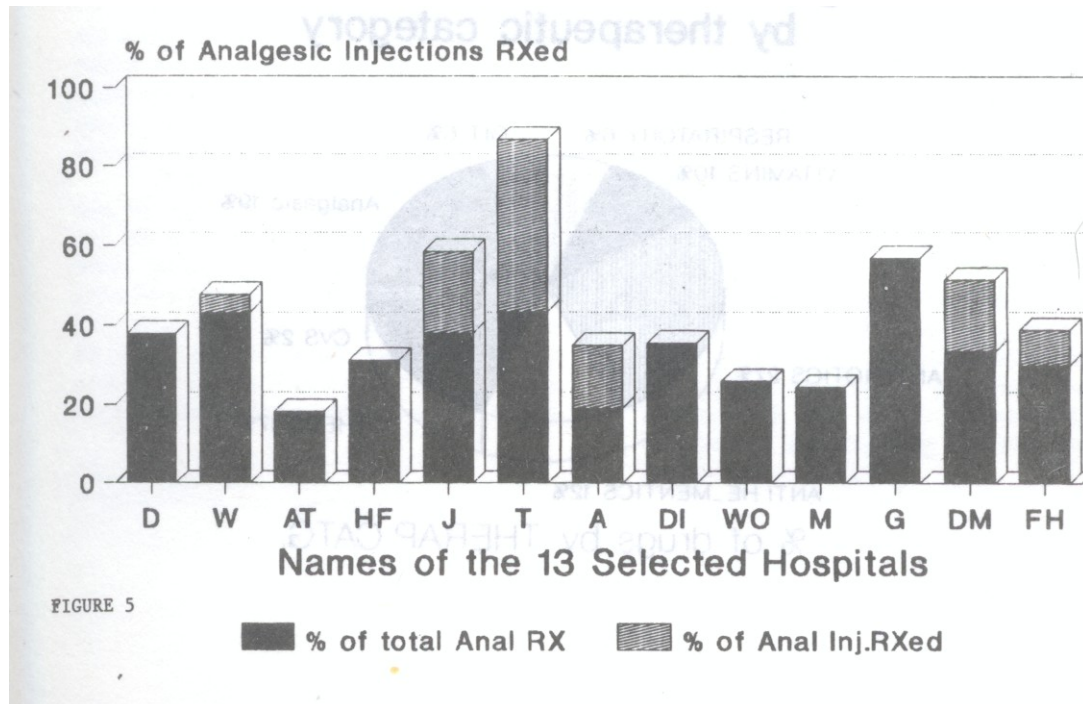


FIGURE 4

FIGURE 4

Percent of Analgesic Injections RXed out of total Analgesics



Type of Analgesics Prescribed in all hospitals expressed as percentage

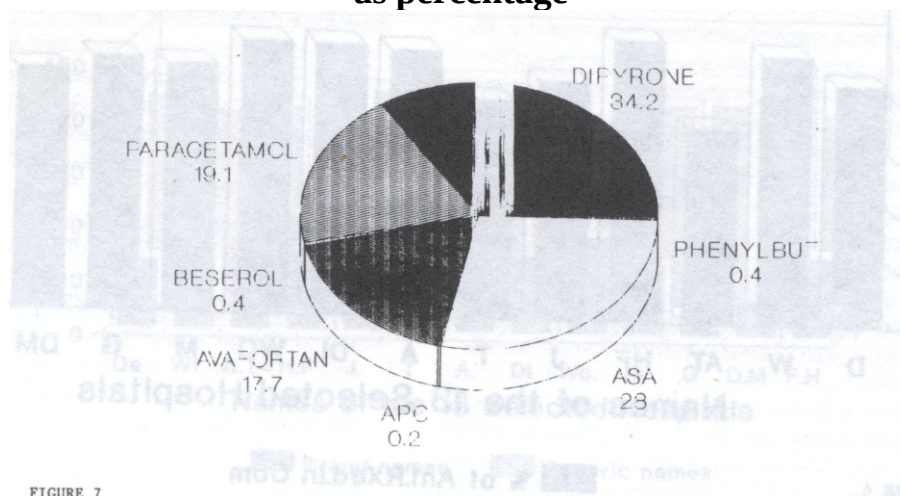
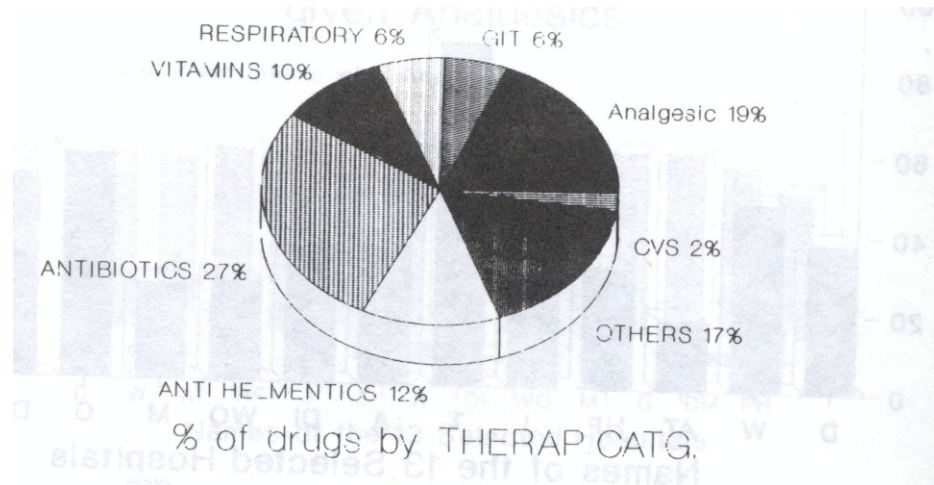


FIGURE 7

Drugs Prescribed in one day by therapeutic category



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SURVEY OF THE KNOWLEDGE AND APPLICATION OF ESSENTIAL AND NATIONAL DRUG LISTS AMONG HEALTH PROFESSIONALS IN ADDIS ABABA

Teodros Leka* and Yohannes Jorge**

ABSTRACT: It is a well known fact that proper understanding and clear identification of main areas of obstacles in the implementation of essential drug policy and rational usage of drugs is the backbone for achieving pertinent and radical solutions to the problem. This paper examines the knowledge and application of Essential and National Drug lists among health professionals in Addis Ababa. A mean value of 89 (77.4%) of the total health service providers who respond to the questionnaire defined Essential and National Drug lists correctly. The majority 90.4% of the surveyed health professionals could see indispensable advantages in limiting unnecessary duplication of brand named drugs through the implementation of Essential and National drug lists.

INTRODUCTION

Drugs can be loosely defined as medical substances in the treatment and prevention of diseases. They include locally prepared remedies as well as highly purified pharmaceuticals, synthesized in modern factories. Whatever their form, drugs play an important role in health care service.

In most of the modern societies, people and health workers have considered the free market of drugs a condition for higher quality of health system. Less attention was given to the quality of the products, and to the safety and efficacy of drugs.

In fact a high proportion of "new drugs" does not consist of real therapeutic innovations -and this is true particularly in those countries where governmental control is loose. It has never been proven that a large variety of drugs for a given disease provide any greater benefit for public health than a more selected number of products. On the contrary, the existence of a large number of drugs may cause confusion at all levels of the therapeutic chain and represent a waste of manpower and money (1). The idea behind the concept of essential drugs is not that of depriving health workers and customers the 'right' to choose drugs and treatment, but to provide the majority of the population with effective, safe and less expensive drugs easily accessible for better drug treatments.

The concept of essential drugs was launched in Ethiopia in 1985, and followed by the publication of the first National Essential Drugs List and sub-lists for the different levels of the health institutions. The implementation of the lists was intended to extend the accessibility of the most needed drugs to those population sectors whose basic health needs could not be met by the existing supply system (3).

Ethiopia is one of the member states of the World Health Organization (WHO) that accepted the essential drug policy and drafted its own National and Essential drug lists. But, as it is true with other third world countries, the National and Essential drug lists have certain implementation problems.

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MATERIALS AND METHODS

A survey has been carried out through a designed questionnaire given to 195 health professionals (doctors, health officers, pharmacists, druggists, pharmacy technicians and nurses) working in 12 health institutions located in Addis Ababa.

Out of the 12 hospitals, 12 health centers and 10 clinics found in Addis Ababa under the Ministry of Health, 5 hospitals, 3 health centers and 4 clinics were randomly selected.

All doctors, health officers, pharmacists, druggists and pharmacy technicians in the selected health institutions were included in the survey assuming that they are the responsible groups to prescribe or dispense drugs accordingly. Regarding nurses, we have considered those working in sampled health centers and clinics who are in charge of prescribing drugs and are responsible for coordinating the activities of the health institutions.

A questionnaire containing 25 questions, both open and closed type, was distributed among health professionals through heads of departments, volunteer individuals and in some cases directly to the concerned health professionals. More than two weeks was given to all respondents to fill and return the questionnaire.

RESULTS

Out of 195 questionnaires distributed among health professionals 115 (59%) were carefully filled out. The remaining 80 (41%) did not respond for various reasons.

Of the 115 respondents, 89 (77.4%) defined National and Essential Drug Lists correctly and the majority 103 (89.6%) of the sample population could see indispensable advantages in limiting unnecessary duplication of brand name through the implementation of the National and Essential drug lists. 106 (92.1%) of the sample group of health professionals who responded to the questionnaires declared that they use Mims Africa and other manufacturer's pamphlets as their source of drug information.

30 (26%) of the surveyed professionals mentioned that they were not well informed about the drugs and pharmaceutical items including the quantities of drugs produced locally and imported from abroad. Also a significant number responded that they lacked information on the cost of individual drugs to consider cost as one factor during prescribing.

35 (30.4%) of the study group said that they have tried to teach and orient patients and other member of the society about National Drug Policy with emphasis on the benefits of the use of essential drugs. On the contrary, 80 (69.6%) of the study group did not do this activity. 71 (61.7%) of the sample group responded that they do not carry out any group discussion on rational selection and proper use of drugs for clinical application, in their respective health institutions.

86 (74.8%) of the sample responded that they prefer generic names to brand names for the following reasons:

1. Brand name products are more expensive due to the research funds added upon them for slight modifications from their generic counterparts.
2. Sometimes the component ingredients are not genuine.
3. Since each patent owner gives new brand names to the same generic product previously well known, they created confusion due to the duplication of names.

DISCUSSION

A large proportion of the sample group have understood what is meant by National and Essential Drug Lists which will give good opportunity for the successful implementation of the objectives of Essential Drugs Programme in Ethiopia. In addition, even though, a smaller number of the sample group still see no advantages of the implementation of National and Essential Drug Lists, the majority of the sample group have accepted and appreciated the indispensable advantages of the implementation of

Essential Drug list. The concept of Essential drugs should be well understood and accepted through out the health professionals and the list of Essential Drugs should be used as a guide for health professional involved in the diagnosis and treatment of diseases as well as those concerned in the selection, procurement, distribution and storage of drugs.

The concept and implementation of Essential Drug Policy is obviously linked with the concept and application of generic drug products. In this aspect the result obtained in the survey is quite encouraging and still further effort should be undertaken to make the result as high as 100%.

CONCLUSION AND RECOMMENDATIONS

The pertinent authorities of the Ministry of Health are urged to provide the necessary pharmaceutical and medical reference books in each health institutions - hospitals, health centers, clinics -of the country.

All health professionals who are directly or indirectly involved in activities such as prescribing, distribution and dispensing of drugs should be made aware of the importance of National and Essential drug lists. To achieve this purpose, physicians and pharmacists, in particular, are urged to do their best to understand the concept of essential drugs, since they are the most responsible groups in prescribing and dispensing in the clinical environment. Their effort should be backed with the provision of the necessary reference materials and literature.

The pharmacists should act as the main sources of drug information in the clinical environment. In collaboration with physicians and active participation in the implementation of clinical pharmacy - they could be the center for drug information.

The physicians also should be well aware of this valuable and beneficial aspect of collaborative clinical work. A clinical discussion is also recommended to include physicians, pharmacists and nurses of pertinent departments.

The budget for the provision of drug information service should be considered as vital as that of drug budget and properly implemented. The absence of drug information service and relevant medical and pharmaceutical reference books in health institutions can be a handicap to health professionals who would like to update their knowledge. This is particularly true of hospital pharmacists.

All pertinent health professionals of the country should be involved in teaching and orienting the public, patients and professionals about importance of Essential Drug Policy and its implementation. In addition to this, they are required to carry out organized clinical group discussions on drugs among themselves.

Prescriptions are recommended to be written in generic names rather than in brand names for the benefit of patients and for proper implementation of the Essential Drug Policy.

