THE USE OF STUDENTS' QUESTIONNAIRE IN IDENTIFICATION OF COMMUNITIES AT RISK OF ONCHOCERCIASIS IN KEFA, SOUTH-WEST ETHIOPIA

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LIST OF ABBREVIATIONS

- OCP Onchocerciasis Control Program
- OPD Out Patient Department
- WHO World Health Organization

DEDICATION

This paper is dedicated to my daughter Tamirawit Habtamu.

ABSTRACT

A study was conducted to test the application of the so called "indirect questionnaire approach" using key informants, for the assessment of high risk areas for onchocerciasis.The objective was to determine the validity, cost-effectiveness and operational feasibility of questionnaires. Questionnaires were designed and distributed to six junior high schools via the education officer and administered to 1385 students through their teachers. Validation test was undertaken on 1345 students of the same schools. Using the Spearman rank correlation analysis on the positive response rate on the indictors of onchocerciasis to the parasitological results,all the questions were negatively correlated,due to probably poor perception,immune tolerance and lack of attention to the manifestations in the high risk areas.Report of "nodule" was the only significantly correlated.The use of educational sector was found to be feasible.The indirect questionnaire approach was seven times less expensive, with comparable time and coverage as the biomedical approach.The study area was found to have high prevalence (15.5%) of microfilarial rate in young teenagers,and the endemic area wider.Further study is recommended to assess the applicability of the approach,in different socio-economic and demographic situations.

I. INTRODUCTION

Onchocerciasis (River blindness) is a filarial disease caused by Onchocerca volvulus (O. volvulus) and transmitted by a haematogenous female blackfly (Simulium). It is found in Africa, Latin America and East Mediterranean area where a total of estimated 17.6 million cases, including 326,000 people blinded exist. 90 million people are at risk of infection in 34 countries (1-4).

The spectrum of the manifestations and socio-economic impact of the disease varies in different geographical areas(5). In general it manifests as dermal, lymphatic, systemic and ocular form. The most serious form is ocular onchocerciasis which may lead to blindness. In some hyperendemic areas upto 15% of blindness is reported(5). It is the appreciation of such a problem with a serious socioeconomic impact, which resulted in the development of one of the expensive projects, the Onchocerciasis Control Programme, in west Africa. The social and economic impact of the other forms as well is not unremarkable. Severe itching and debilitating results, chronic irritation with unsightly features up to rare outcome from superinfection can result. In late stages of lymphatic form lymphaedema can

be seen (1-6).

Even though relatively better studied than the other filarial diseases(7-17), there still is deficiency of information on onchocerciasis in Ethiopia.Especially, there is a need of informations on the ocular form, and the socio- economic effects of the disease. Despite the consensus on mildness of the manifestations and rarity of the ocular form of onchocerciasis in Ethiopia for long time (8-13,15-17) the recent observations indicating the probable onchocerciasis related blindness (18,19) may strengthen the need for further assessment. The socioeconomic impact of the non-blinding form of the disease itself warants more attention to this problem. Up to now the only control activity on this disease in Ethiopia is the passive case detection and treatment of individual patients with Diethylcarbamazine. This seems to have been so because of the conceived mildness of the manifestations of the disease and that the control strategies known were not feasible. The current development in the therapy and control of the disease and the different situations in this country that are seen to be potential grounds for spread of the disease were considered to recommend a better attention to onchocerciasis in Ethiopia at this time (13).

The epidemiological methods of assessing onchocerciasis used in OCP areas and recommended by WHO,

would be expensive, need facilities and highly trained manpower (5,6).The so called "Indirect questionnaire approach" directed to "key informants" was recommended to be tested on onchocerciasis (20).It is a method that would indicate the priority areas where further epidemiological studies will be done.To test its application to Onchocerciasis this study was undertaken in Kefa zone, the area from where the first report of cases of onchocerciasis in Ethiopia came, and which contains two of the towns studied in southwestern Ethiopia in 1968 (8). There has not been an intervention, except the passive case finding and treatment of few cases(21),there is an active population movement, and the current situation of the disease in the area is not known.Based on the manifestations of onchocerciasis seen in the country as well as the recommendations of WHO about easily identifiable features of onchocerciasis the study instruments were determined and the educational sector was chosen as a structure with key informants.It is believed that the study will give information on the application of the method being tested on onchocerciasis by using the educational sector, as well as its use in health assessment in general.The biomedical test was designed to give estimate of the distribution of the disease in the area as well.Kefa zone, besides its use in validation of the method of interest.

II.Objectives

General Objectives:-

The general objective of this study was to determine the application of the indirect questionnaire appraoch using students as key informants in identifying the areas at risk of onchocerciasis.

Specific Objectives:-

1. To determine the validity of questionnaires administered to students through their teachers, inidentifying the communities at risk of onchocerciasis.
2. To identify the manifestation(s) of onchocerciasis that give(s) the best test efficiency in identifying the communities at risk of onchocerciasis.
3. To determine the operational feasibility of the indirect questionnaire approach by involving the educational sector as key informants for assessment of Onchocerciasis.

4.To compare the cost-effectiveness of the indirect questionnaire approach to biomedical survey, in identifying the communities at risk of onchocerciasis

5.To determine the distribution of onchocerciasis in the study area.

III. LITERATURE REVIEW

3.1. Onchocerciasis

3.1.1. Definition and Epidemiology

Onchocerciasis is defined and understood in relation, and contrast to the disorders related to it in some way. It is one of the disorders,in group called Filariasis, the cause of which belongs to the nematodes of the family called Filariodea. Two of the diseases of the group are emphasized because of their health, and related social and economic impact up on the individual patient as well as the community affected. They are:- Onchocerciasis (or River blindness) and Lymphatic filariasis (or elephantiasis). Onchocerciasis is defined in standard textbooks, as cutaneous Filariasis caused by Onchocerca volvulus (O.volvulus) (1-3).

Onchocerciasis is transmitted by female blackfly (simulium), and is characterized by dermal, lymphatic, systemic and ocular manifestations.The extent and spectrum as well as the associated social & economic effects vary in different geographical areas(5). In 1990 it was estimated that in the world 17.6 million cases of onchocerciasis including 326,000 people blinded exist, while 90 million people were at risk, in 34 countries (4).The great majority are in Africa and the rest in central America and eastern mediterranean region (5).

The parasite introduced into human host in its larval form, matures in to either female or male worm in about one year.The adult lives singly or more often as coiled entangled masses in the deep fascia and subcutaneous tissues becoming encapsulated by fibrous tissue, forming onchocercal nodules called onchocercomata. The gravid female which may live as long as 15 years releases thousands of microfilaria daily. The latter migrate into the skin, subcutaneous tissue or the eye and will either be ingested by the blackfly or degenerate after about 30 months (1-3,5,6).

Blackflies (Diptera : Simulidae) are the only vectors of onchocerciasis. In Africa and Southern Arabia Simulium damnosum complex is the main species while S. neavei group also transmits the disease in central and east Africa. The female deposits eggs to free flowing rivers and streams particularly in rapids on sticks, rocks, appendages of vegetation and superficial debris. The eggs hatch into larva that migrates down stream developing in to pupa. This fixes on some structure in the stream and adult fly comes out of this stage. The time from deposition of eggs to its emergence as adult is about two weeks (1-3,5). It was believed that the female blackfly restricts its flight to within few km of larval & pupal habitat called Breeding site. However, observations in OCP area indicate that it can be taken to

hundreds of kms by wind. The species of the vector differ in their host preferences, adaptation to different bio-climatic zones & vectoral roles. While the parasite is believed to develop in the vector with in a certain environmental temperature and humidity range, its strains vary in virulence and their attraction to species of vectors (5,22,23).

3.1.2. Manifestation and impact of onchocerciasis

The spectrum of manifestations and the social and economic impact vary in different geographical areas.In general signs and symptoms are characterized as dermal, lymphatic, systemic and ocular. The serious manifestations include blindness, lymphatic involvement resulting in lymphoedema & adenolymphocele, and skin involvement with irritating, and unsightly manifestations up to super-infection (1-3,5). One of the expensive vertical programmes, the Onchocerciasis control programme (OCP) which has resulted in a significant reduction of onchocerciasis in Western Africa was developed as the impact of the disease was well appreciated because of high prevalence of blindness in the area (5,6,24). Blindness is the major complication that makes the disease a public health problem, it affects mainly the economically active adults & is associated with excess mortality (5).

However the debilitating effects of non-blinding dermal, lymphatic and ocular disease leads to loss of considerable working time and reduces working efficiency. The irritation of itching as well as the psychosocial effect of the chronic manifestations is remarkable (5,6)

3.1.3. Biomedical Assessment of onchocerciasis

The epidemiological methods used in OCP Area are recommended by WHO for different purposes such as assessing prevalence and severity of onchocerciasis, to provide baseline data for evaluation and monitoring of the effects of different control activities, to provide baseline socio-economic data and to evaluate and monitor the socio- economic changes due to the intervention programmes. These methods include medical, entomological, aquatic chemical monitoring, and socioeconomic assessment (5,6).

The medical and mainly the parasitological methods are the most frequently used techniques to assess the prevalence & severity of onchocerciasis. The demonstration of microfilaria is the commonest parasitological method used.This is done by taking at least one snip from below the waist in africa.The snip is to be preserved in normal saline or distilled water and microfilaria to be counted after 24 hours for better sensitivity(5).Mazzotti test which was considered as a

useful aid in clinical diagnosis,is being condemned and not applicable for epidemiological surveys (1-3,5,6).The assessment by detection of nodules (for adult worms) being of a limited use due to low sensitivity. The ophthalmological methods include the detection of microfilaria in the eye and diagnosis of eye lesions but they are complicated,and need special equipment and specialized training.Immunology as a method of medical assessment is still not applied, even though promising (5,6,25).

The Entomological assessment includes searches for aquatic stages, vector identification and dissection for parity and parasites and further studies for monitoring and evaluation of control programmes aimed at the vector. Aquatic and chemical monitoring is performed to determine the effects of insecticides to be sprayed for vector control, on the other aquatic life in the rivers(5,6).The socio-economic assessment includes both qualitative and quantitative methods for assessing baseline information & changes in social and economic life of the population in the endemic areas (5,6).

3.1.4 Onchocerciasis in Ethiopia

It is repeatedly stated that the existence of onchocerciasis is known since 1939 when, Italian group reported cases from, south western Ethiopia. After the

report of the Italians a community based study which involved much of the southwestern Ethiopia was done by Oomen in 1967/68. That study involved Kefa, Illublabor part of Wellega and GamoGofa & identified different level of endemicity in different parts of the areas (8).

The manifestations reported by the Italian group from Bonga, and that of Cossar in Gore and Jimma, on the high rate of visual involvement, was later found to be not typical for Ethiopia (8,9).The rarity of the visual involvement is repeatedly stated in other studies as well (10-17).The existence of onchocerciasis in Gamo Gofa beyond the areas identified by Oomen was proved by De Sole & Waston, and in northwestern Ethiopia by Zein (10,11) later. Up to now the southwestern & Northwestern areas are proved to be endemic. It was estimated that 929,000 cases of onchocerciasis and 10 million people at risk of infection exist in Ethiopia while the an endemic area would be 200,000 sq.km.(13). A check list of blackflies and their distribution map made from published as well as unpublished sources indicate that the area width of the distribution of confirmed and suspected vectors of the disease extends beyond the areas known to be endemic for the disease (14) The problem of onchocerciasis is not given much attention despite the wide distribution and knowledge of its existence for long time. This probably is due to the fact that blindness

related to onchocerciasis is rare and control strategies have not been feasible.

It is not clear why ocular complication of onchocerciasis is rare in Ethiopia. Oomen, after raising the hypothesis of gradual adaptation of man with parasites resulting in reduced pathogenic effect of the parasite, speculated that Ethiopia could be one of the oldest habitat of onchocerca volvulus (8). Despite the common opinion,the recent report indicating the possibility of onchocerciasis as cause of blindness in a southwest Ethiopian district where the disease is hyperendemic (18),and a case report
of a probable onchocerciasis related blindness (19),may suggest the need for a thorough investigation on the problem.

Although up to now onchocerciasis related blindness is not reported to be high, the medical & socio-economic effects of dermatological manifestations itself is not unremarkable (5).A study done in southwestern Ethiopian coffee plantation field workers has shown that workers with onchocerciasis were more likely to be absent from work due to illness and other reasons & earned significantly less wages (26). Besides the known rates and potential of spread, the recent advances made in the therapy and control of the disease in Africa was seen to recommend proper attention for

onchocerciasis in Ethiopia (13). The mass treatment trial being carried out in a coffee plantation in south west Ethiopia is a step for future control plan. This is based on the recent advances in therapy of onchocerciasis (27).

Even though the area endemic for onchocerciasis in Ethiopia is estimated, there still is deficiency of information about the level of endemicity in the rural inaccessible districts. Except the study done in 1967/68 in a Wider area of the southwest Ethiopia (8), the rest was done in limited communities. The earlier study itself was done at towns and,yet not on representative samples of them.The routine health statistics are weak and not well developed on some countries (28) and in Ethiopia they are not seen to give informations better than what exists (12, 13, 21),as would be seen in problems lacking routine surveillance (29).This indictates the need for better information and means of getting it.

3.2. The" indirect uestionnaire approach"

3.2.1.The approach in relation to the problem of Onchocerciasis.

The development of ivermectin, a safe and single dose regimen drug that has proved to be applicable for mass treatment (30, 31), indicates that a possibility

of control exists,in areas where the vector control was not feasible (5). However it needs to identify the endemicity level of each area, because of the difference in the strategy of the treatment with respect to the level of endemecity (31). The classical methods of assessing this would be difficult to apply for a wide area, due to time, cost, technical and technological constraints (5,6). Faced with such a problem, in Nigeria, the so called Leopard skin (a spotty depigmentation) was used to estimate the endemicity level of onchocerciasis, and recommended for use in Africa (32). This is a late manifestation (to be found in adults only), and needs to be tested in other areas. Even if it doesn't need a highly trained personnel, it needs to study a representative sample (to estimate the endemicity), and still personnel for the survey.

One method, which doesn't measure the level of endemicity, but helps to identify the candidate areas for the epidemiological survey, was tested in Tanzania on urinary schistosomiasis and was recommended for onchocerciasis as well. This method termed as an " indirect questionnaire approach", involves the distribution and administration of simple questionnaires to the existing social and administrative structure and to delineate the low and high risk communities based on their response.

The health and disease conceptualization and prioritization pattern of the people involved was felt to be reflected on their response. The respondents were school children and teachers, as well as party officers in the Tanzanian study. These "key informants" may not be the representative group of the communities they represent, especially where school enrolment rate is low.This approach was found to be a cost-efficient means of identifying the communities at a higher risk for urinary schistosomiasis. Based on this a multicountry study was conducted in seven African countries (including Ethiopia) to assess its application to different socio-cultural context (20,33,34).

In this approach "the key informants" were accessible due to their specific location and ability to give literate response, while their wide distribution gives the advantage of a wide area coverage (20,33,34). Furthermore the approach is expected to give information related to the demand, in contrast to the information of the need,that would be gathered by biomedical surveys.This has implications on the community involvement for control of the problem (20).It has to be emphasised that in contrast to the use of leopard skin (32),the indirect questionnaire approach doesnt estimate the level of endemecity. However it helps to exclude the low risk areas and then to concentrate the resource for

the further assessment of the high risk areas only.

The method is to be applied only when the problem of interest doesn't need confidentiality, has a feasible method of validation in the field, and that there is a functioning administrative structure that'll serve as key informant. The operational feasibility of the method was to be measured in terms of the details related to the design and comprehension of the questionnaire, the distribution and return as well as the validation means and process (20).

To this level the method was found to be cost-efficient and valid in identifying high risk areas for urinary schistosomiasis in Tanzania, the first phase was successful in the multicountry study (20), and the students' response reported to be "correlated extremely well" (35). The report from the group in Ethiopia, however indicated that, the method didn't offer an efficient alternative to the classical methods, and the knowledge about the pathogenesis of the disease was poor. However the recording of the students' response by their teachers was assessed to be reliable (36).If this method is found useful in the assessment of onchocerciasis, it means that the time and cost of the classical methods of assessment would be applied only to the high risk areas.

The fact that local people know diseases and their main signs in their areas (20),and that they may even

have local names for onchocerciasis (5), was supported in some highly endemic areas in this country (26).The presence of control activity and health education could determine the perception and prioritization pattern, and hence the response of the informants.Urinary schistosomiasis was perceived as low priority where there was control activity, and yet high prevalence (33), and onchocerciasis was well known but a low priority where there was nodulectoomy for long time (37). In some areas patients may be aware of some signs, such as nodules despite low prevalence and intensity (38). In other study the wide spread consciousness of onchocerciasis was speculated to influence the high rate of recognition of modules in the rainforest than the savanna (39). In Ethiopia few complained of nodules, but the complaint and objective signs of pruritus was found to be comparable (16).