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List of Health Institutions

1. St. Paul's Hospital

2. Yekatit 12 Hospital
3. Tikur Anbessa Hospital
4. Ethio-Swedish Pediatric Hospital
5. Minilik II Hospital
6. Kazanchis Health Center
7. Anbessa Clinic
8. Addis Beer Clinic
9. EELPA Clinic
10. Arada Clinic
11. Sheromeda Clinic
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MEDICAL STUDENTS' ATTITUDES TOWARDS COMMUNITY HEALTH

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ABSTRACT: Attitudes of medical students are important because as members and leaders of the health team in the national health system, they are potentially influential in affecting the opinions of others, particularly of their peers, other health workers, the public and public officials after graduation. This study was undertaken to describe the magnitude of, and social and demographic factors associated with, negative attitudes towards community health activities among medical students in Addis Abeba, Ethiopia. The study population consisted of all premedical, preclinical 1, preclinical 2, clinical 1 and clinical 2 students of the Faculty in the 1985/86 academic year. A cohort of students consisting of all premedical and preclinical 1 students also completed the same questionnaire for a second time in the second half of the 1988/89 academic year (ie, after a three year interval). A total of 434 out of 523 students (83%) completed the questionnaires in the academic year 1985/86. For the academic year 1988/89 the corresponding figure was 219 out of 262 (83.6%). It is shown that medical students in Addis Abeba, Ethiopia are predominantly young, males, christians, Amhara, from major urban centers and mid- or upper- income families. It is also shown that negative attitudes towards community health activities increased during the course of medical school and that this negative attitude was positively associated with type of high school attended (non-government) and with parental income (mid- or upper-level) in this population of medical students.

INTRODUCTION

The national health policy of Ethiopia emphasizes the expansion of rural health services, disease prevention and control, and promotion of self-reliance and community involvement in health activities [1]. Medical doctors, as members of (or as leaders of) the health workers team, have a critical role to play in the implementation of this policy.

It has been stressed that the objectives and activities of medical schools should be aimed at developing not only technical knowledge and skills, but also attitudes in line with the health policy of the country [2]. The stated objective of the Faculty of Medicine of Addis Abeba University is to produce basic doctors capable of functioning within the health system of the country [3].

Attitudes of medical students are important because as members and leaders of the health team in the national health system, they are potentially influential in affecting others' opinion particularly their peers, other health workers, the public and public officials after graduation. It has been recognized for sometime that the knowledge, skill and attitude of a graduating physician is closely associated with the socio-demographic characteristics of the student and the policy and practice of the

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medical school [4]. Little, however, is known about the attitudes of Ethiopian medical students on com-

munity health activities, which are the salient feature of the national health system. Even less is known about the relationship between their personal characteristics and their attitudes toward community health. The present study was undertaken to describe the magnitude of, and social and demographic factors associated with, negative attitudes towards community health activities among medical students in Addis Ababa, Ethiopia.

MATERIALS AND METHODS

The Faculty of Medicine of Addis Ababa University was established in 1964 and is involved in undergraduate and post graduate medical education. Medical students undergo one year of premedical (premed) education in the Faculty of Science and two years each of preclinical (preclin) and clinical (clin) education and one year of internship in the Faculty of Medicine. The yearly intake into the premedical year approximates 120 students.

The study population consisted of all premed, preclin 1, preclin 2, clin 1 and clin 2 students of the Faculty in the 1985/86 academic year. The students were asked to complete a questionnaire during the first-half of the academic year. A cohort of students consisting of all premeds and preclin 1 students also completed the same questionnaire, for a second time, in the second-half of the 1988/89 academic year (ie, after a three year interval). This allowed for analysis of longitudinal as well as cross-sectional differences.

A four-point Likert scale was used in the questionnaire which was designed to measure attitude towards community health activities. Public health specialists and a psychologist were consulted in the preparation of the questionnaire. It was pretested on a group of medical students from another medical school (Jimma Institute of Health sciences). Ten items were drawn up to assess attitudes concerning the following activities: 1) rendering service in rural areas after graduation (hereafter called 'rural service'), 2) giving more importance to prevention of disease and promotion of health than to the treatment of the sick (= 'prevention of disease'), 3) being involved in administrative activities within the health system (= 'health administration'), 4) working among people in the community in addition to work in clinics or hospitals (= 'community work'), 5) involving other sectors of the community outside of the health sector in health activities (= 'inter-sectoral collaboration'), 6) the activities of traditional healers in the country (= 'traditional health'), 7) encouraging people to participate in health activities, through their mass associations, (= 'community participation'), 8) the importance of a health referral system (= 'referral system'), 9) spending some time in the training of low-level health workers (= 'training health workers'), and, 10) using locally produced, cheaper health technology (= 'appropriate technology').

The students were requested to indicate their responses by choosing from among a set of four choices: 'strongly agree', 'agree', 'disagree' and 'strongly disagree'. In order to increase the validity of the measure, a) the "undecided" choice was left out[5], b) one-third of the questions were phrased negatively and c) the questionnaire was administered anonymously. All students completed the questionnaire within a class room setting. The date of the survey was not pre announced.

Students were classified to have negative attitudes to a particular item if their response to that variable was 'disagree' or 'strongly disagree' for the positive worded items and 'agree' or 'strongly agree' to the negative worded items. Responses were scored as follows: 'Strongly disagree' =1, 'disagree' =2, 'agree' =3, 'strongly agree' =4. The scores were then summed up over all items. The maximum possible score was 40 and the minimum 10. Higher scores indicated a 'positive' attitude and lower scores indicated a 'negative' attitude toward community health activities. The scores obtained by all students were then categorized into quartiles. Students with scores within the upper-most quartile of the distribution (those with 'positive' attitudes) were then compared, with students with scores in the lowest quartile of the distribution (those with 'negative' attitudes), in terms of their socio-demographic characteristics. Comparison of students within the upper-most and lowest quartiles of the score distribution reduces misclassification of students with positive and negative attitudes.

Students were classified into three categories of parental income to measure the association of this

variable with negative attitudes towards community health practices. Although measurement of income alone may not fully represent level of socio-economic class comparison of upper and lower income groups in terms of attitudes is unlikely to be biased. We classified towns with a population of 50,000 or more during the 1984 Census (6) as 'major' cities.

The Statistical Analysis System software [7] was used for data processing on a micro-computer. The Chi-Square and Fischers' exact tests were used to test for significant associations.

RESULTS

A total of 434 out of 523 students (83%) completed the questionnaires in the academic year 1985/86. Response rates for each medical school year were as follows: Premeds = 105/120 (87.5%), preclin 1 = 84/106 (79.2%), preclin 2 = 98/120 (81.6%), clin 1 = 71/96 (73.9%) and clin 2 = 76/81 (93.8%). For the Academic year 1988/89 the corresponding figures were: preclin 2 = 87/95 (91.6%), clin 1 = 60/89 (67.4%) and clin 2 = 72/78 (92.3%), with a total response rate of 83.6%.

In the 1985/86 Academic year 85.5% of the students were male, only 15.9% were 25 years of age or above, 92.3% were Christians, and, 48.1% were Amhara, 23.1% Tigray and 11.3% from the Oromo ethnic group. 62.4% of the students attended their high school education in a major city and 29.0% in a provincial town. 59.4% had parents living in a major city and 26.0% in a provincial town (Table 1). 27.7% of the respondents had parents with a combined monthly income of 800 Birr or more and 50.7% had incomes between 200 and 799 Birr (1 Birr = 0.48 US Dollars). The corresponding figures for the 1988/89 academic year are also shown in the same table.

The proportions of medical students with negative attitude toward selective community health activities is shown in Table 2. The cross-sectional data of the 1985/86 academic year shows that the proportion of students with negative attitudes toward prevention of disease was 15.2% which increased to 32.9% in the clin 2 group. Similarly the proportion of students with negative attitude toward health administration work increased from 29.5% (premed) to 40.8% in the clin 1 group. No appreciable changes in the proportions was seen for community work, referral system and training of health workers. For rural service, inter-sectoral collaboration, traditional health, community participation and appropriate technology the proportion of students with negative attitudes decreased with increase of medical school year.

Longitudinal analysis of the cohort of premed and preclin 1 students after three years of medical school, ie., as they reach clin 1 and clin 2 years, respectively, shows that for all the community health activities (except for traditional health, inter-sectoral collaboration and referral system) the proportion of students with negative attitudes increased with increasing medical school stay. For traditional health, there was a decrease and for inter-sectoral collaboration and referral system, no appreciable difference in the proportion.

Out of the 219 medical students surveyed in 1988/89, 57 (25.5%) students with a total score of less than or equal to 27, (ie., within the lowest quartile of the score distribution = 'negative attitude') were compared with 56 (25.5%) students with a total score of more than or equal to 33 (ie., within the uppermost quartile of the score distribution = 'positive attitude') in terms of their demographic, social and economic characteristics as shown in Table 3.

Although there were positive associations between the female gender and age (≥ 20 years) with negative attitude to community health activities, these were not statistically significant ($p > 0.05$). For gender there is an almost two-fold difference in the proportions of male and female students with negative attitudes, the large p value being a result of the small

Table 1 Socio - economic characteristics of medical students in Addis Abeba, Ethiopia

Academic year	1985/86						1988/89		
Medical school year	Pre med	Pre clin1	Preclin2	Clin1	Clin2	Total	Preclin2	Clin1	Clin2
Parental monthly income (In Birr*)									
≤ 199	17(21.8)**	13(26.0)	11(20.3)	7(18.9)	10(19.6)	58(21.5)	14(18.4)	15(31.2)	10(17.5)

200-799	39(50.0)	21(42.0)	28(48.3)	21(56.7)	28(54.9)	137(50.7)	39(51.3)	25(52.1)	26(45.6)
≥800	22(28.2)	16(32.0)	15(25.8)	9(24.3)	13(25.5)	75(27.7)	23(30.3)	8(16.6)	21(36.8)
Type of high school									
Government	87(82.8)	64(81.0)	70(71.4)	58(73.4)	61(80.2)	340(79.6)	66(89.2)	41(89.1)	52(80.0)
Non-government	18(17.2)	15(19.0)	28(28.6)	11(26.6)	15(19.7)	87(20.4)	8(10.8)	5(10.9)	13(20.0)
High school location									
Major city	60(57.2)	52(61.9)	58(59.2)	43(60.5)	58(76.3)	27(62.4)	50(62.5)	32(57.1)	40(59.7)
Provincial town	33(31.4)	24(28.5)	32(32.6)	24(33.8)	13(17.1)	126(29.0)	26(32.5)	16(24.2)	23(34.3)
Other	12(11.4)	8(9.5)	8(8.2)	4(5.6)	5(6.6)	37(8.5)	4(5.0)	8(12.1)	4(5.9)
Parental residence									
Major city	57(54.3)	49(58.3)	60(61.2)	42(59.1)	50(65.8)	258(59.4)	50(61.7)	29(52.7)	39(58.2)
Provincial town	32(30.4)	26(30.9)	28(28.5)	17(23.9)	10(13.1)	113(26.0)	25(30.8)	17(30.9)	21(31.3)
Other	16(15.2)	9(10.7)	10(10.2)	12(16.9)	16(21.0)	63(14.5)	6(7.4)	9(16.3)	7(10.4)

* 1 Birr = 0.48 US Dollars ** Percentages in parenthesis; Values for non-respondents not shown. This accounts for the variations in the total number of students for the various variables.

TABLE 2 Percentages of medical students Ethiopia, with negative attitudes towards selected community health activities, in Addis Ababa.

Academic Medical school year	1985/86						1988/89			
	Premed	Preclin1	Preclin2	Clin1	Clin2	TOTAL	Preclin2	Clin1	Clin2	TOTAL
Rural service	16.2	10.9	9.3	13.2	3.9	10.9	13.8	18.3	9.7	13.7
Prevention of disease	15.2	13.6	15.3	21.4	32.9	19.0	29.8	20.0	23.6	25.1
Health administration work	29.5	35.4	32.9	40.8	27.6	32.9	35.6	53.5	44.4	43.4
Community work	35.5	31.7	36.1	38.6	46.0	37.4	34.5	40.0	37.5	36.9
Inter-sectoral collaboration	5.8	12.2	9.4	2.8	2.6	6.8	9.1	5.0	18.0	10.0
Traditional health	25.7	28.0	22.4	15.4	14.4	21.6	11.5	18.3	8.3	12.3
Community participation	6.6	11.1	9.5	4.2	3.9	7.2	10.3	11.6	15.3	12.3
Referral system	16.2	21.7	17.3	18.5	15.8	19.7	21.8	15.0	16.6	18.2
Training health workers	8.5	6.0	5.1	2.8	5.2	5.8	21.8	25.0	22.2	21.8
Appropriate technology	31.0	32.9	20.6	24.6	19.7	26.0	31.0	43.3	31.9	34.7

Table 3 Demographic and socio-economic factors associated with negative attitude towards community health activities among medical students in Addis Abeba Ethiopia.

		Total	Number(percent) with negative attitude	P-Value
Sex	Male	93	43(46.2)	N.S*
	Female	6	5(83.3)	
Age(years)	≤ 19	10	4(40.0)	N.S
	20-24	78	35(46.0)	
	25-	8	4(50.0)	
Med school year	Preclin 2	46	19(40)	N.S
	Clin 1	32	20(62.5)	
	Clin 2	34	17(50.0)	
Ethnicity	Amhara	48	18(37.5)	<0.05**
	Oromo	12	6(50.0)	
	Tigrai	20	10(50.0)	
	Other	19	10(52.6)	
Religion	Christian	82	39(47.6)	N.S
	Muslim	13	7(53.9)	
	Other	2	1(50.0)	
Parental monthly income(Birr)				
	≤ 199	19	6(31.6)	<0.05**
	200-799	42	18(42.8)	
	≥ 800	30	14(46.6)	
Parental residence				
	Major city	57	28(49.1)	N.S
	Other	43	16(37.2)	
High - school type				
	Government	76	30(39.4)	<0.05**
	Non-governm.	12	10(83.3)	
High school location				
	Major city	57	30(52.6)	N.S
	Other	42	14(33.3)	

* Two-tail Fischer's exact test, N.S = non significant. ** Statistically significant. Values for non-respondents not shown. This accounts for the variations in the total number of students.

number of females.