In spite of the above variations, villagers and primary health care workers were expected to identify, nodules, itching and hyperpigmented skin, leopard skin, brownish cornea and night blindness among the manifestations of onchocerciasis (5).

As to the key informants, school childerens' response on the manifestations of onchocerciasis may be questionable (40), but proved valuable in urinary schistosomiasis (20, 33-35). The other social structures

such as religions groups and community leaders (20), could serve well but the functionality, distribution and literacy of these may not be comparable to schools, in our setting. The other limitatio would be due to the variation of manifestations with age, behaviour and profession in relation to onchocerciasis. Immunetolerance speculated to develop in children exposed to microfilaria in utero (5), may affect the major manifestations and the response. Besides this the likelihood of children with positive snips, of having nodule was said to be less than that of the adults (6).The common manifestations of the disease may not be specific,and some other tropical parasitic diseases which usually are found in Onchocerciasis endemic areas could be accountable for them more than Onchocerciasis (16,40).However,to use the easily identifiable features would be safe for the purpose.

3.2.2. <u>The application in relation to the study area</u>.

In Ethiopian situation the educational sector is a more practical functional administrative structure to use for indirect questionnaire approach than others. To have a wider area coverage high schools may not be useful, due to their low distribution and a high drop-out rate which most probably is seen in the rural population, that is the most at risk of infection. Elementary schools have

children mostly below 10 years of age, the ones less likely to have or manifest the infection.The junior high schools are in between,with respect to the age composition,reliability and distribution that improves the coverage.

The manifestations to be used for this purpose have to be the earlier ones, those to be perceived well, and prevalent in the area.Itching was the most common complaint in all the studies done in Ethiopia.It is early, as well as perceivable manifestation. Nodules and hyperpigmented skin are among the manifestations to be easily identified and not exclusively late signs.Onchocercomata was seen in 22% in Teppi (26), 11% in Jimma Hospital (9). Depigmentation was seen to be common and onchocercomatas relatively rare in high land and vice versa in Southwestern Ethiopia (8).Nodules were found in 37% once and 7% in other time (16,17).Even if not specific,lymphadenopathy has been a common finding in some studies (8,9,15-17,26) and won't be difficult to recognize. The question of lymphoedema and its relation to onchocerciasis is not well defined (5). There was some indication for association to elephantiasis of the leg(8),and it was further postulated that the presence of superadded lesion to the lymphatics by onchocerciasis could lead to lymphoedema (16). If associated, lymphoedema would be clearly recognized. Among the easily

identifiable features, leopard skin and visual impairement are not expected to be found in the age group 10 to 15 years, the age range expected in the junior high schools in the area. Therefore itching, nodule, skin depigmentation, lymphadenopathy, and leg elephantiasis can be justified as indicartors of Onchocerciasis to include in the questionnaire for study area, population, and approach.

The standard diagnostic method for onchocerciasis is parasitological test for the microfilaria (1-3,5). This is a procedure feasible in mobile field situations.

As to the transmission, manifestations and effect of onchocerciasis, there is no observable reason to keep strong confidentiality, (see ethical considerations, part 4.9). Therefore all the prerequisites to test the "indirect questionnaire approach" to onchocerciasis in the area are fulfilled.

IV. METHODOLOGY

4.1. Introduction to the study area

The study was done in Kefa zone, south-western Ethiopia. It is one of the zones currently accountable to the Southern Ethiopian peoples regional government. Kefa zone comprises of nine weredas (districts) with an estimated 1992/93 population of 613,000 in an area of 10,070 sq.kms. The topography of Kefa zone is characterized by hills and gorges. Nearly 35% of the area is covered by rainforests.Climate of 85%, 10% and 5% of the area is cool (Woyna dega), cold (Dega) and hot (Kolla) respectively. The altitude ranges from 1000 to 3000 meters above the sea level. Many rivers and streams are found in the area, the big ones being Gojeb the Gicha (Dincha), Guma, Adiyo, Bitino, Beko, and Teeri rivers (Fig. 2)

The majority (>90%) of the population is "Kafecho" or "Kefa" while the rest include different nationalities mainly the Amhara, Tigre, Kembata, Guragie, Oromo and etc. The official language and therefore the media of education is Amharic while the local language of communication is Kafigna followed by Amharic.Nearly 90%

of the population is estimated to be Christian,the rest being Muslims.

The main economic activity is mixed farming. The capital of Kefa zone - Bonga is located 447 kms south west of Addis Ababa. There are two senior and 9 Junior high schools and 126 elementary schools in the zone.There is a health center and 24 health stations making a health service coverage of 35-40%.

According to the health units records, the major causes of morbidity are:- Respiratory tract infections, Rheumatism (unspecified), intestinal parasitism, Diarrhoea,and skin & subcutaneous infections.One of the diseases studied, in the area is onchocerciasis. According to Oomen in 1968 the prevalence of onchocerciasis in males above the age of 15 years was 30% in Bonga town and 53% in Ghimbo (Ufa) (8). The health stations have no facility to diagnose onchocerciasis. But the health centre record shows that eight to 25 cases are diagnosed annually (21).

In the area there has been a continuous population movement mainly related to the resettlement programs, in relation to the Wushwush tea plantation and Gojeb state farm found in the zone, as well as the coffee plantations in the neighbouring zone (Bebeka and Teppi Coffee farms). There has not been a study on onchocerciasis (since 1968) in the area. The only activity against the problem in the

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area is passive case detection and treatment by Diethylcarbamazine. There has not been health education programme given on this topic as far as the health institutions are concerned. Therefore it is not known to what extent, onchocerciasis is a health problem, how the trend has been and what the perception of the population is to the problem.

4.2. Study design

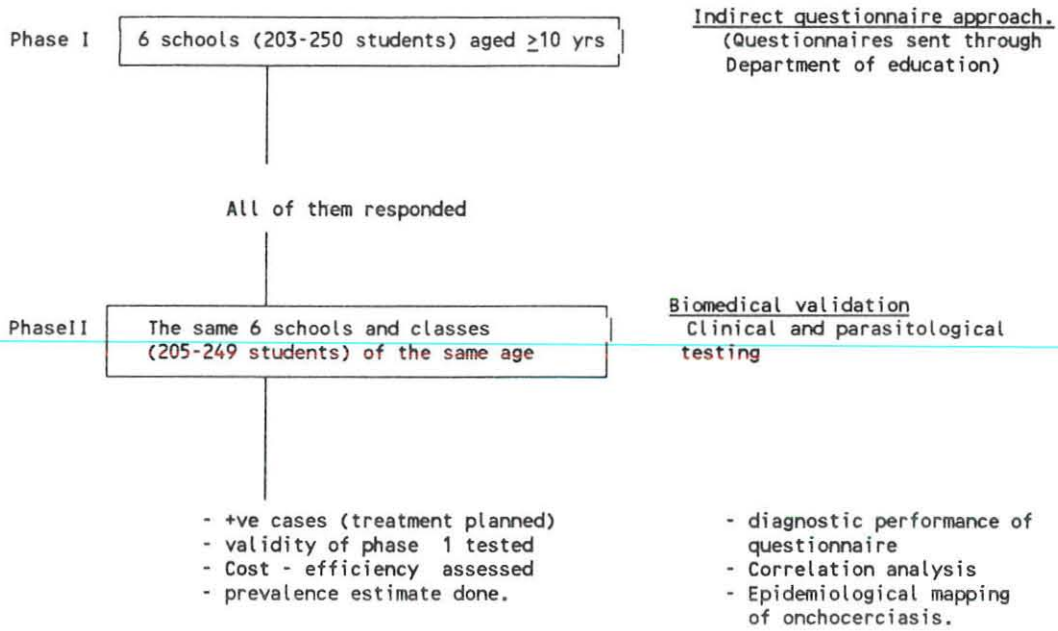
The study design is a community based cross sectional study.It involved " the Indirect questionnaire's approach" with " Biomedical validation test," a two-phase study design (figure 1).

4.3. Sample size determination.

Using the formula $N = \frac{Z^2(p)(1-P)}{L^2}$

Assuming 16 up to 20 percent prevalence,and accepting 5 percent margine of sampling error,a sample size of 203 to 250 in the first,and 205-249 in the second phases was used. The sampling method was "convenience sampling" for which the age of subjects, distribution of the units and their accessibility wastaken in to consideration.

Figure 1. Scheme of the study design



4.4. Study population and schools

Six junior high schools found in four districts and one town (the capital of zone - Bonga) out of the nine in the zone, were included. All the studied schools were accessible by all-weather roads (figure 2). A total of 1385 and 1345 students were studied in the 1st and 2nd phase respectively. 203 to 250 and 205-249 students were involved from each of the six schools in phase I and II respectively. The school enrolment rate is very low in the area (around 20%) and most of the students in under the 6th grade are less than 10 years of age. To involve those aged 10 years and above, priority is given to the higher classes 8th & then 7 th) and the lowest grade limit 5th grade, as it was found to coincide with the lowest age limit (of 10 years), according to the district educational office records.

consideration.

4.5. Operational definitions

- Communities at risk of onchocerciasis:- are the communities in the study area estimated to belong to a certain endemicity level for onchocerciasis (based on the prevalence estimate on students) without further details of the problem in the communities.

as the diagnostic performance of the questionnaire.

-Indicator Manifestation:-is a manifestation of Onchocerciasis,which when reported positively is assumed to indicate the presence of Onchocerciasis or vice versa.In this study the indicators used are ;ithcing,nodule,groin lymph node enlargment,leg elephantiasis,and skin depigmentation asd well as the history of Onchocerciasis.

-Biomedical validation:- is validation of the indirect questionnaire approach in estimating the risk gradient to onchocerciasis in different communities, by the standard epidemiological measurement of onchocerciasis problem.

The Biomedical method involves environmental assessment,parasitological and clinical assessment, while the principal measurement used for the validation is the microfilarial rate.

-Case definition:-

a) An individual is labelled as; a case,if found positive for microfilaria; a probable case, if negative for microfilaria but has a history of exposure to the major rivers(three or more times a week) and has history & signs of itching , or exposure to the major rivers one to two times a week & has nodule(s).

b) A community (here a school) is defined as a high riskarea if the microfilarial rate is 14% or above,and a low risk area if less.

4.6. Measurements

4.6.1. Phase I (Indirect questionnaire)

Using the questionnaires administered to the students by their teachers, demographic variables and perception variable were collected. These are:-

a) Demographic variables:- The students age. sex. school,home address (Woreda = district) and duration of stay.

b) The perception variables:- The students response on their experience of selected sign, symptoms and diseases.

4.6.2. Phase II (validation)

In the second phase of the study, demographic and interrelated variables which make clinical and parasitological data were collected by the medical team. These are:-a) Demographic variables:- The students' age, sex, school,address (Woreda or district and community in the district), duration of stay in this address, previous address (if any) & duration of stay.

b) Variables indicating exposure:- The practice and frequency of exposure to the rivers and river side.

c) Variables on the subjective features of onchocerciasis including the perception variables collected by the questionnaire.

d) Anthropometric variables:- Weight and height

e) Variables of objective features of onchocerciasis

f) Variables of clinical assessment of the subjects:- This are the clinical findings and the clinical diagnosis based on the demographic, exposure, subjective and objective features which suggest for or

against onchocerciasis and other diseases.

g) Variables of parasitological measurement:- The measurements of parasitological status were qualitative (presence or absence of microfilaria) and quantitative (Parasitological load) informations.

4.6.3. Both phases:- Time, cost and operational feasibility variables were collected for both phases.

4.7. Data Collection

a) Students' questionnaire

Questionnaire aimed at students and to be administered by their teachers was prepared. After arrangement with the regional and Awraja (zone) education officers, it was pretested in schools outside the study area but with similar social and economic structures. As a result of the pretest Organization, presentation, and description of the features, as well as the content was modified. The questionnaire was prepared in Amharic, translated to English and back translated. Thirteen to fifteen copies of the finalized questionnaires and descriptions per school, were given to the zonal education officer and a proposed outline of the content of an accompanying letter of the officer was presented and explained by the investigator.

The students questionnaire was prepared to contain demographic variables and eleven variables of perception measurement, six of which are related to onchocerciasis. In the pretest fourty students were interviewed on a sheet of paper (back and front),while it was twenty in the actual study. The perception questionnaire was to be presented as " Do/did you have experience of ____?". The response of the students to the demographic as well as perception questions was recorded in numerical codes.(see Appendix A1 in English and A2 for Amharic version used in this study).

Through attached papers, descriptions on the objectives, organization and administration as well as the necessary cautions and arrangements to avoid or limit bias was given. Based on the lessons from the pretest, the head teachers and teachers were given roles to play in the performance of the different activities.The filled questionnaires were returned to the district education officer,who in turn returned to the investigator.

b) Biomedical validation test

The method of reference used to test the validity of the questionnaire method as well as to estimate the prevalence distribution of the disease in the area was, the clinical and parasitological method.This was done by the medical team consisting of trained and qualified health personnel, supervised by the investigator as the physician.

Orientation was given to the group together, on the objectives, principles, procedures and the outline of individual steps. Then the following trainings were given separately.

Nurses were trained on conducting interview and recording the responses. This included the need for a friendly approach, on the need of interviewing privately and communication in local language (when necessary), and on translation of the content. Before raising the actual question, descriptions were to be given, such as address and duration of stay to be stated by relating to local situations, and events, as well as the time of school entry. Before the issue of exposure factors, description of activities which bring across and around rivers was to be given and sufficient time to be allowed for response. In each step it was to be cleared before response, that the issue is understood.Health assistants were trained how to measure height and weight, to check the instrument

In the interview the exposure history was recorded in terms of the stated frequency per day, week, month or year. History of the indicator sign/symptom was recorded as yes or no, while an open question was used to include more (if any other complaint is reported) (Appendix B).

Height and weight was measured using the adult scale. Height was recorded to the nearest two decimal points of meters to be translated into centimetres and weight to the nearest one decimal point of kg to be translated to the nearest kg by the investigator, later.

Visual acuity was tested with Snellen's E-test and recorded as d/D, where d is the distance at which letters are read and D the distance they should be read and translated later by the investigator to fit the WHO's recommendation of labelling visual impairment (41,42).

The physician's clinical impression was based on history and physical examination, and it was done independent to the parasitological test. After the possible causes of the manifestations were ruled out, subject with strong history of exposure to the major rivers ($\geq$ 3 times a week),and history of itching supported by skin changes observed, or exposure of $\geq$ once a week supported by presence of observed nodules with or without itching was labelled as a case of onchocerciasis. During analysis if such a subject was negative for microfilaria, he/she was to be labelled as a probable case of onchocerciasis. The skin snip was taken by sterile razor blades from both buttocks. To maintain consistency of the size only one of the technicians took snip. A sample of the snips was weighed by a triple beam balance and used to calculate the microfilarial load. Parasite count was done using a low x magnification, 20 to 24 hours after the biopsy.

4.8. **Data Quality control**

a) Questionnaires:- Descriptions and emphasis on the roles of headteachers was to control the quality of performance. As learned from the pretest, it was emphasized to interview not more than 10 subjects continuously, to avoid exhaustion and carelessness. The plan of the proceeding medical examination to test the correlation of response, was communicated by the attached letter to create a strong attention to the work.

b) Biomedical test:- Care in recruitment, training, assessment and cross-check was excercised. The personal background of the members in the routine practice and knowledge of the area & language (nurses, health assistants) were considered in recruitment. The members of the group were trained and assessed for their performance before and during the field practice.The principal investigator was involved in every step (interview, height, weight & visual acuity measurement, physical examination and diagnosis as well as microscopic examination). The skin snip taking, however, was done only by one laboratory technician to reduce interpersonal variation in snip size. At least 10% of subjects were cross checked by the principal investigator in this phase exept for the biopsy. In the first two schools a person experienced in field and clinical surveys of onchocerciasis was involved to cross - check the procedures, findings and diagnoses.The translation of the individual data according to the coding manual was undertaken by the principal investigator.

Data entry and storage was done by using SPSS/PC+ computer package at Jimma institute of health sciences, and data clean up done for consistency with original data completed before analysis.

4.9.**Ethical Consideration**

Every procedure was described beforehand ,and sterile technique was applied during the skin biopsy. Seriously ill students were treated at the spot.Treatment of positive cases is arranged and drugs collected to be provided before the closure of the schools. Although Confidentiality doesn't pose a serious problem,the emphasis on separate interview in the first phase was partly to maitain this.The disease was considered as one the problems to test the indirect questionnaire approach (20,33,34),which implies that confidentiality (one of the preconditions to this method) is not a problem.