There were statistically significant positive associations between attendance at a non-government high school, high parental income and negative attitude towards community health activities. Stratified analysis of type of high-school attended versus the occurrence of negative attitudes, controlling for the effect of parental income shows (Table 4) that the association between attendance at a non-government high school and negative attitude is independent of parental income level. For both mid- and upper-parental income levels there is an association between attendance of a non-government high school and negative attitudes, although the association is statistically significant ($p < 0.05$) only for the upper- parental income category.

The statistically significant association between a positive attitude and coming from the Amhara ethnic groups (Table 3) disappears when income levels are controlled for in the analysis. The spurious associations is due to the relatively small number of Amhara students who attended a non-government high school ($n = 4$), and who had parents from mid- or upper-income categories, compared to students from other ethnic groups. No statistically significant association was observed between location of high school (major city/ other) or parental

Table 4 Negative attitude towards community health activities and type of high school attended controlling for parental income level, among medical students in Addis Abeba, Ethiopia.

	Total	Number(percent) with Negative" attitude	" P-VALUE*
Parental monthly income $\leq$ 199 Birr High School Type			
Government	18	6(100.0)	
Non-Government	0		
Parental monthly income =200 - 799 High School Type			
Government	35	15(42.8)	N.S**
Non-Government	3	2(66.1)	
Patental monthly income > 800 High School Type			
Government	18	6(33.3)	<0.05***
Non-Government	9	7(77.8)	

* Fischer's exact test (2-tail) ** N.S = non significant. *** Statistically significant.

residence (major city/other) and negative attitudes towards community health.

DISCUSSION

The study examines the relationship between the medical school environment (medical school year) and socio-demographic characteristics of students on the one hand and their attitude towards community health activities on the other. It is shown that medical students in Addis Abeba are predominantly young, male, Christian, and Amhara, from major urban centers, and mid- or upper- income families.

Examination of the cohort of premeds, preclin 1 and preclin 2 students after three years of medical school years showed that there was a general trend in which the magnitude of negative attitudes towards community health activities increased except for traditional health. For the cross-sectional data of 1985/86 this trend was shown only for prevention of disease and health administrative work.

The deterioration of attitudes with increasing medical school year and academic year, particularly to social issues in medicine has been shown in studies conducted in developed countries. Ewan [8] who compared medical students with their contemporaries in non-medical faculties and who also followed a cohort of first year medical students for four years has shown that medical students had less positive attitudes towards social factors in medicine than non-medical students and that there was a deterioration of their attitude towards the negative as they progress through medical school. On the other hand Dornbush [9] showed that attitude toward social sciences in medicine are maintained during the course of medical school, and Perricone [10] showed that students social concern increases during their progression through the medical school. Rezler [11] who reviewed the literature on attitudinal changes during medical school concluded that the medical school environment does not seem to increase student humanism or benevolence and in fact contributes to the development of cynicism. A recent study from Africa [12] of final year medical students also noted a high proportion of medical students with negative attitudes toward community health disciplines.

The change in attitude during the course of medical school could be due to the medical school

environment. It may also be due to factors external to the medical school (eg. societal factors in general). Highly urbanized, technology-intensive, teaching-hospital-centered medical school environments could probably lead to changes in attitudes towards the negative side[8].

85% of curriculum time in the preclinical years is allotted to basic science disciplines in the Faculty of Medicine (3). In the clinical years 92% of the time is spent on clinical disciplines, the rest is spent on a rural community health training program. Most of the clinical teachings are carried out in two of the largest hospitals in Addis Abeba. Thus, the relatively heavy focus of medical education in basic science and clinical teaching conducted in teaching hospitals may be responsible for the deterioration of attitudes with increasing medical school year seen in this study population.

Our study also shows a positive association between negative attitudes toward community health and attending a non-government high school, and coming from a mid- or upper-income parents. The relatively small number of females in the study population will not permit firm conclusion as to the importance of the association between negative attitude and the female sex. The relative hardship conditions of rural areas (the focus of national community health activities) when compared to urban areas could account for this association.

All non-government high-schools in Addis Abeba charge some kind of tuition fee while government schools are free. Thus, there is a tendency for non-government school students to have parents from mid- or upper- income categories than students from government high-schools. This social class difference could partially explain the association between attending a non-government high-school and negative attitudes toward community health among medical students. It is possible that the students from upper income families want to earn high income also, and associate community health activities with low income.

Furthermore, it is also shown that this association is partially independent of parental income levels. This could be a result of the high-school environment per-se. It is conceivable that the predominant use of Western text books and other instructional materials in non-government schools, exclusivity of student population, elitism, the composition of the teacher population (expatriates from developed countries) or location (within the capital city) of these schools may predispose to negative attitudes towards community health activities. The exact component of the high-school environment which fosters negative attitudes, however, can not be deduced from the present study.

Our results are unlikely to be biased. The response rates were fairly high. The objectives of the survey was not pre-announced to students and those who completed the questionnaires were those present in class during the survey day. Classes of community health subjects were not employed for survey purposes. Absence from classes is, therefore, unlikely to be associated with negative attitudes towards community health activities. Likewise medical school attrition is unlikely to systematically or selectively affect those with particular attitudes. Our study also shows that the socio-demographic characteristics of student did not change as they progressed through medical school.

We conclude, therefore, that medical students' negative attitudes towards community health activities increase during the course of medical school and that this negative attitude is positively associated with the type of high-school attended (non-government) and with parental income (mid- or upper-level) in this population of medical students.

Thus important consideration should be given both by the relevant departments within medical schools and ministries of health to influence medical students with negative attitudes toward community health with the aim of effecting favorable changes in their attitudes. Further studies are also required to clearly characterize the component of the high school environment which favors initiation or development of negative attitudes toward community health activities among medical students.

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INTESTINAL PARASITISM AMONG THE STUDENT POPULATION OF THE WONJI-SHOA SUGAR ESTATE

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ABSTRACT: Students from the five schools of the Wonji Shoa Sugar Estate had their stool specimens examined for intestinal parasites. The method of student selection was by the stratified simple random sample employed for each school. The formol ether concentration supplemented by the direct saline method was used to detect the diagnostic stages of the parasites. Of the 964 examined, 563 (58.4%) were found positive for one or more parasites. Significantly higher infection rate was noted in males than in females ($p<0.001$). Infection with multiple parasite species was observed in 48% of the positives. On the coverage, 1.7 parasite species per infected individual was recorded for all positive students. Of the ten parasites detected, the leading in order of their level of prevalence were; *Ascaris lumbricoides* (22.2%) *Trichuris trichiura* (19.5%), *Schistosoma mansoni* (15.4%) and *Hookworm sp.* (14.7%). The prevalence of the other parasites ranged from 0.7% (*Enterobius vermicularis*) to 6.7% (*Giardia lamblia*). While the frequency of infection with *Schistosoma mansoni*, *Hookworm sp.* and *Strongyloides stercoralis* were significantly higher in males than in females respectively ($p<0.001$, $p<0.001$, $p<0.05$) the reverse was true with *Taenia sp.* ($p<0.05$). The implications of the present findings with the possible lines of control are discussed.

INTRODUCTION

The occurrence of intestinal parasites in a community is largely due to deficient or absent sanitary facilities as transmission is usually effected directly or indirectly through faecal contamination. Their distribution in different geographical locations however may vary depending on factors involved in the maintenance of the life cycle of each parasite. The majority do not require intermediate hosts and therefore have wider distribution while some need obligatory secondary hosts, climatic and or habitat requirements naturally found or modified by human activities.

In Ethiopia, like in other developing countries, intestinal parasites are widely spread. Most of the intestinal parasites such as *A.lumbricoides* and *T.trichiura* show wider distribution (1,2) and some parasites appear more prevalent in some defined areas. In places where conditions are favorable due to human interference as in the development of large scale agricultural schemes, the less common parasites such as schistosomes have equally been reported (3,4).

The purpose of the present study was to investigate intestinal parasitism among the school children of the Wonji Shoa Sugar Estate, Awash Valley, and to consider some action oriented approaches for control.

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MATERIALS AND METHODS

The Wonji-Shoa Sugar Estate is a continuously operating scheme located in the upper part of the Awash Valley some 110 kms south east of Addis Ababa. The plantation area consists of over 7000 hectares with a gravity fed canal network of about 530 kms. According to the 1988 census result conducted by the Wonji Hospital (personal communication), the population has reached nearly 28,000. The residents live in two factory and 14 plantation villages. This population size does not include the estimated 15,000 settlers around the plantation villages and about 6000 seasonal cane cutters.

Between mid November to mid December 1989, 964 students selected by the stratified simple random method from one elementary school, three junior high schools and a comprehensive senior high school were examined for intestinal parasites. Each selected student was provided with a labelled stool cup, toilet or waste paper and a clean piece of applicator stick. On delivery, the stool specimens were examined at the Wonji Hospital Laboratory using the Ritche formol ether concentration method (5) supplemented by a direct saline examination for detection of protozoan trophozoites.

RESULTS

There were 800, 1884, 1333, 1060 and 3000 (total 8077) students who attended the Elementary School, Wonji Junior High School, Shoa Junior High School, Camp-7 Junior High School, and the comprehensive High School, respectively, at the time when this investigation was conducted. Piped water at a single delivery point was available for the students. A pit latrine with spaced holes was also available at each school except at Camp-7 Junior High School. However, the latrines were all improperly used.

Table 1 shows the number of positive students for any one or more parasites at each school. The prevalence among the schools ranged from 53% to 72%. The overall prevalence was 58.4% (563/964). Significantly higher prevalence was recorded among males than females ($p < 0.001$). Similarly, the infection rate among the Camp-7 students was significantly higher than the remaining schools ($p < 0.001$).

The prevalence of each parasite species at each school and the cumulative for all is shown in table 2. Ten different parasite species were detected, among which *A.lumbricoides*

Table 1. Number of students positive for one or ore parasite species (Positive/Examined, (%))

School	Male	Female	Total
Elementary	26/33 (78.8)	21/38 (52.3)	47/71(66.2)
Wonji J.H.	64/108 (59.3)	59/126 (46.8)	123/234(52.6)
Shoa J.H.	43/599 (73.0)	49/84 (58.3)	92/143 (64.3)
Camp-7 J.H	57/75 (76.0)	43/64 (67.2)	100/139 72.0)
Compr.H.	126/220 (57.3)	75/157 (47.8)	210/337(53.3)
Total	316/495 (63.8)	247/469 (52.7)	563/964 (58.4)

M>F ($p < 0.001$);

Camp-7>Others in infection rate ($p < 0.001$)

(22.2%), *T.trichiura* (19.5%), *S. mansoni* (15.4%) and *Hookworm sp.* (14.7%) were the most common. The highest and lowest prevalence of *A.lumbricoides* was observed among the elementary and the comprehensive high school students respectively, while the highest prevalence rates of *T.trichiura*, *S.mansoni* and *Hookworm sp.* were observed among the Camp-7 Junior High School students. The rarer parasites

showed prevalence rates ranging from 0.7% (*E.vermicularis*) to 6.7% (*G.lamblia*).

Of the positive students, 48% were infected with two or more parasite species (table 3). Over 50% of the positives from the senior high school and Wonji Junior High School students were infected with single parasite species and over 60% of the Camp-7 and close to 60% of the elementary school positive students were infected with two or more parasites. The parasite species per infected student varied from 1.5 (Comprehensive High School) to 1.9 (Elementary and Camp-7 Junior High School). The overall parasite species per infected individual was 1.7. The most common combination of parasites were: *A.lumbricoides*, *T.trichiura*, *Hookworm sp.* and *S. mansoni*.

Table 2. Parasite Prevalence by Species in each school

Parasite	Elems. (n=71)	Wonji J.H. (n=234)	Shoa J.H. (n=143)	Camp-7 J.H. (n=139)	Compr.H (n=377).	Total (n=964)
<i>A.lumbricoides</i>	29(40.8)	44(18.8)	49(34.3)	2(323)	60(16)	214(22.2)
<i>T.trichiura</i>	21(29.6)	53(22.6)	26(18.2)	46(33.1)	42(11.1)	188(19.2)
<i>S.mansoni</i>	12(17)	29(12.4)	21(14.7)	37(26.6)	49(13)	148(15.4)
Hookworm sp.	9(12.7)	33(14.1)	8(5.6)	40(28.8)	52(13.8)	142(14.7)
<i>G.lambliia</i>	3(4.2)	14(6)	18(12.6)	8(5.6)	22(5.8)	65(6.7)
<i>E.histolytical</i>	2(2.8)	5(2.1)	10(7)	5(3.6)	40(10.6)	62(6.4)
<i>Hymenolepis</i> sp.	5(7)	10(4.3)	13(9.1)	8(5.8)	14(3.7)	50(5.2)
<i>S.stercoralis</i>	5(7)	9(3.8)	8(5.6)	9(6.5)	14(3.7)	45(4.7)
<i>Taenia</i> sp.	2(2.8)	5(2.1)	2(1.4)	6(4.3)	7(1.9)	22(2.3)
<i>E.vermicularis</i>	1(1.4)	4(1.7)	—	2(1.4)	—	7(0.7)

While most of the parasite species showed similar frequency in male and female students (table 4), *S.mansoni*, *Hookworm sp.* and *S.stercoralis* were detected significantly more in males than in females ($p<0.001$, $p<0.001$, $p<0.05$). *Taenia* sp. however was found significantly higher in females than in males ($p<0.05$).