4.10. Analysis

Data analysis was done using the SPSS/Pc+ computer package. The age and sex distribution of the study subjects of the two phases of the study was compared. The distribution of study subjects by schools as well as home address was compared for the two phases of the study. The distribution of microfilarial rates in schools and between sexes was compared using x^2 - test. The major analyses were:-

a) correlation analysis of the prevalence of positive response to the indicator manifestations of onchocerciasis in the questionnaire approach to the actual microfilarial prevalence and intensity of onchocerciasis infection measured in the second phase. This was done for schools on age and sex adjusted estimates and sex specific estimates using Spearman's rank correlation tests.

b) Linear regression analysis on the prevalence of positive response to the indicator manifestations and the actual microfilarial prevalence and intensity of onchocerciasis in schools.

c) Sensitivity, specificity, predictive value and yield of the indicator manifestation found to give significant correlation was done using Baye's method.

d) Cost and time spent for the two phases was compared.

V. RESULTS

5.1 The Students' questionnaire

All the six schools returned the filled questionnaires within 36 days. A total of 1385 students from grades five to eight were interviewed. The majority (70%) were from sixth and seventh grades. An average of 231 (range 203 - 250) students per school were involved. The mean and median age was 14 years (25% ile = 13 and 75% ile = 15 years). The male to female sex ratio of the students was 124 to 100.The number and sex distribution of the students interviewed in the six schools is seen in table 1. The age distribution of the students interviewed is seen in table 2. The majority (96%) of the students have lived for three or more years in their stated home address.

Almost all of the responses of the students to the listed manifestations and diseases was "yes" or "No" except for "Onchocerciasis" where 125 (9%) of them responded" I don't know" or " I don't understand".

The prevalence of positive response ("Yes I have/had ...") of the students to groin lymph node enlargement was 22.9%,followed by nodule 20.2%. The prevalence of positive response to itching, skin depigmentation, Onchocerciasis and leg elephantiasis was 16.9%, 10.5%, 6.1% and 2.6% respectively. Out of the five questions used to mask the disease of interest, the positive response to headache or dizziness ,abdominal cramp,anaemia,malaria,and goitre was 81.4% ,61.4%,40%,5.8% and 2.4% respectively.The response rate of students in different age and sex category was compared. Accordingly ,the prevalence of positive response to itching, groin lymph node enlargement, nodule, leg elephantiasis and skin depigmentation was

significantly higher in males than females where as it was not significant for Onchocerciasis (P>0.1).

Table 3 summarizes the prevalence of positive response of Males & Females to the different indicators tested and the x^2 test values with the corresponding significance, based on the analysis of response to the individual indicators by sex. There was no significant difference in prevalence of positive response in different age groups (P>0.1).

Table 1. Distribution of Students Interviewed by Schools, Kefa zone, 1992/93

Schools	Male No.(%)	Female No.(%)	Total	
			No.	%
Ghimbo	135 (54%)	115 (46%)	250	18.1
Dirri	119 (59%)	85 (41%)	204	14.7
Shishinda	132 (61%)	86 (39%)	218	15.7
Washwush	128 (53%)	115 (47%)	243	17.5
Bonga	115 (46%)	134 (54%)	249	18.0
Tinishu Gesha	137 (62%)	84 (38%)	221	16.0
Total	766 (55%)	619 (45%)	1385	100.0

Table 2. Age Distribution of Students Interviewed, Kefa Zone, 1992/93

Age (years)	Numbers	%
9	2	0.1
10	21	1.5
11	51	3.7
12	150	10.8
13	329	23.8
14	431	31.1
15	236	17.1
16	97	7.0
17	27	2.0
18	19	1.4
19	5	.4
20	7	.5
21	1	.1
22	2	.1
23	2	.1
24	3	.2
25	1	.1
unidentified	1	.1
Total	1385	100.0

Table 3. Summary of the Responce of Male and Female Students on the Different Indicators of Onchocerciasis, Kefa Zone, 1992/93.

Indicator of Onchocerciasis in the questionnaire	Males(n=766) +ve response rate (%)	Female (n=619) +ve response rate (%)	x^2	P-value (df=1)
Itching	21.9	10.8	28.9	P<0.001
Groin L.node enlarg.	25.7	19.7	6.5	P<0.05
Nodule	22.7	17.2	5.9	P<0.05
Leg elephantiasis	3.5	1.5	4.7	p<0.05
Skin depigmentation*	12.5	7.8	7.6	P<0.01
Onchocerciasis	7.0	5.0	2.2	NS

* Skin depigmentation here refers to hypo- or hyperpigmentation without specifications on site,extent,duration and etc.

The response of students (as Yes or No) to the different indicators of onchocerciasis was cross tabulated with schools. Comparison of the age - sex adjusted proportions of positive and negative response in the six schools, using the x^2 - test, df = 5 shows a highly significant difference of response to itching, groin lymph node enlargement, nodule, and skin depigmentation ($P<0.001$) & onchocerciasis ($P<0.01$). But there was no statistically significant difference in the response of students to leg elephantiasis ($x^2 = 3.7$ df = 5, minimum expected frequency 5.3) ($P>0.1$).

5.2. The clinical and parasitological test

Clinical examination and diagnosis of cases based on clinical and parasitological test was carried out in all the schools and classes involved in the questionnaire test within three to 20 days after the questionnaires' return. A total of 1345 students were tested. The average number of students in this phase was 225(range 205-249) per school.

The mean age of these students was 13.9$\pm$ 1.8 years (25% ile = 13 years and 75% ile = 15 year and range 9-25 years). The male to female sex ratio was 121 to 100. The number of students involved in the biomedical test in each school and their sex distribution is given on table 4 and their age distribution on table 5.

Table 4.Distribution of the Students Involved in the Validation Test in Schools, Kefa Zone, 1992/93

Schools	Male No.(%)	Female No.(%)	Total	
			NO	%
Ghimbo	134 (54%)	115 (46%)	249	18.5
Dirri	117 (57%)	88 (43%)	205	15.2.
Shishinda	138 (62%)	84 (38%)	222	16.5
Wushwush	121 (52%)	111 (48%)	232	17.2
Bonga	101 (44%)	127 (56%)	228	17.0
Tinshu Gesha	125 (60%)	84 (40%)	209	15.5
Total	736 (55%)	609 (45%)	1345	100.0

Table 5.The Age Distribution of Students Involved in the Validation Test, Kefa Zone, 1992/93

Age(years)	Number	Percent
9	1	0.1
10	20	1.4
11	47	3.6
12	151	11.2
13	296	22.1
14	417	30.9
15	248	11.2
16	92	18.4
17	34	6.8
18	24	2.5
19	5	1.8
20	3	0.4
21	3	0.2
23	1	0.2
24	2	0.1
25	1	0.1
Total	1345	100.1

A total of 208 = 15.5% (95% CI = 13.6% - 17.4%) of the 1345 students were positive for microfilaria of O.volvulus.Fourty three additional students were labelled as probable cases by clinical impression,but negative parasitologically.The positive predictive value of clinical diagnosis to parasitological positivity was 28.3%. The mean parasite load was 1.4 mf/mg skin snip (95% CI=1.0 - 1.8%). Based on parasitological test, the median prevalence of onchocerciasis in the schools was 17.7% (range 5.9 -22%). The proportion of males positive for microfilaria was 22.9% where as it was 6.2% in females (a very high significant difference) using Z-test. The mean parasite load in males was 2.2/mg skin and in females 0.4/mg skin,(a significant difference using Z-test, $P<0.0001$).The rate of positive responce to the indicators (phase I) as well as the microfilarial rate in the sixschools is seen in table 6.

Comparison of the proportion of students diagnosed clinically, and parasitologically in the six schools was done using a x^2 test.The difference in the age-sex adjusted parasitological as well as clinical case prevalence between schools was highly significant ($P<0.001$).

5.3 Validation of the questionnaire method

The correlation analysis of the questionnaire to the parasitological result was done on age-sex standardized rate using the spearman rank correlation and the results shown in table 7.

The correlation analysis was done separately for males and females and showed a different picture (table 8). A significant correlation was seen with nodules, itching, and onchocerciasis in either or both sexes when analyzed separately.The response of students on the indicators during the indirect questionnaire approach was compared with their response on the same indicators when administered by the medical team during the validation phase. The spearman rank analysis shows very good correlation (r= 1.0, 0.95, 0.93 and 0.88 on groin lymph node enlargement, nodule, skin depigmentation and leg elephantiasis respectively. All the correlations were significant ($P<0.05$) & the least was on itching i.e., $r=0.75$ and yet significant.

The regression analysis between the students response to the different indicators of onchocerciasis and the parasitological tests is seen on figures 3a-f and 4a-f.