DISCUSSION

The investigation indicates the presence of a range of intestinal parasites among the school children of the area. The fact that the excreta disposal pits in the schools were improperly used implies there is lack of awareness on the side of the students. Hence the risk of continuous contamination and direct mode of transmission of most parasites could be predictable. Although availability of a pit latrine by itself, if not properly used, does not prevent the students from acquiring faecal borne infection, the highest prevalence rate observed at Camp-7 Junior High School could primarily be due to lack of a pit latrine altogether. Besides as observed subjectively, the bare-footed majority of the children presumably belonging mainly to the plantation workers happened to attend this school.

Of the parasites encountered, *A.lumbricoides* and *T.trichiura* were the most common. This may be attributed to the simple life cycle and direct mode of transmission of the parasites. Although direct comparison may not be possible to make, due to variations in study subjects and diagnostic methods, the present findings with regards to *A.lumbricoides* and *T.trichiura* are in agreement with most previous reports. Wang (6) in Begemider school children, Aklilu Lemma (3) in the Awash Valley, Kloos et al. (4) in the Awash Valley including the Wonji-Shoa Sugar Estate, Seyoum Tatichoff et al. (7) among preschool children in Addis Ababa and Bakale Mamo and colleagues (8) in Akaki, reported similar findings indicating *A.lumbricoides* followed by *T.trichiura* as the most common parasite. *Schistosoma mansoni* and *Hookworm sp.* were also amongst the leading four parasites. Occurrence of these latter parasites more in males than in females, observed in the present study, was also communicated earlier by Kloos et al. (4) in the Awash Valley. This may reflect a higher exposure risk of males as they spend most of their spare time outdoors playing, working or wading in canals much more than their female counterparts. For similar reasons, the overall prevalence rates of the parasites were significantly higher in males than in females. On the other hand the situation of *Taenia* sp. to be found significantly higher in females than in males may perhaps be associated with the increased opportunity of females to handle and eventually consume raw meat prior to cooking.

There appears no strong evidence to justify the low prevalence of *E.histolytica*, *G.lambliia* and

Hymenolepis sp. reported in the present study. Low level of prevalence of these in Wolega and the latter two parasites in the

Table 3. Multiple Parasitism

	Elems.	Wonji J.H.	Shoa J.H.	Camp-7 J.H.	Compr.H.	Total
Single	19(40.4)	71(57)	45(49)	38(38)	120(59.7)	293(52)
Double	20(42.6)	30(24.4)	39(32.6)	35(35)	56(27.9)	171(30.4)
Triple	4(8.5)	16(13)	16(17.4)	20(20)	22(10.9)	78(13.9)
Quadruple	3(6.4)	5(4.1)	1(1)	4(4)	3(1.5)	16(2.8)
> Four	1(2.2)	1(0.8)	0	3(3)	0	5(0.9)

P.S/Infected 1.9 (89/47) 1.7 (206/123) 1.6 (145/92) 1.9 (193/100) 1.5 (300/201) 1.7 (943/563)

P.S/Infected = Parasite species per infected student

Awash Valley were also reported by Gunderson and Hailu Birrie (9) and Kloos et al (4) respectively. The low prevalence of *S.stercoralis*, *Taenia* sp. and *E.vermicularis* may however be due to the diagnostic method. For example, the same time when this investigation was made, the prevalence of *S.stercoralis* in the same school children was found to be four fold (17%) by the Baermann's filtration method (10). The actual prevalence of such parasites could therefore be higher than reported in this study. Similarly, had the scotch tape anal swab technique been employed, a higher rate of *E.vermicularis* may have been observed.

The occurrence of *Hookworm* sp. almost invariably in many places where *A.lumbricoides* and *T.trichiura* are found has been noted (11). *Schistosoma mansoni* and *Hookworm* have also been reported more often as double infection in the irrigation schemes of the Awash Valley (4). These helminth parasites are associated as causes of compromised growth (12,13) and reduced physical fitness (14) that in turn influence the educational attainments of school children (15). Another consequence following infection with such helminth parasites could be impaired productivity among those occupationally exposed labor force in development areas like in the Wonji-Shoa Sugar Estate.

In the absence or inadequate effort to mitigate the problem, the introduction of new parasitic diseases and further spread of the already existing ones in Wonji and similar other areas is highly probable. Periodic chemotherapeutic measures targeted at the school children and at the occupationally exposed groups may be implemented within the capability of local

health infrastructure. Since there are already available anthelmintics which show broad spectrum activities and apparently safe (16), the new concept of helminth control mainly by chemotherapy should perhaps be exercised

among target groups. As individual screening generally incurs high cost, targeted chemotherapy with a long term improvements of sanitation, health education and multi-sectoral activities seems appropriate in endemic countries like Ethiopia. The advantages, in terms of the dynamics of transmission, targeting chemotherapy at school children have been well established (17). This approach has also been

Table 4. Distribution of Parasite Species among male and female students

Parasite Species	Male	Female	Total
<i>A. lumbricoides</i>	107	107	214
<i>T.trichiura</i>	96	92	188
<i>S.mansoni</i>	101	47	148*

Hookworm sp.	93	49	142*
G.lambliia	35	20	65
E.histolytica	34	28	62
Hymenolepis sp.	30	20	50
S.stercoralis	30	15	45*
Taenia sp.	6	16	22a
E.vermicularis	6	1	7
Total	538	405	943

* = M>F (p<0.001, p<0.001, p<0.05)

a = F>M (p<0.05)

demonstrated elsewhere in Kenya where remarkable reduction in morbidity and rapid improvement in child development were attained following repeated chemotherapy (14). It is our opinion therefore that control measures spearheaded by chemotherapy could alleviate intestinal parasitism among the vulnerable school age groups and the occupationally exposed risk groups in Wonji and similar other development schemes in Ethiopia.

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SURVEY OF IMMUNIZATION LEVELS AND FACTORS AFFECTING PROGRAM PARTICIPATION IN KEFFA, SOUTH-WESTERN ETHIOPIA

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ABSTRACT: To date there has been no systematic study on factors affecting participation in EPI in Keffa (Presently Illubabor) region. Using the EPI methodology and a structured questionnaire, a survey of 212 children below 2 years and their respondents was carried out to determine the levels of immunization coverage and identify factors associated with program participation during the period December 1987 to April 1988. It was found that in EPI service sites, 65.6% of study children were fully immunized, 29.2% partially immunized and 5.2% not immunized at all. For index mothers, the coverage for the second dose of TT was 31.1%. Extrapolation of the findings to eligibles of the entire region suggested only about 8% of children and 7% of pregnant women were protected. Of the variables selected for examination, factors related to health workers, health institutions, and those concerning consumers have shown significant effects. It is suggested that realistic social-mobilization, the application of modern principles of management techniques, practical public education and regular monitoring and evaluation will improve immunization coverage.

INTRODUCTION

Immunization is one of the most cost effective of all preventive health services (1). Although considerable progress has been made in delivering vaccines to the world's children, the potential promise of immunization remains unfulfilled (2). In terms of coverage, less than 40% of the target population has been immunized in most developing countries (3). For the case of Ethiopia the coverage rate remains below 20% (4) and the rate for certain antigens is minimal and drop-outs are varied. As the year 1990 has arrived, "Universal Childhood Immunization" in Ethiopia and in some other less developed countries is not likely to occur using current approaches (4,5).

A number of studies on demographic, behavioral and institutional aspects of child immunization have been carried out in many parts of the world (6,7). Several reasons for participation or non-participation in immunization program have been identified. The major ones were that people must be convinced of a reasonable likelihood that a disease will occur in their area and that they or their children are susceptible to it; they must be convinced that a disease is serious; and must be convinced at least of the safety if not the efficacy of a vaccine before accepting it. In addition, immunization status of children was related to the mother's educational level, ethnic background, marital status, employment, distance to health facilities, the conditions of health workers, etc. The role of community acceptance and cooperation were demonstrated to have considerable effect on the initiation and completion of immunization programs in Gondar, Ethiopia (8).

This paper attempts to present the findings for some factors influencing childhood immunization in south-western Ethiopia. The complete study has been presented elsewhere (9).

MATERIALS AND METHODS

The study was carried out in Keffa (presently Illubabor), which is located in the south-western part of Ethiopia, between January and March of 1988. The study population was comprised of all children 12 to 24 months of age on the first day of the survey and parents or guardians. To ensure that the child had access to immunization, only children who had been in Keffa for at least 6 months on the date of the survey were included in the study group. The study design utilized the modified Expanded Program on Immunization (EPI) methodology of the World Health Organization (10) and a questionnaire developed by this investigator. Using the EPI cluster sampling technique (11) the study group was selected to assess immunization coverage. A standardized and pretested questionnaire consisting of background (sex, age, relation to index child, length of stay in the locality, level of education, marital status, number of persons in the household, number of pregnancies, place of delivery of child, etc.) enabling factors (occupation, place of immunization, type of facility, etc.) and predisposing factors (knowledge of vaccine preventable diseases, source of immunization information, knowledge of the benefits and side-effects, age for immunization, etc.) were administered to mothers or nearest guardians of the child by trained interviewers. Interviewers used a manual that had been prepared by the investigator to help them understand the questionnaire and to use it properly. The questionnaire was written in English and Amharic.

The total number of children sampled was 212. The process of selection was achieved in two steps. The first was the random selection of communities in the region where the 30 clusters were located. This was accomplished by using the updated list of population figures with EPI centers from the regional health department. From a randomized starting point, 30 clusters were systematically assigned. The second step was the selection of representative households to discover children 12 to 24 months old where by the first household was randomly selected but the next ones were with the front doors nearest to the first household (11). The interview schedule was administered to mothers (guardians) of all the study group. To compare mothers (guardians) of immunized and non-immunized children, an attempt was made to arrive at optimum sample sizes by using certain assumptions (based on experience) for major variables. Therefore, the conclusion was that the working sample size of approximately 210 guardians should be large enough for the comparisons that were intended; the differences could be compared statistically with sufficient power to detect differences (12,13).

Data were collected for 212 respondents for immunized and non-immunized children on the study variables and transported to New Orleans, LA, U.S.A. by this investigator for analysis. Immunization status was taken as a binomial outcome (immunized or not) to facilitate data analysis using categorical method (12). The Biomedical Computer Program (BMDP) (14) was used for analysis.

RESULTS

A total of 1675 households were visited during the survey. An average of 55.8 households were identified to permit enrollment of at least 7 children per cluster. The number of households visited per cluster ranged from 13 to 125. A total of 212 children and 212 respondents (mothers, fathers or guardians) participated in the study.

The immunization status of study children and index mothers determined during the survey is summarized in table 1. Among the study children in the service zones, 65.6% were fully immunized (3 doses of polio, and DPT, 1 dose of BCG and measles), 29.2% were partially immunized and 5.2% were non-immunized (15). Of the index mothers only 31.1% had 2 doses of tetanus toxoid. Of the children, 9.4% were immunized prematurely and/or out of the recommended schedule (interval) for measles, polio and DPT.

Table 1 Summary of immunization status for - 30 clusters in Keffa Administrative Region, Ethiopia - March 1988.

Cluster	No. of children	Vaccination card		DPT			Polio			Measles	BCG			Immunization status			Maternal TT		No. of households visited
		+	-	1	2	3	1	2	3		Vacc.	Scar		Fully	Partly	None	1	2	
												+	-						
1	7	7	0	7	7	7	7	7	7	6	7	7	0	6	1	0	2	2	44
2	7	7	0	7	7	7	7	7	7	7	7	7	0	7	0	0	3	3	82
3	7	7	0	7	7	7	7	7	7	7	7	7	0	7	0	0	2	2	62
4	7	7	0	7	7	7	7	7	7	7	7	7	0	7	0	0	5	5	60
5	7	6	1	6	6	6	6	6	6	5	6	5	1	5	1	1	4	4	81
6	7	7	0	6	7	7	6	7	7	6	7	7	0	5	2	0	6	6	13
7	7	6	1	1	6	6	6	6	6	6	6	5	1	5	1	1	1	1	56
8	7	7	0	7	7	7	7	7	7	7	7	7	0	7	0	0	6	5	60
9	7	7	0	7	7	7	7	7	7	6	7	7	0	6	1	0	2	1	71
10	7	6	1	6	6	6	6	6	6	5	6	6	0	5	1	1	2	2	51
11	7	7	0	7	5	4	7	5	4	5	7	5	2	2	5	0	1	1	49
12	7	7	0	7	7	7	7	7	7	6	7	5	2	5	2	0	0	0	49
13	7	7	0	7	5	4	7	5	4	6	7	6	1	2	5	0	0	0	43
14	7	4	3	5	5	5	5	5	5	4	5	5	0	4	1	2	1	1	77
15	8	6	2	7	7	6	7	7	6	6	7	7	0	5	2	1	2	2	53
16	7	7	0	7	6	4	7	6	4	6	7	6	1	2	5	0	0	0	60
17	7	5	2	7	7	7	7	7	7	6	7	7	0	6	1	0	3	3	59
18	7	7	0	7	7	7	7	7	7	7	7	7	0	7	0	0	3	3	50
19	7	4	3	5	2	1	5	2	1	2	4	4	0	0	5	2	0	0	77
20	7	7	0	7	7	7	7	7	7	7	7	6	1	6	1	0	2	1	29
21	7	4	3	4	3	1	4	2	1	2	4	3	1	1	4	2	0	0	50
22	7	7	0	7	7	5	7	7	5	7	7	7	0	5	2	0	3	3	29
23	7	7	0	7	7	6	7	7	6	5	8	7	0	5	2	0	1	1	43
24	8	8	0	7	8	6	7	8	6	6	7	7	1	3	5	0	4	4	31
25	7	7	0	7	7	6	7	6	7	7	7	7	0	6	1	0	3	2	125
26	7	5	2	7	7	7	7	7	7	6	7	6	1	5	2	0	4	4	25
27	7	7	0	7	7	7	7	7	7	6	7	7	0	6	1	0	2	2	112
28	7	6	1	6	6	6	6	6	6	1	6	4	2	0	6	0	0	0	41
29	7	7	0	7	7	7	7	7	7	6	7	7	0	6	1	0	5	5	43
30	7	7	0	7	7	7	7	7	7	6	7	4	3	3	4	0	3	3	40
Total	212	193	19	198	191	180	198	189	181	169	199	182	17	139	62	11	70	66	1675
%	100	19.0	9.0	93.4	90.1	84.9	93.4	89.2	85.4	79.7	93.9	85.5	8.0	65.6	29.2	5.2	33.0	31.1	

A breakdown of reasons for not immunizing the child are presented in table 2. There were a total of 68 responses. Of the total responses, 25.0% gave reasons related to lack of information; 11.8% gave reasons related to lack of motivation and 63.2% reported obstacles related to immunization.