Table 6. The Rate of Positive Response to the Indicators of Onchocerciasis in the Questionnaire (phase 1) and Microfilarial Rate(phase 2) in the Surveyed Schools, Kefa Zone 1992/93

School	% Yes to indicators* of onchocerciasis						MF rate **
	Itch	GLNE	nod	Leg E	skin	oncho	
Ghimbo	23.2	26.0	22.0	2.4	12.4	10.0	15.3
Dirri	6.9	3.9	12.3	3.9	2.9	3.9	20.1
Shishinda	33.0	65.1	40.4	1.8	22.0	7.3	5.9
Wushwush	8.2	5.8	9.5	2.9	4.9	3.3	20.7
Bonga	16.9	8.4	23.7	3.2	9.6	8.0	9.6
Tinishu Gesha	12.7	30.5	13.2	1.4	11.4	3.6	22.0
Total	16.9	22.9	20.2	2.6	10.5	6.1	15.5

Indicators*

Itch = itching
GLNE = Groin lymph node enlargment
Nod = Nodule(s)
LegE = Leg elephantiasis
skin = skin depigmentation (Hypo/hyper pigmentation, unspecified)
Oncho = Onchocerciasis

MF rate** = Microfilarial prevalence rate.

5.4 Diagnostic performance

The diagnostic performance of the questionnaires i.e. sensitivity, specificity, predictive values and yield were assessed only for the question "yes I have /had nodule". Taking 14% and above microfilarial rate as high risk area,the threshold of 25% positive responce to nodules had the best diagnostic performance in identifying the communities as high or low risk areas.The rate of positive responce to the indicators (phase I) and microfilarial rate(phase II) in the schools is seen in table 6,and the diagnostic performance of nodules at different thrshold limits in table 9. The other correlations were not significant for total cases and therefore their diagnostic performance was not determined.

Table 7. The Spearman Rank Correlation Coefficients on Estimates from the Students'Questionnaire to the Estimates from Parasitological Test, Kefa Zone, 1992/93

Students questionnaire (N=6)	Microfilarial rate	Intensity (mean microfilarial load)
Itching	-0.71	-0.60
Groin lymph node enlargement	-0.31	-0.54
Nodule	-0.88 (P<0.05)	-0.60
Elephantiasis of the leg	-0.14	-0.31
Skin depigmentation	-0.49	-0.49
Onchocerciasis (River blindness)	-0.71	-0.03

- Except nodule with microfilarial rate there was no significant correlation.

Table 8. The Spearman Rank Correlation Coefficients on Estimates from the Students'Questionnaire to the Estimates from the Parasitological Tests by Sex, Kefa Zone, 1992/93

Students' questionnaire (N=6)	Mirofilarial rate		Microfilarial load	
	Males	Female	Males	Females
Itching	-0.71	-0.83	-0.60	-0.93 (P<0.01)
Groin lymph node enlargement	-0.31	-0.66	-0.54	-0.84
Nodule	-0.94 (P<0.01)	-0.94 (P<0.01)	-0.37	-0.81
Elephantiasis of the leg	0.00	-0.20	0.12	-0.28
Skin depigmentation	-0.49	-0.77	-0.49	-0.61
Onchocerciasis (River blindness)	-0.77	-0.77	-0.09	-0.93 (P<0.01)

All without indicated P-value are not-significant.

Table 9. The Diagnostic Performance of Positive Response to Nodules (at Different Threshold Limits), in Identifying the Six Studied Schools as High or Low Risk for Onchocerciasis, Kefa Zone, 1992/93

Threshold of +ve response rate to nodule	The diagnostic performance in identifying a school as low or high risk (N=6 schools)				
	sensi.	speci.	PPVT	NPVT	Yield
15%	75%	67%	100%	67%	75%
20%	75%	67%	100%	67%	75%
25%	100%	100%	80%	100%	100%
30%	100%	100%	80%	100%	100%

- The threshold of + ve response is taking the inverse relationship, in accordance to the negative correlation.
- A low risk here is microflarial rate of <14% and high risk as ≥ 14%
- sensi = sensitivity
- speci = specificity
- PPVT = positive predictive value of the test
- NPVT = negative predicative value of the test

5.5. Cost-efficiency analysis

The cost of the methods was calculated in terms of transport, personnel, stationery, materials or equipment cost. The personnel cost included perdiems and allowances.The transport cost was mainly on fuels and minor car maintenance.The personnel cost mainly was during training and field survey ,on data entry and typing. Stationery cost was mainly on the papers, pens, duplication ink and the related.Material and equipments were field materials, battery and lamps, reagents and chemicals (mainly disinfectants and blades) for snips. Salary of the different people who have contributed their time at the different stages (officers, teachers and school staff, health workers including the medical team) was not analyzed. The initial training cost of the physicians, nurses, laboratory technicians and health assistants as well as other personnel involved directly or indirectly was not included . The depreciation cost of the vehicle used for transportation , the personnel cost of the consultants and the principal investigator was not accounted for.There was no material and equipment purchased for the questionnaire phase.The personnel cost of this phase included the cost during the production of questionnaire, data processing,and typing in addition to that of travel to the educational offices. The capital cost of equipments such as microscopes, scales, vehicles and other facilities was not included. The indirect questionnaire approach was seven times less costly but took a comparable time for comparable coverage as the biomedical approach.The time spent for arrangements (for both phases) was not included.Seven of the 35 days spent in phase II was on training and orientation of the team.Microscopy was done after the working hours ,during

the data collection period and no additional time is considered in the analysis.

The summary of cost analysis is shown in table 10 and comparison of cost efficiency is summarized in table 11.

5.6. Operational feasibility

The operational feasibility of the "indirect" questionnaire approach was reviewed according to the phases identified by the informal consultation group on this method (20).

a) Design and comprehension

The content of the questionnaires was believed to be concise and simple. There was no statistically sound basis used for the selection of the list of questions and the extent of the disease perception and prioritization patterns. However, two methods were used to limit this problem. The first was an informal consultation of research oriented individuals from the study area and assessment of the individual comments and perceptions before decisions on the list. The second was the pretest on two schools during which a close assessment of the administration, perception and response pattern was done to improve the questionnaire. These have resulted in change and modification of the style and contents of the explanatory text, the list of questions and recording of the students' response.

Table 10. Summary of the Cost(Eth.birr) of Indirect Questionnaire and Biomedical Approaches of Assessing Areas at Risk of Onchocerciasis, Kefa Zone, 1992/93

Method of assessment	Personnel	Transport	Stationery	Material & Equip.	Total
Indirect Questionn. approach	1380.00	460.00	890.00	-	2730.00
Biomedical tests	10862.00	1768.00	3678.00	4030.00	20338.00

Table 11. Summary of Cost Efficiency Comparisons of the Two Approaches of Assessment of Onchocerciasis, Kefa Zone, 1992/93

	Indirect (I) Questionnaire	Bio-medical test (II)	Ratio I:II
Total cost(Eth.birr)	2730.00	20,338.00	1:7.45
No. school screened	6	6	1:1
No. students screened	1385	1345	1.03:1
Cost/surveyed school	455.00	3389.67	1:7.45
Cost/surveyed student	1.97	15.12	1:7.68
Time for screening (days)	36	35	1.03:1

b) Distribution - feasibility, return time and rate

A functioning administrative system with literate population and of wider coverage selected in the study area was the educational sector. The six schools chosen were accessible by all weather roads, and two accessible by telephone as well. The return rate was 100%, and the return time ranged from 16 days to 36 days.

Two of the six schools returned the filled questionnaires within 16 days, the third on 20th day (after a telephone call), the fourth on 28th day (after an oral message), the fifth on 34th day (after a telephone call and explanation). The questionnaires of the 6th school was retrieved after a visit to the school and tracing the channels the school had used to return it to the educational office.The acceptable time period from dispatch to return of filled questionnaire was set at 16 days after discussion with the Awraja educational officer, partly because of the coincidence of the date of a meeting of head teachers. Thus only 1/3 of the schools, complied to this time.

Informations on the main aspects of the distribution comprehension and return was collected by informal interview of the office staff and, schools during the validation test.The questionnaire didn't reach the 5th school until the 14th day, and the 6th school until the 18th

day. In one of the most readily accessible schools the administration of the questionnaires was not started until the 30th day when a telephone call was made by the officers for the second time.

The regional and Awraja education officers and delegates were found to be highly cooperative and understanding. The routine channel of communicating messages within the study area, (and hence applied to this case was) through casual opportunities and cooperation of passers-by, casual visitors and etc. Based on an informal communication and observations during and after pretest and implementation of the questionnaire test, the performance of the offices, and the sections at the higher level of the organization of the units involved was found to be more appropriate and as desired. This was assessed by the timing and quality of performance of the role assigned to the unit (i.e. Distribution of the questionnaire, follow-up, administration, understanding, filling, completeness, return and etc).From observations during the validation phase, the staff in schools were not aware of the tests as well as the disease of interest.