Table 2. Stated Reasons by Respondents for Non-immunization of Children. Keffa, Ethiopia, February 1986.

Reasons	Number	%
Lack of Information		
Unaware of needed for immunization	4	5.9
Unaware of need to return for 2nd & 3rd dose	6	8.8
Fear of side reactions	6	8.8
Wrong ideas about contra indications	1	1.5
Total	17	25.0
Lack of Motivation		
Postpone till another time	6	8.8
No faith in immunization	2	2.9
Total	8	11.7
Obstacles		
Time of immunization inconvenient	3	4.4
Vaccinator absent	2	2.9
Mother too busy	5	7.4
Family problem including illness of mother	10	14.7
Child ill - not brought	1	2.9
BCG abscess, wrong age, etc.	21	30.9
Total	43	63.2
Grand Total	68	100.0

The variables found to be significantly related ($p < 0.05$) to child immunization status are presented in table 3. The variables in the table are selected for the purpose of illustration.

DISCUSSION

While only 5.2% of children in service zones received no immunization, 65.5% were fully immunized and 29.2% were partially immunized based on the immunizations schedule followed in Ethiopia (13). The service sites experienced 85% full protection for DPT, polio and TB; and about 80% for measles (Table 1). Extrapolation of these findings to the population at large is inappropriate, since there is no full population coverage, as service sites are limited. However, there were 213,165 eligible children for immunization in Keffa for the year 1986 (16). Out of the total children, it was estimated that 16,198 were fully immunized (17). It was thus indicated that only 8% of the eligible children were immunized in the whole region. The explanations for this phenomenon were low geographic distribution of health facilities, communication drawbacks, logistics, deficiencies in planning, etc.

The immunization coverage of pregnant women left much to be desired with 31.1% having 2 doses of Tetanus Toxoid (TT). This is a relatively low coverage, although most developing countries experience 20% on the average (18). TT is given to

prevent neonatal tetanus (NT). NT is second to measles as a global killer, yet remains a disease largely invisible to the health services, because its control requires a focus on immunizing women of child-bearing age and on improving delivery practices (19). EPI in Ethiopia has focused thus far on pregnant women rather than on women of childbearing age. This approach made it difficult to raise the coverage level since pregnant women are a difficult target population to reach for immunization programs. Additionally most vaccine campaigns are targeted at children.

There were 133,228 expected pregnancies in Keffa for the year 1986 (17). According to the report of the regional health department, 13,701 of the pregnant women received one dose of TT and 8,644 got 2 doses. This showed that only 6.5% of the pregnant women were protected with TT in that year. The 31% level probably reflects a cumulative effect from several years of effort, as well as the fact that only areas with EPI services were sampled.

Overall coverage for most of the childhood vaccines was relatively high where the programs were smoothly working though measles vaccine was less (79.7%). Measles is among the most infectious of the communicable diseases, and in many communities, immunization levels above 90% seem to be * probability <0.05 required before transmission ceases (18). Even where transmission has been successfully interrupted, an epidemic may quickly occur if a sufficient pool of susceptible accumulate, particularly in Keffa where the children's

Table 3. Parental Characteristics for Immunized and Non-Immunized Children, Keffa, South-western Ethiopia, 1986.

Variable	Immunized (n=139)		Non-Immunized (n=73)		Chi-square Test Result
	N	%	N	%	
Sex					
Male	12	8.6	16	21.9	$X^2 = 7.36$
Female	127	91.4	57	78.1	d.f. = 1
					*p=0.0066
Length of stay in locality					
Since birth	37	26.6	29	39.7	$X^2 = 8.277$
Less than 5 years	39	28.1	17	23.2	d.f. = 2
5 years or more	63	45.3	27	37.0	*p=0.041
Place of vaccination					
Outreach	61	43.9	46	63.0	$X^2 = 9.471$
Clinic	45	32.4	16	21.9	d.f. = 3
Health center	21	15.1	10	13.7	*p=0.0236
Hospital	12	8.6	1	1.4	
Knowledge of benefit of immunization					
To cure	24	17.3	12	16.4	$X^2 = 13.008$
To prevent	108	77.7	47	64.4	d.f. = 2
Do not know	7	5.0	14	19.2	*p=0.0046
Knowledge of completing time of primary series					
< 2 months	6	4.3	2	2.7	$X^2 = 22.25$
2-4 months	11	7.9	11	15.1	d.f. = 6
4-6 months	10	7.2	3	4.1	*p=0.0045
6-8 months	5	3.6	1	1.4	
8-12 months	83	59.7	28	38.4	
> 12 months	8	5.8	5	6.8	
Do not know	16	11.5	23	31.5	
Waiting time during immunization					
< 1 hour	12	8.6	6	8.2	$X^2 = 27.557$
1 hour	65	46.8	27	37.0	d.f. = 3
1-2 hours	47	33.8	13	17.8	*p=0.0001
> 2 hours	15	10.8	27	37.0	
Provision of additional services (during immunization)					
Yes	69	49.6	22	30.1	$X^2 = 10.741$
No	70	50.4	51	69.9	d.f. = 1
Maternal immunization status	63	45.0	115	21.0	$X^2 = 14.23$
					d.f. = 1
					p=0.0042

nutritional status is markedly low (20).

There have been some drop-outs in all series of antigens (Table 1). Though there was an increased drop-out rate between the second and third doses, the rates were relatively small for all vaccines. It should be possible to reach all children who started the first dose, for even late doses will build immunity. The problem

lies in reaching the target population to begin immunization.

The reasons for failure to start or complete the course of immunization were elicited (Table 2). Of the responses, obstacles to immunization, lack of information and lack of motivation constituted 63.2%, 25.0% and 11.8% respectively. Obstacles such as competing maternal responsibilities, erratic scheduling of services, technical mistakes (wrong technique, wrong age) by personnel etc. constituted the majority of

reasons for failure. Lack of information included lack of awareness of need of immunization and the need to return for subsequent doses and fear of side reactions. This was mainly due to lack of communication between mothers and health staff, which discourage both initial utilization and return visits.

Respondent variables or characteristics in table 3 depict that when the nearest guardian of a child was a male, the proportion of immunized children was lower, 42.9%, as compared to 69.0% for female. This is indicative of the fact that the women in general are considered better providers of health care for the family (21). Reaching women with proper health information will enhance better health care for children as well as the family (21). A lower proportion of children of native born i.e. 56% were immunized compared to 70% of the new comers. It was interesting to note that the shorter the period of time the parent had been living in the target area, the higher was the completed immunization rate. It was speculated that new comers were a better informed lot or more outreach may have been offered to them. The majority of children, 50.5% lived in sites served by outreach services but the immunization coverage was lower than that of fixed facilities. This may have been because outreach sites were mostly rural, relatively inaccessible and less supervisory support is offered to them. The distribution of responses as to the knowledge of benefit of immunization indicated some differences. Over all, 78% of respondents for immunized children mentioned to prevent diseases while 64% for the non-immunized group did not have any knowledge of benefit. Considering the expected completion time for primary series, a higher proportion (60% versus 38%) of the immunized group mentioned 8-12 months. Having no idea of the time was most common in the non-immunized group. When waiting time was reported to be greater than 2 hours only 11% were immunized, compared to 37% for the non-immunized. Waiting time is a known deterrent of initiation or completion of health services (22). The provision of other services during immunization was significantly associated with child immunization. This emphasizes the fact that integration of services is beneficial and motivating. It reduces frequency of trips to health facilities and ensures continuance of services. It was observed that child immunization status was significantly related to that of the mother. It has been reported that maternal utilization of health services was determined to be a key predictor of whether a child enters the medical care system (19,21). The role of mothers in the care of their children can not be over emphasized. Mothers with active interventionist orientation toward health care or who attributed high susceptibility to their children are high users of preventive care.

CONCLUSION AND RECOMMENDATIONS

In Keffa and/or Ethiopia, universal childhood immunization will not likely occur by 1990 or in the very near future using the current approaches. Concerted efforts need to be taken at all levels of the health care, viz:-

1. Bottom-up Approach through Realistic social-mobilization.

- Immunization programs are more sensitive to self-reveal the success or failure of preventive services than others. In fact they can indicate the weakness and strength of the general health care system. The programs once started should be maintained. For this, empowering the communities to play a more active role in planning, implementing and monitoring avenues for this endeavour may be the attainment of realistic political support, collaboration with other sectors, linking immunization to social and/or ceremonial activities within communities, etc. This will eventually enhance the "Bottom-up Approach" which is evidently necessary for the overall community development.

2. Improve the management of the health services.

- Management is a large concept and embraces many functions. For the purpose of this recommendation some aspects in the planning, supervision, management of resources and programs will be touched.

2.1 Target setting

- It is common to see health personnel at the regional or district levels that do not present the size of the target population they are attempting to serve. They are thus unable to think in terms of coverage implications when reviewing information such as number of children immunized, new pre-natal visits,

health center or hospital deliveries, etc. In this case there is often a limitation in the ability to relate health resources to populations, or to understand the distribution of special risk groups in the catchment area.

2.2 Information on effectiveness and efficiency

- Insufficient attention is given to the effect of health service activities including immunization programs, e.g. there is no reliable incidence or prevalence data on EPI target diseases at district, regional or national levels. One reason (apart from case detection capability) for this state of affairs is the lack of information about the denominator population which is necessary to understand program effects in epidemiological terms.

2.3 Resources (personnel, finance, vehicles) and utilization.

- The pressing problems in management seem to be inadequate performance of personnel (managers as well as subordinates) in the health service. The problems may be attributable to: 1) the individual capabilities of the staff and their motivation in the performance of their jobs, 2) the operating environment in which many personnel work and the support they receive in that environment, and 3) the external forces (e.g. policy and priority matters in the government, etc.).

These problems may be better handled if purposeful, planned and periodic supervision is carried out by all levels of the health care. Supervision seems to have been acknowledged essential in the health care system but is done poorly or not at all, especially in places where its inadequacy or absence is visibly felt; at the community or district level (23). The supervisory activity when done, should address the clarification of program objectives, analysis of difficulties encountered, development of staff motivation and some kind of continuing education. To aid supervision, instruments should be developed. In the design of instruments, selected areas from program objectives, job description of the particular health workers, performance standards, etc. may be utilized. Example, to supervise EPI related activities, one can consider the program objectives, incidence or prevalence of target diseases, number of target groups, operation of the cold chain, coverage, activity schedule, techniques of immunization, expected performance from the health worker, participation of the community, etc. The supervisory activity should be given feedback for the purpose of follow-up.

While supervision is a necessary tool for performance improvement, it is not in itself sufficient. Supervision should base itself on a clearly set program objectives, the job description of personnel, the specific tasks to be done and the acceptable standards of performance (24). This helps personnel to if she/he is performing correctly. Upon good performance, personnel should be rewarded in some feasible ways (e.g. letter of recognition, giving more training, increasing responsibility, etc.)

The financial management, though finance is scarce in the health system, is often separated (fragmented) from service provision responsibilities. Thus, there exist two separate reporting systems: one for finance, and the other is for services offered. These reports are often directed upwards and not horizontal. It is very unlikely that managers or professionals know the cost incurred for various services offered for particular period of time. Neither do the financial section workers in the health services realize the costs and toiling rendered by health workers out in the field. The travel and daily allowances stringently allocated for field staff are below available food and lodging rates necessitating additional expenses from the staff making the workers avoid outreach activities or cut short the duration and frequency of supervisory visits. All of these affecting the expansion of health service programs, be it immunization or otherwise.

Vehicles in health facilities have many possible uses other than those for which they are intended, and by their very nature are often not under close scrutiny. It is in fact a critically important resource for ensuring adequate support for the health activities including immunization. Ensuring that vehicles are being used efficiently and effectively is therefore an important issue for the execution of programs.

It is more complex, but not impossible to relate vehicle use to specific purposes, such as supervision, immunization, prenatal services, environmental health etc.

In general, it is worth noting here that success in management should be judged by not only how

Figure: Rural optometry - Nigeria

well managers and/or officials in the health services perform their own tasks but, also by how effective they are in organizing the work of others i.e. coordination and delegation of tasks with authority and workable resources. The delegation component seems to be markedly missing or weakly assembled in the health care.

2.4 Staff motivation

- Program objectives, however good they may be, do not generate good results of their own accord. These objectives need to be perceived, accepted and understood by workers eager to achieve them (25). Health personnel should be given support wherever the need is felt, whether it be in the understanding of objectives, in the performance of tasks or in human relations (23,25). For instance, the essential elements of the cold chain system (the most important component of the vaccination program) are "PEOPLE" to organize and manage the vaccine and the program; and "The Equipment" to store and transport the vaccines (26). The importance of people in the system can not be stressed enough. Even if the finest and most modern equipment and transport are available, the cold-chain will not be effective if people do not handle and administer the vaccines properly. It seems that much is said about the care of the cold-chain, vaccine handling, coverage, etc. but relatively little on the personnel doing the operation. The issue of "the human factor" needs to be carefully addressed in program development and execution. Feasible and workable managerial techniques to motivate staff in our situations are encouragement of open communication through periodic meetings, recognition of individual abilities and giving assistance to realize their full potential, providing staff with appropriate resources and authority to carry out the tasks efficiently, adapting approaches to personnel matters according to the situation as well as to the individual, using discipline, praise, guidance, etc. as appropriate.

3. Campaign versus Sustainance

- It is observed through experience that a great deal of campaign methodology is applied to accelerate the EPI program. The importance of campaigns should not be undermined in their relation to national or global commitments. However, it is equally important that programs be technically and managerially sustainable and financially viable. Before campaign momentum subsides, system should be established or strengthened to carry on immunization activities for new cohorts of new borns and women who will be at risk. Factors that may be considered to improve sustainability in immunization endeavors are:

1) Financial

- Almost all of the capital investment for EPI in Ethiopia is made by donor agencies. The continuation of such investment is not assured. In fact donor support is subject to the priorities of the governments and organizations which provide resources. Therefore, the gaps in financing may be identified and hopefully resolved through additional government outlays, private contributions, service fees, etc.

2) The Primary Health Care Strategy (PHC)

- The primary health care infrastructure has been strengthened by the acceleration of immunization activities. Very often EPI has been considered to be a "locomotive" which may have been used to pull along other services. It is thus important to be cautious while introducing new interventions during the post-campaign period for this may affect the continuation or refinement of immunization activities.

3) Strengthen the fixed and outreach facilities by,

a) ensuring maintenance of equipment that is in place (cold chain, injection, sterilization, etc.)

b) facilitating community level surveillance for births and deaths and therefore, determination of vaccination target population.

c) setting quantified monthly targets for vaccination at the local level.

d) conducting regular supervision from higher levels.

4. The need for continued and effective health education.

- In order to increase the immunization coverage (or utilization of other health services), public education must be continuously given while monitoring its effectiveness in relation to the purpose.

Health education does not replace other health services but it is needed to promote their proper use.

The concern here is promoting health behaviour because behaviour could be the main cause of a health problem as well as the main solution (27). The common misconception of equating health education to health information needs to be straightened. Health information (passing only information on health matters by word of mouth, printed materials, etc.) is a basic component of health education but the latter addresses a lot more issues, e.g. attempts to facilitate resources, adaptation of the given information, skills in the application of the information, etc. In addition, health education necessitates a shift from a paternalistic advocacy of behaviour change to the participant assumption of responsibility for his/her own care. Health workers should also realize that their own personal example serves to educate the public.

5. Research

- Research is needed to diagnose local health problems including immunization, analyze their causes, and design alternative approaches to problem-solving. The role of research in problem solving should be appreciated and supported.

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Special Article

TECHNICAL AND MANAGERIAL ASPECTS OF ENVIRONMENTAL AND HEALTH IMPACT ASSESSMENT OF WATER RESOURCE DEVELOPMENT PROJECTS-THE ETHIOPIAN EXPERIENCE

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ABSTRACT: Past experience in Ethiopia has shown that water resources development projects implemented without environmental and health consideration face serious environmental and social problems. The environmental dimensions of sedimentation and soil erosion through accelerated vegetation removal, loss of grazing land, displacement of people, proliferation of disease vectors, productivity decline through salinization and water logging and loss of wild life habitats constitute the major problems encountered. This paper reviews the environmental and health consequences of water resources development projects, and assesses current practices and arrangements for impact assessment and follow-up environmental monitoring in Ethiopia. Lack of compulsory Environmental Impact Assessment (EIA) and an established responsibility and procedure for follow-up actions, coupled with shortages of trained manpower and financial provisions constitute serious constraints for effective integration of environmental and health considerations into the development process. Recommendations include the need for compulsory EIA, well defined institutional responsibilities and inter-sectoral collaboration.

INTRODUCTION

It is well known that water resource development projects generate benefits to any country through production of crops and energy to meet local demands as well as export earnings. In addition, dams and reservoirs can be used for fisheries, drinking water supply, flood control and water based recreation. However, if such development schemes do not integrate environmental protection requirements, they can cause ecological disasters that could be costly to present and future generations.

Water resource development projects in Ethiopia as well as in many other developing countries were too often dictated by national economic interests as conceived by central planners. Projects have been primarily planned and evaluated in terms of their technical and economic feasibility. Ecological, social and health considerations have been either virtually ignored or at best sufficiently included in project planning and implementation. Such an approach has not only resulted in a multitude of environmental and social problems but also in some instances, adversely affected the long-term economic sustainability of the projects themselves. There are cases on record where fertile lands have been lost due to salinization; capacities of dams reduced as a result of heavy silt load, and the well being of the local populations, as well as that of migrant workers negatively affected. Many epidemiological investigations on the occurrence and spread of schistosomiasis and malaria, including its resurgence in the tropics have shown a cause and effect relationship between intensification of these diseases and expansion of irrigation and other forms of water resources development.

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It is now recognized that past development projects have had serious adverse ecological, social and economic impacts, although the level of recognition of such impacts is still far from satisfactory. Nevertheless, conservation-based development is getting more and more attention by decision makers and

planners alike.

One of the commonly adopted strategies as a tool in the planning and decision-making process for environmentally and socially sound development of natural resources is Environmental Impact Assessment (EIA). In Ethiopia, some kind of EIA has been initiated for major water resource projects since the 1980s. This paper reviews the major environmental projects, the evolution of the state of the art of EIA and its organizational and administrative managerial arrangements in Ethiopia. It also attempts to review the appropriateness and adequacy of current practices and provides a set of recommendations to address the concerns of the environment in development planning in Ethiopia.

WATER RESOURCES AND THEIR UTILIZATION IN ETHIOPIA

Ethiopia is one the countries in Africa richly endowed with water resources. The mean annual surface runoff is estimated at a little over 100 billion cubic meters. The country also possesses a considerable area of irrigable land mainly located in the arid and semi-arid areas where soil and climate are suitable for the production of a variety of tropical crops. Furthermore, the hydrological and topographical features of the country have created favourable conditions for the generation of large quantities of hydropower energy with considerable surplus for export the creation of large reservoirs.

Presently, the contribution of the water sector to the national economy is very low with only less than 3% of the potential harnessed for irrigation and hydropower generation. The nationwide area under irrigation is in the order of 160,000 hectares of which 60,000 hectares (37.5%) are small scale schemes scattered throughout the country. The small scale schemes are those below 200 hectares and mostly traditional involving simple diversions without control facilities. According to Tahal, many of these schemes are subject to frequent damages by floods and suffer from leakages and waterlogging due to the rudimentary nature of the diversion structures and lack of control and drainage facilities (1).

The remaining 100,000 hectares are medium (200-3000 hectares) and large scale (over 3000 hectares) irrigation projects with a further 45,000 hectares currently under construction. Of the existing medium and large scale irrigation schemes, 71,215 hectares are located in one of the 14 basins of the country, namely the Awash Basin. The medium scale schemes produce a mix of food and other cash crops whereas the large scale irrigation projects are primarily for sugarcane, cotton and citrus. Some 42,000 hectares in the Awash Basin are in need of infrastructural and water use efficiency improvement (2).

With regard to hydropower, there are seven major regulation schemes with a total installed capacity of about 23,000 GWH/year which represents only 1.4% of the potential (3). Hydro-electric power development as a clean source of energy, could play a major role in the expansion of industries and electrification of urban and rural areas to reduce the pressure on forests and woodlands for fuel wood. About 90% of the total energy demand is derived from biomass which has resulted in massive deforestation, soil erosion, high rates of sedimentation and loss of wildlife habitats.

The present industrial water demand is not known, but it is considered to be substantial enough to arouse concern both in terms of effluent discharges and abstraction. Unique demands are made of water resources in and around few major cities like Addis Ababa where there is some industrial concentration. Industries like food processing, breweries, meat packing, pulp and paper are known to use large quantities of water. A major concern, especially considering the lack of pollution control in the country is, however, industrial pollution.

Responsibilities for water resource development and management lie with five institutions. The Ethiopian Valleys Development Studies Authority (EVDSA) established in 1987 is responsible for water development planning including the preparation of integrated master plans and feasibility studies of medium and large scale irrigation schemes. While design, construction and maintenance of major schemes are the responsibilities of National Water Resources Commission, operation and management of state farms and hydropower plants are carried out by the Ministries of State Farms, Industry (the sugar estates) and Mines and Energy (hydropower). The Ministry of Agriculture has an overall responsibility for peasant

agriculture including the planning and development of small scale irrigation projects which are basically constructed and operated by beneficiaries themselves.

In the face of the recurrent events of climatic droughts and devastating famines during the last few decades and the high population growth rate (2.9%), the development of the country's water resources, as reflected in the Ten-year perspective plan (1984/85-1993/94) is expected to increase greatly before the end of the century. According to the plan, 126,000 hectares of land will be brought under irrigation and the present hydropower generating capacity will double during the plan period. Although the plan recognizes the need for rational exploitation of the country's natural resources, the inevitable environmental modification should be expected to bring about undesirable side effects. The growing challenge to the concerned authorities and professionals would be how to achieve the development objectives of meeting the food, fibre and energy demand of the population without compromising the interests of the environment.

EFFECTS OF WATER RESOURCE PROJECTS-PAST EXPERIENCE

General Situation

There are no comprehensive studies on the effects of past projects on natural resources and health in Ethiopia. There are, however, a number of studies on specific environmental parameters relating to soil modification, water quality, socio-economic impacts and water related vector borne diseases. These studies were mainly carried out in the Awash Valley where the major water resource schemes of the country are located.

The Awash Basin covers an area of about 120,000 sq. kms. of which 70,000 sq. kms. are effectively drained by the Awash River which runs through a course of 1200 kms. The basin is conveniently divided into the Upper, Middle and Lower Awash Valleys (Fig.1). The population inhabiting the basin is estimated at 5.9 million excluding Addis Ababa which has a population of 1.6 million (2). This represents a mean population density of 49.2 persons per sq. km. as compared to the national average of 34.4 persons per sq. km. Prior to the development of irrigation, the lowlands in the Middle and Lower Awash Valleys were predominantly inhabited by trans-human pastoralists. The rapid increase in the population of these parts of the basin during the last three decades has been accentuated by seasonal migrant workers from the neighbouring highland areas. The opening up of the Awash Highway connecting the main Ethiopian port of Assab with the central and the south eastern regions of the country has also resulted in heavy and rapid movement of people and goods through the formerly isolated Awash Valley.

Presently, as mentioned in the preceding section, some 70,000 hectares of the land is under cultivation in this basin which represent 70% of the total irrigation in the country. There are 24 plantations in the Valley producing primarily cash crops like sugarcane, cotton and fruits. These schemes are state owned and to a large extent labour intensive. The work force is in the order of 200,000, i.e., about 3 persons per hectare. Basic amenities provided in the state farms are generally considered satisfactory compared with those available to the general population. However, the level of maintenance and utilization of sanitary facilities in the labour camps are often poor. Health services, mostly curative, are provided to the workers and their dependents free of charge by the respective agencies managing the farms.

Irrigation of the agricultural estates is carried out mainly through gravity with few plantations using pumps. All canals and drains are unlined earth ditches and their maintenance depends on irrigation regimens. Primary and secondary canals in the cotton plantations are cleaned and deepened once a year before the main planting season while the maintenance intervals in the sugarcane and citrus fruit plantations are much longer due to intense irrigation regimen. As a result, growth of canal bank vegetation in the latter plantations is very prolific and has serious health implications in the spread of intermediate snail hosts of schistosomiasis.

Besides irrigation, the Awash River is used for power production, industrial processes and waste

discharges. There are three dams which have a combined power output of 493 KWH/yr. All these schemes, including all irrigation schemes excepts the Amibara Irrigation Project, have been constructed without due consideration of environmental impacts. As a result, many of the development projects have resulted in immense social and environmental problems.