C) Validation

The validation test was done to the six schools involved in the questionnaire test. Areas were classified

into two - high risk (which would be comparable to meso and hyperendemic) and low risk taking, 14% parasite prevalence as demarcation (for the study group).This limit was decided to be comparable to 40% in the total population,a limit of mesoendemic and above. Cost efficiency was analyzed based on the cost of transport, personnel, material and equipments as well as stationery recorded during the study period. The lack or deficiency of equipments planned for the study (corneosceleral punch, Torsion's balance) and the time and cost of travel to collect, purchase or borrow equipments (microscope, triple-beam balance etc) were some of the problems and limitations faced in the implementation of the biomedical test. The requirements of transport facility for team, in a situation where a car was shared with the health center and health department was the other operational problem faced. Due to the lack of sufficient number of corneoscleral punch and to avoid prolonging the time by disinfection of the few number to be found, razor blades were used and the sites of snip reduced from six to two.

5.7 Distribution of onchocerciasis in Kefa zone

The distribution of onchocerciasis in study area was determined and the epidemiological map prepared based on the parasitological test results. Communities were classified in to areas based on their ecological

similarity mainly forest and climate, geographical continuity, and share or distance from the major rivers. Three districts, the zonal capital town with its surroundings, and part of two more districts were covered. 13 areas comprising of different size of communities (kebeles) were identified.The proportion of parasitologically positive students and mean parasite load was calculated for these. The areas were mapped as to wether they are among the high or low risk ones,according to limit set for the validation (Figure 2).

The information gathered from the study gave basis to estimate the distribution of onchocerciasis in 50% of the area of Kefa zone (i.e. for an estimated 5,000 sq. kms). Nine of the 13 areas were identified as high risk areas,that is mesoendemic or hyperendemic,which makes nearly 60% of the studied area. The highest prevalence was recorded in the communities around Gicha (Dincha) river and Beko river, followed by Teeri - Gojeb rivers (Figure 2).


Addis Ababa
Gojeb R.

Fig. 3A Regression Line & Scatter Plot of +ve Response Rate of Nodule by MF Rate

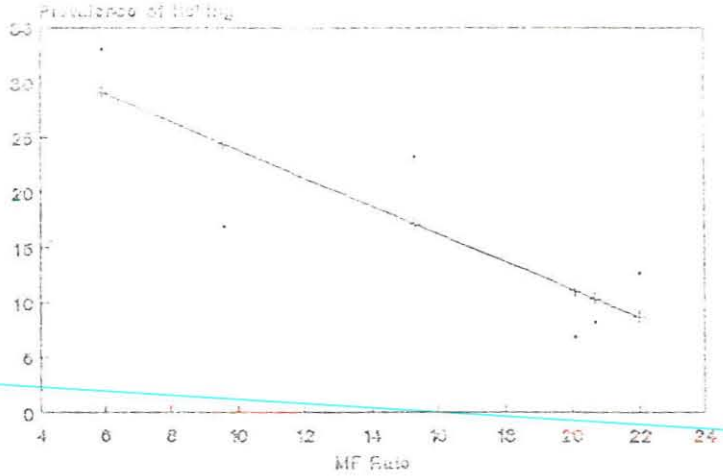


Fig. 3B Regression Line & Scatter Plot of +ve Response Rate of GLNE by MF Rate

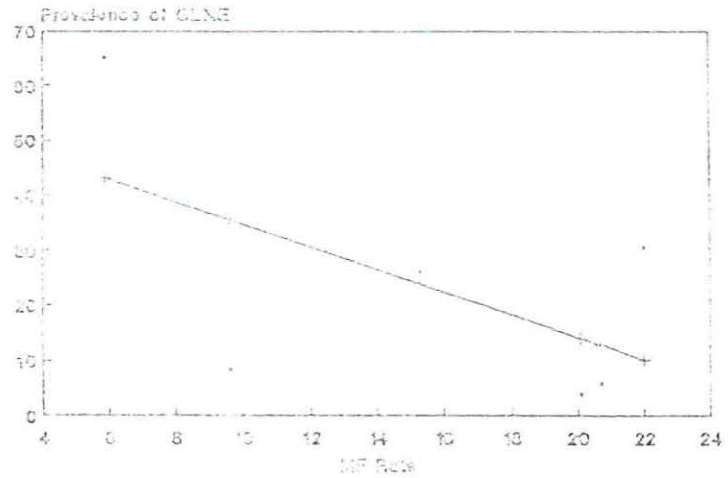


Fig. 3C Regression Line & Scatter Plot of +ve Response Rate of Nodule by MF Rate

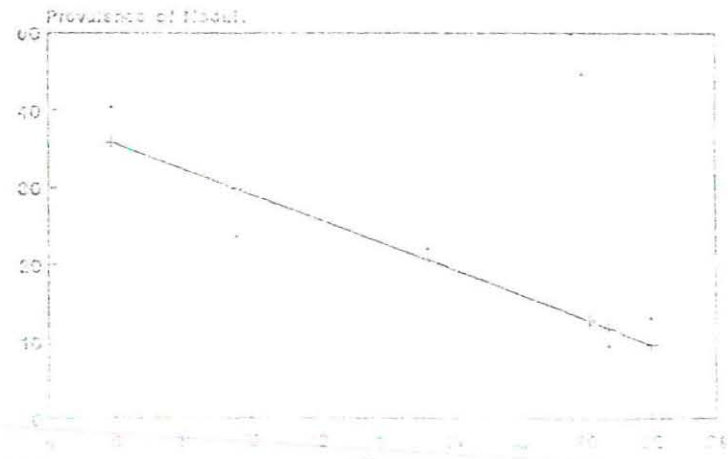


Fig. 30 Regression Line & Scatter Plot of +ve Response Rate of Lag Elaph. by MF Rate

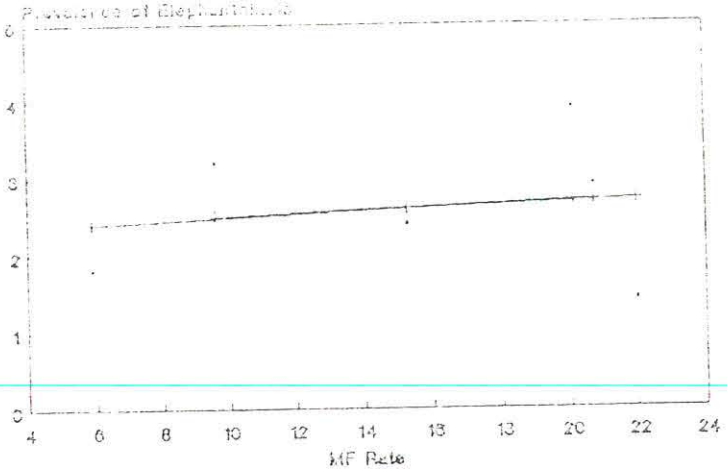


Fig. 31 Regression Line & Scatter Plot of +ve Response Rate of Skin Depigm. by MF Rate

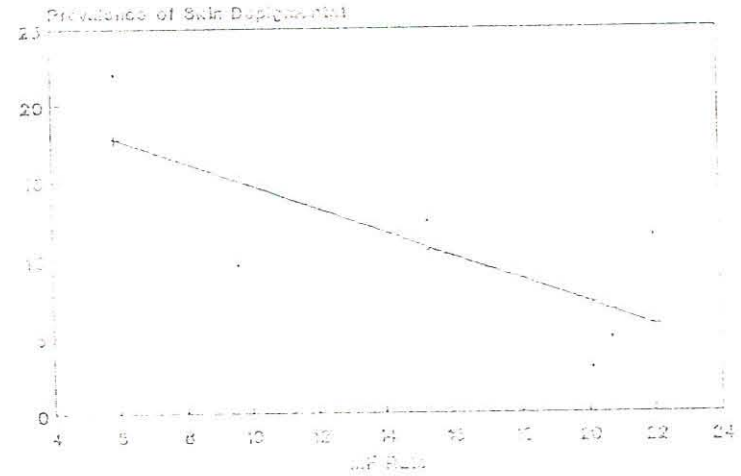


Fig. 32 Regression Line & Scatter Plot of +ve Response Rate of Orchio. by MF Rate