Impact on Water Quality

In the Upper Awash, there is a heavy concentration of industries relative to the rest of the country. Most of these industries do not have effluent treatment plants and discharge their untreated wastes directly into the Awash River or its tributaries. Based on study of selected industries, the industrial effluent contained high BOD, suspended and dissolved solids or exhibited alkalinity or acidity problems (4). Furthermore, these streams are polluted by septic tank effluent, trade wastes, oil and grease from garages. The study presented the streams as being virtually depleted of oxygen and characterized them as highly polluted and unfit for human consumption without substantial treatment which would be expensive.

In the remaining part of the basin, extensive use of agricultural chemicals, especially pesticides, poses a serious threat to public health and the aquatic ecosystem. Over 30 types of chemicals, including toxic organo-phosphorous compounds, are used. On occasions, fish kills have been reported following the application of agricultural pesticides. Another hazard associated with irrigation is salinity. Recent data on salinity, measured as electrical conductivity showed an increase from 400 to 800 μ mhos/cm over the period 1970-1985 (2).

Socio-economic Effects

The development of the Awash Basin has undoubtedly contributed to the national economy and to the well being of considerable numbers of people through generation of employment and access to basic infrastructural services. At the same time, the development has brought about some adverse socio-economic effects which by no means are unique to Ethiopia. The major negative effects in the Awash Valley relate to population supporting capacity, reduction of grazing land and social adjustment problems.

The population of the Valley has increased substantially since irrigated agriculture began in the lowlands which, prior to introduction of irrigation, were considered marginal for rain-fed agriculture. The rapid increase in the population has placed high pressure on limited resources available to meet the food, fuel wood and construction material needs of the people newly settling in the area. A recent study by UNDP/FAO on population support capacity has projected significant deterioration in the situation by the year 2010. According to the base model of this study, the majority of the areas in the valley will be converted to deficit capacity areas (5).

Although the exact size is not known, considerable portion of the area presently under irrigation is reported to have been formerly used for dry season grazing by the indigenous population of pastoralists. The net effects of this loss are pressures on the local pastoralists to move into new areas and over-grazing of existing rangelands.

Health Implications

The irrigation canals, drains and the formation of man-made swamps have provided suitable breeding habitats for disease vectors in several farms of the Awash Valley. A combination of the proliferation of the disease vectors, migration of farm workers and intense water contact have resulted in the introduction and transmission of new diseases like schistosomiasis and intensification of local endemic diseases like malaria.

Both *Schistosoma mansoni* and *S.haematobium* are found in the valley. *S.mansoni* was first reported from migrant workers originating from endemic areas. Transmission is now well established in the formerly non-endemic areas of Wonji and Metehara Sugar Estates and other farms in the Upper Awash Valley with a prevalence rate of 5-11% (6). The annual economic loss due to *S.mansoni* at Wonji alone is

estimated at Birr 452,000 which is expected to quadruple in five years time (7). On the other hand *S.haematobium* is found in specific localities in the Middle and Lower Awash Valleys with a marked decline (50%) in the transmission due to drying up of the natural swamps (the natural habitats of the intermediate host) resulting from upstream water regulation, irrigation development and provision of drainage facilities (6).

Despite an active control programme with DDT spraying twice a year, malaria is still the leading cause of morbidity in the Awash Valley. A prevalence rate of 6.7% has been recorded in the Middle Awash Valley, a level that exceeds the critical national level of 5% (8).

Land Degradation

The main causes of land degradation in the Awash Valley are soil erosion, waterlogging and salinization. The extent of soil erosion is so high that Koka Dam lost 35% of its storage capacity over the period 1960-1989 (2). Water tables are rising at an estimated rate ranging from 0.6 m/year to 3 m/year in localized areas. Signs of salinization are already evident and recent studies have indicated the need for the installation of sub-surface drainage in much of the irrigated area of the Middle Awash before the end of the century. Waterlogging, salinization and overgrazing appear to accelerate land degradation in the Valley.

ENVIRONMENTAL IMPACT ASSESSMENT

Arrangements for EIA in Ethiopia

Environmental Impact Assessment (EIA) is relatively new in Ethiopia. EIA of water resource development projects evolved from a UNDP/WHO assisted project during 1980 to 1986. The main development objective of the first phase of the project was to assess the health implications of planned water resource schemes, especially irrigation, in the river basins of Ethiopia.

The second phase of the project covering the period 1983-1986 was reformulated to include water quality. A small unit with modest laboratory facilities was created under the name "Public Health and Environmental Health Planning Project" within the Water Resources Development Authority (WRDA).

Another complementary arrangement was the creation of the Committee for Inter-institutional Collaboration (CIC) in 1985, following a multi-disciplinary campaign against urinary schistosomiasis in the Amibara Irrigation Project from 1981-1983, by interested national scientists from different sectors. The positive results of this inter-institutional collaboration attracted the attention of various ministries and other institutions and this effort culminated in the formal establishment of the CIC by means of a Memorandum of Understanding. The main objective of the CIC is the prevention and control of water-based and water related vector borne diseases affecting populations resettling or living in irrigation scheme areas or those migrating to and from these areas.

The CIC solicits the collaboration of different sectors through a multi-disciplinary approach. It is composed of the National Research Institute of Health, the Water Resources Development Authority (WRDA), the Institute of Pathobiology of Addis Ababa University, the Ethiopian Valleys Development Studies Authority and the Ministries of Health and Industry. Membership is open to all relevant government and non-governmental organizations. Its organizational structure includes a General Assembly, ad-hoc committees and a Secretariat whose office equipment was provided by WHO.

A further development in Ethiopia relevant to the management of water resource development projects was the establishment of a semi-autonomous body known as the Ethiopian Valleys Development Studies Authority (EVDSA) in 1987. The main objectives of EVDSA are to conduct studies of natural resources of the valleys of Ethiopia, to prepare master plans and to undertake studies and initiate policies and strategies for the protection of the environment. The underlying concept is to enable the country to undertake integrated basin-wide development planning in which the full range of alternative ways of rational utilization of natural resources and improving or maintaining the quality of the environment can be

assessed. This makes EVDSA well-suited to take adequate account of the inter-relationships between environmental quality and aspects of development and use of resources. Within EVDSA there is the Environmental Conservation Studies and Research Desk initially established by transferring the Public Health and Environmental health Planning Unit from WRDA. Unlike those unit, the present desk is firmly backed by proclamation, and has broader scope, better status in the organization and better resources.

EIA Methods, Scope and Procedure

Ethiopia does not have yet a compulsory or standardized EIA system, although one is currently under preparation. Since 1980, four large and seven medium irrigation projects, two hydropower plants and one major drainage scheme were subjected to some kind of EIA. The scope, level and methods varied from one project to the other depending on availability of expertise, funds and nature of the project. The assessment was done according to terms of reference (TOR) prepared by the project proponent, namely WRDA, and was carried out during the feasibility study phase of the projects. The TOR were normally prepared following a short field visit by a small team with a view to identifying the main issues to be addressed. The main elements generally considered were:-

- i. Public health and sociological aspects
- ii. Water quality
- iii. Wildlife, and
- iv. Biomass especially in relation to firewood and building materials.

These components were assessed by individual experts or group of experts like the CIC and often involved baseline data collection through rapid field surveys. Surveys were essential because there was a general lack of data. Even if available, the data were incomplete, of poor quality or inaccessible.

The experts produced statements usually containing sections on the status of the existing environment, the possible effects of the proposed scheme and recommendations of safeguard measure together with the cost implications which were included in the total project cost. The statement was incorporated in the main report of the feasibility study in a summary form and annexed in separate volumes in its entirety. These reports were reviewed by an ad-hoc committee comprising responsible representatives from the concerned ministries and agencies such as the Ministries of State Farms, Health and Agriculture and the National Planning Office. The final reports were presented to the Council of Ministries for approval.

One such project that has been implemented is the Amibara Irrigation Project with a total area of 10,000 hectares for cotton production. The project had environmental and health components costing around one million birr as part of a loan package from the World Bank and ADB. Although the fund allocated was small, it has nevertheless created awareness among decision makers and engineers and set precedence for subsequent projects.

Monitoring

Adequate and sustained monitoring is often lacking due to institutional, financial, human resource and legal constraints. The prime interest of those who manage projects is maximization of production regardless of the consequences of their activities on the environment. The only initiative that has been undertaken so far is the creation of the Project Control Center (PCC) within the Amibara Irrigation Project. The PCC is responsible for the management of the major water diversion and distribution system.

A major maintenance operation of the PCC is desilting of canals and drains and clearing of vegetation.

The PCC has a small unit staffed by a sanitarian and two trained technicians to monitor the effects of the project on the environment and institute measures to mitigate adverse impacts. Although the unit is not comprehensive in its activities and is constrained by funds and facilities, it appears a practical arrangement for regular site monitoring and the promotion of intersectoral collaboration.

CONCLUSION

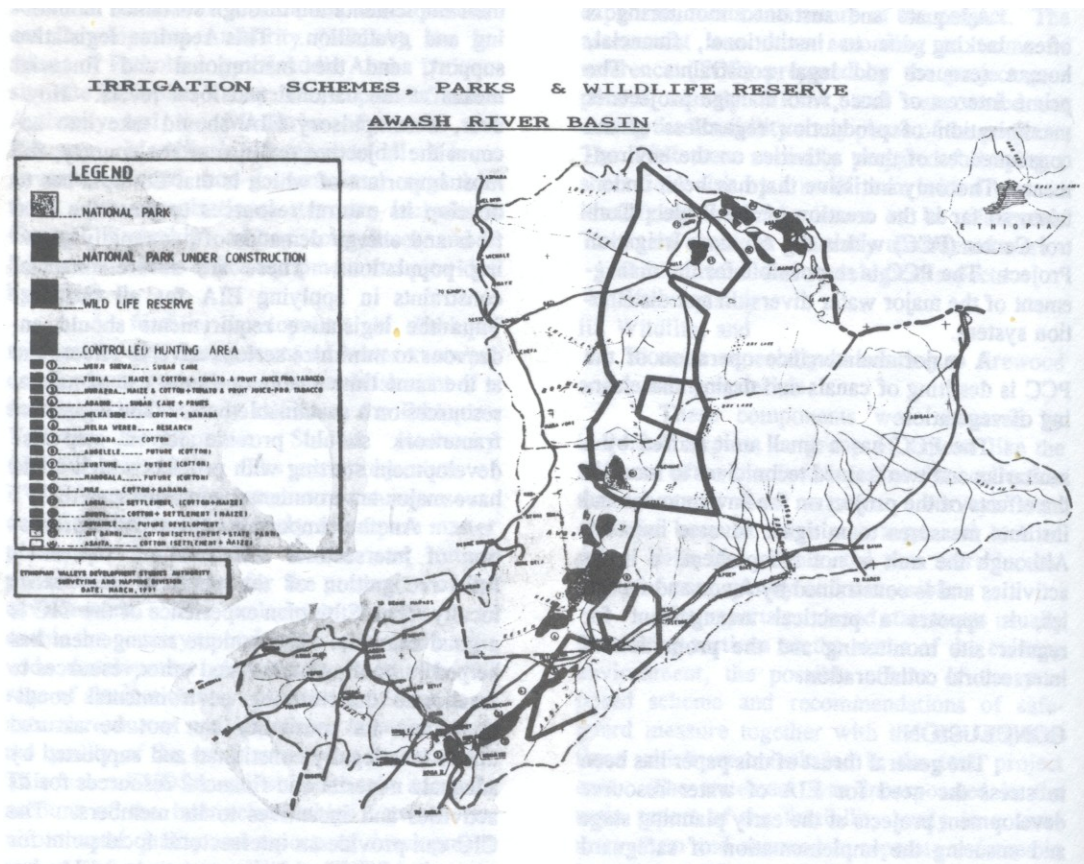
The general thrust of this paper has been to stress the need for EIA of water resource development projects at the early planning stage and ensuring the implementation of safeguard measures throughout the life of the projects. Failure to do so would result in serious environmental degradation and socio-economic impacts. What has to be realized is that once the resource base is depleted or polluted, it is financially and technically difficult for developing countries like Ethiopia to restore it to its original productive capacity.

Past efforts to incorporate environmental concerns in development planning in Ethiopia were limited both in scope and in influencing decisions. EIA requires a systematic methodological approach based on adequate knowledge of the local ecology, existing socio-economic and environmental status, careful assessment of possible impacts of the proposed project, development of simple but effective mitigation measures against adverse effects and ensures their implementation through sustained monitoring and evaluation. This requires legislative support, and the institutional and financial means at the national and local levels. However, a compulsory EIA should take into account the objective realities of the country, the most important of which is that Ethiopia has to develop its natural resources to meet the food fiber and energy demands of her rapidly growing population. There are severe financial constraints in applying EIA for all projects. Thus the legislative requirements should endeavour to minimize serious adverse effects and at the same time enable optimum use of natural resources on a sustainable basis. The legislative framework should provide for a step-wise development starting with projects which could have major environmental consequences.

Another important aspect is the promotion of intersectoral collaboration. There is little recognition of the potential that exists locally. The Ethiopian experience of the CIC is a good example. This unique arrangement has helped in pooling human and other resources to ameliorate deteriorating environmental conditions, but its continuity can not be assured unless it is legally constituted and supported by adequate material and financial resources for its activities and incentives to its members. The CIC can provide an intersectoral focal point for successive stages of comprehensive EIA implementation including evaluations.

Engineers are often inadequately informed of the environmental risks associated with the projects they design and construct. It is therefore of utmost importance to inform practicing as well as student engineers of the possible impact and of the technologies available to avert adverse effects.

Most of the large scale projects in many developing countries are at least partially financed through donor aid or loans which often lack provisions for the implementation of environmentally sustainable development. Funding agencies especially the international financing agencies as well as the UN agencies can have a considerable influence on projects financed by



them. They should therefore collaborate with developing countries in their effort to plan and implement environmentally sound development through human resource development facilities and financial support.

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RURAL OPTOMETRY AS AN INTEGRAL PRIMARY HEALTH CARE IN IMO STATE, NIGERIA

S.A. Igwe*

The ability to use the eyes to see the world around is regarded by people everywhere as their greatest gift. We rely on our sense of vision more than all of our other senses put together.

In 1978, the Alma-Ata Declaration endorsed Primary Health Care (PHC) and established the goal of "Health For All By The Year 2000 (HFA 2000)" (1). PHC is defined as essential health care made universally accessible to individuals and families in the community by means acceptable to them at a cost that the country and community can afford (2). Affordability is a key facet of the approach. Indeed, some have seen it as a cheap option for health care in developing countries. It focuses on the provision of preventive and basic curative care at the lower tiers of the health care system because it is less expensive and potentially more effective in improving health status than the higher technology care health instructions (3).

More broadly, the concept of PCH with its emphasis on viewing health development as a part of the whole development process on self reliance, community involvement, should be concerned with the pursuit of social justice through alleviation of health inequalities as is currently being enunciated by the Federal Government of Nigeria through MAMSER (Mass Mobilization for Self Reliance, Social Justice and Economic Recovery).

From the foregoing, it becomes quite clear that eye care or vision care which is the primary concern of the rural optometry programme should be embodied in the PHC programme. Since most rural communities can not pay for or afford the services or have access to the higher technology eye hospitals. Moreover, little is known about eye care in developing countries, hence blindness is rampant which can be prevented only if adequate measures are taken promptly.

The term primary care has received considerable attention within the health profession in recent times. It is a term that is increasingly being used to delineate manpower needs and the relative roles and responsibilities of various health disciplines. In that regard, it can be said that primary eye care is the fundamental basis of the rural optometry programme.

Vertical programmes have been designed to ensure that the techniques and services reach the whole population. It aims at even distribution of resources for eye care among the population no matter how remote. There are about 500 autonomous communities in Imo State, and the rural optometry programme is expected to be made available to them within the shortest possible time and in consonance with the PHC spirit.

The rural optometry is vision care and is therefore a part of mobile health service (MHS) through eye care to the rural community. MHS range from the simplest in preventive care such as community health worker (CHW) visiting distant villages, e.g. UNICEF sponsored Expanded Programme on Immunization (EPI), the flying doctor of mobile doctor services of various state governments in Nigeria, to most elaborate in modern surgery, e.g. the American funded Project Orbis that visits countries worldwide, performing ophthalmic operations.

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On the whole, the primary aim of these services is the same i.e. to increase the access of the rural people to medicare which they would hitherto not receive.

In 1984, the World Health Assembly (WHA) enjoined Universities throughout the world to place themselves at the disposal of the communities to the maximum of their capacity for the promotion of health and provision of health care, and to participate in creating awareness in the general public of the action people can take to promote their health and the health of the community in which they live (4). In apparent response to this call by WHA, the Imo State University instituted the rural optometry programme as its contribution, in part, to the fulfillment of the goal of HFA 2000.

The venue of the clinic is usually a health centre or a school or a private hospital or a town hall or any large building suitable for the purpose provided by the rural community.

Participants (patients) receive a comprehensive eye examination at no cost as well as proper treatment. Visual screening and visual analysis are also carried out to identify individuals with various ocular manifestations or disabilities such as squints, strabismus, heterotropia, cataract, etc. Each disorder is managed on its merit and where appropriate referral is made to the more sophisticated ophthalmic centre in the University or the General Hospital Eye Centre. The treatment is usually in the form of prescription for glasses, vision training or low vision rehabilitation, use of drugs, etc. for instance vitamin A is given to children to prevent infantile eye damage. The following procedures are usually taken according to the flow chart:

Equipments

- Pen-torch or torch with 1.5 V batteries, Transilluminator, Ophthalmoscope, Schiottz tonometer, Snellen charts including illiterate letter E, Trial frame, trial case and its accessories, PD rule, Dark or Black Cloth to provide a temporary dark room, Stethoscope and Sphygmomanometer.

The results are usually recorded in this order:

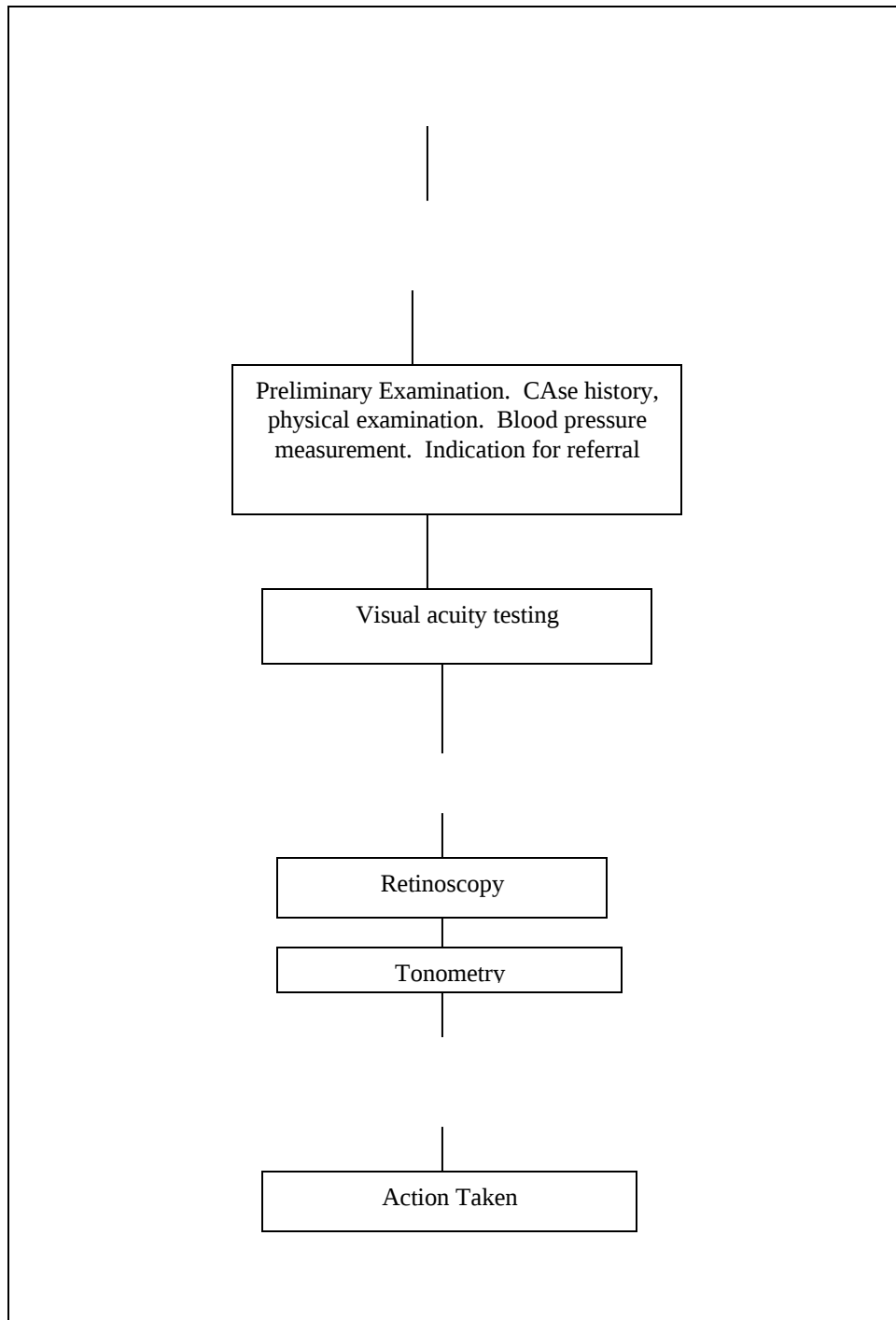
- a. complete history
- b. naked visual acuity
- c. detailed report of external findings
- d. ophthalmoscopy - media, fundus, blood vessels, disc
- e. static retinoscopy
- f. amplitude of convergence and accommodation
- g. phoria and duction finding - horizontal/vertical distance/near
- h. subjective findings
- i. fusion
- j. stereoscopic vision
- k. colour vision
- l. visual fields (confrontation)
- m. visual fields central (in people older than 40 years)
- n. prescription is given and visual acuity is again obtained
- o. corneal tonometry
- p. drug treatment and referral.

Since the Alma-Ata declaration (1), health care has been undergoing significant changes and one effect has been establishment of the rural optometry of outreach programme by the Imo State University. This programme which is an innovation of the PHC, is designed to provide services through tremendous impact on the traditional eye care services as it provides vision care at affordable cost to the rural communities where people live and work thus constituting the first element of a continuing health care process (5).

The advantages are immense. Both the clinicians and the optometrists are exposed to various challenges in the rural community. Here, the primary aim is the participation in the coordination of various

Figure: Rural optometry - Nigeria

levels of secondary and tertiary health care through vision care. Clinical cares are provided, while microsurgery including cataract extraction are referred to ophthalmologists, glaucoma consultation, management of retinal detachment if any and other retinal diseases and consultation for ocular emergencies and a variety of ophthalmic problems are meticulously attended to.



The potential drawback of the programme lies mainly in

- i. Travel limitations imposed by bad roads, since most rural roads are bad and water-logged during the rainy season. However, the activities of the Federally sponsored Directorate for Food, Roads and Rural Infrastructure (DFRRI) in this regard have been very helpful.
- ii. Availability of transport facilities. Most times, the programme has been unduly delayed or cancelled due to lack of transportation.
- iii. Inadequate administrative support and notifying the communities to be visited. When such is the case the turn out of patients needing eye care is usually not encouraging. The function of information dissemination is usually vested on the traditional or local ruler of the community to be visited.
- iv. Financial support, though inadequate has been borne by the University. Assistance from voluntary agencies, wealthy individuals, the State or Federal Government or even local government is indicated.

However, there are obvious benefits which outweigh these problems. These include savings in travel cost by the members of the community to be visited to the urban areas to receive the sophisticated medicare, reduced congestion on the already congested hospitals and clinics in the city centres, provides professional support to health workers in remote areas by bringing in the essential drugs and medicare which are usually not available in the rural area or not affordable. On the whole, the rural optometry is promotive, preventive, curative, rehabilitative, effective and affordable by the rural community.

From this report, it can be seen that there is a great measure of resourcefulness in the area of eye care as an integral part of PHC. It is therefore suggested that more extensive participation of the eye care service be undertaken by the other better placed Universities in order to fully appreciate and maximize its potentials and dimensions so that it can be infused into the global efforts to attain the objective or goal of HFA 2000.

Health for all is not a static target but a dynamic way of improving the health of all people, essential eye care will be accessible to all individuals and families in an acceptable and affordable way.

The evolution of health care is measured, in part by the development of clinical knowledge and by specific clinical procedures that become salient features of contemporary health care practice.

Recent advances in eye care technology serve as valid testimony that this evolution or changes occur. Rural optometry or outreach programme is one such innovation. It is eye care or vision care taken to the rural community at affordable and acceptable cost and condition.

Since it is the first or nearest contact between the individual and eye (vision) care service, it is therefore primary health care through vision care.

It is therefore suggested that rural optometry should be embodied in the primary health care programme.

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NEWS

Health Systems Research in Africa

The WHO/AFRO Advisory Committee meeting on June 1990 considered Health Systems Research (HSR) as one way of strengthening health management. The WHO consultancy meeting of December 1990 held in Ghana recommended that each member country and WHO focus their attention to consensus building, capacity building and consolidation in order to enhance the development of HRS in the Region.

Fighting AIDS Together

In Ethiopia the situation of AIDS has become a matter of increasing concern especially after the number of AIDS cases has been shown to increase recently and reports of HIV carriers from practically all regions of the country. Because of the alarming situation, the Department of AIDS control (DAC), the Ministry of Health, has launched a three-month intensive IEC program on AIDS referred to as "Fighting AIDS Together" (FAT), between October 1-December 31, 1990. The main objective of FAT was to encourage a variety of AIDS related health promotion throughout the nation.

During the campaign, with the active participation of the FAT team (consisted of six persons outside the DAC) the Department has been actively involved in preparation of printed materials, educational package and guidelines, distribution of resource materials, educational package and guidelines, distribution of resource materials (leaflets, posters, discussion/teaching cards) to a number of governmental, non governmental and mass organizations. Training was given throughout the nation to various communicators and trainers from governmental and non-governmental agencies and church representatives on teaching methodology on AIDS, Material production, Counselling and Condom Promotion. A number of AIDS committees have been established in many institutions for the purpose of dissemination of AIDS information and to establish links with DAC "HIWOT" (meaning life), a brand name given to condom in Ethiopia, has been introduced to the public in as much as possible and it is now being sold throughout the nation.

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