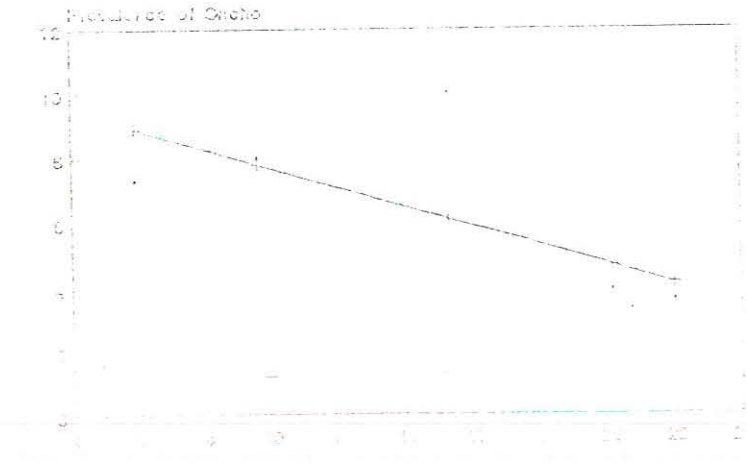


Fig. 4A Regression Line & Scatter Plot of +ve Response Rate of Itching by Mean MF Load

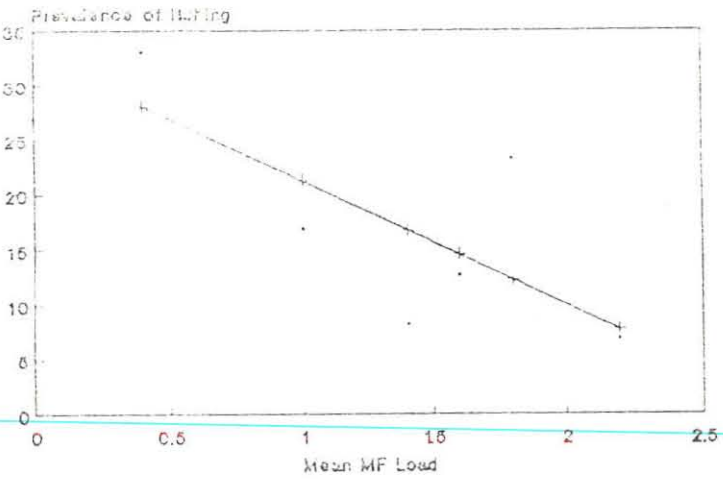


Fig. 4B Regression Line & Scatter Plot of +ve Response Rate of GLINE by Mean MF Load

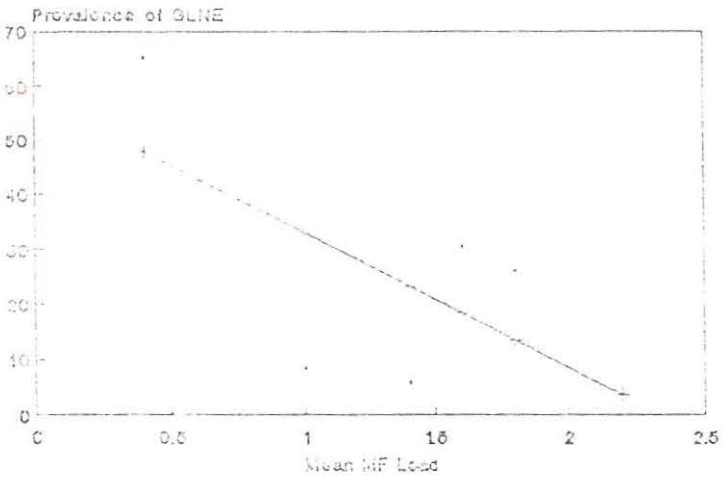


Fig. 4C Regression Line & Scatter Plot of +ve Response Rate of Nodule by Mean MF Load

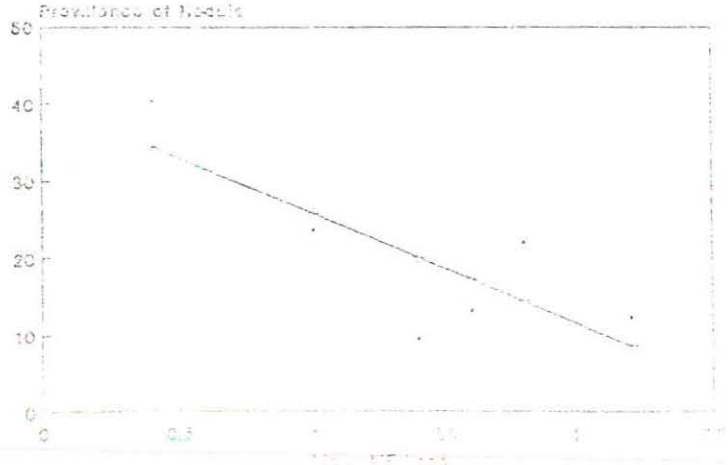


Fig. 4D Regression Line & Scatter PLot of +ve Response Rate of Leg Elaph. by Mean MF L

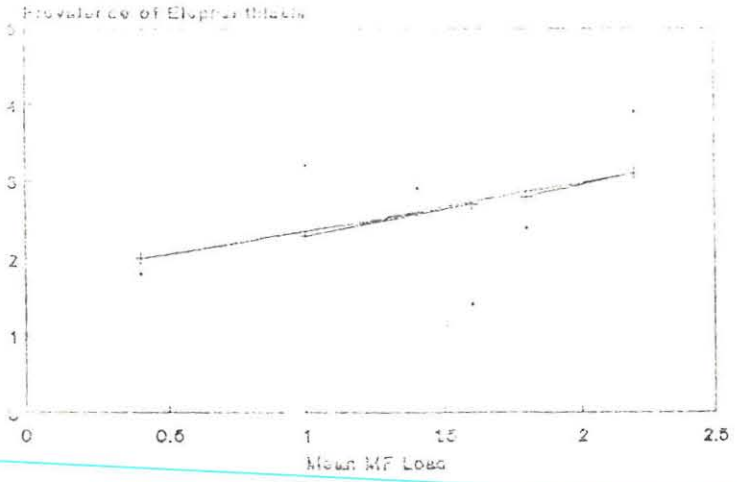


Fig. 4E Regression Line & Scatter PLot of +ve Response Rate of Skin Depigm. by Mean MF

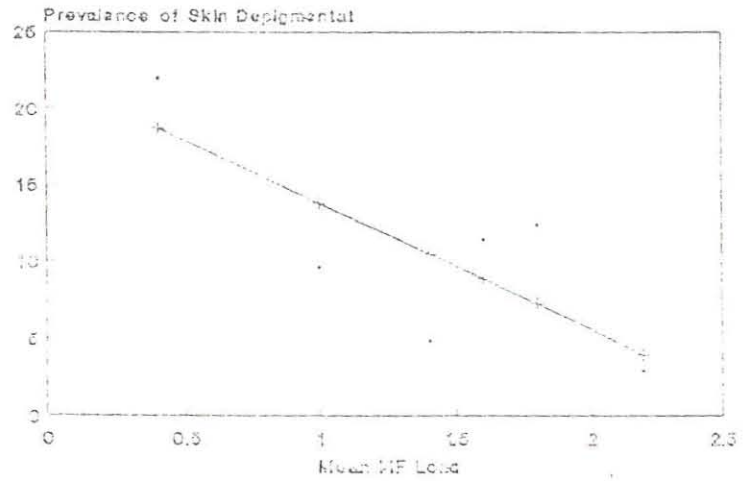
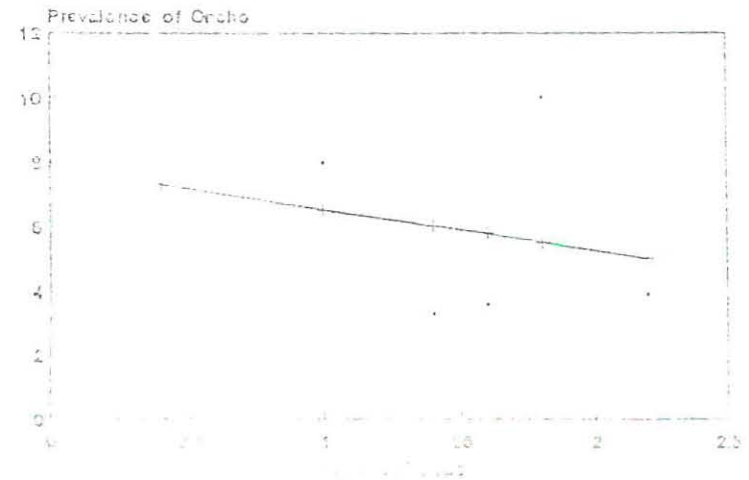


Fig. 4F Regression Line & Scatter PLot of +ve Response Rate of Oncho. by Mean MF Load



VI. DISCUSSION

a). Application of the Indirect Questionnaire approach.

The major aspects of the study and its results are discussed. The results of the correlation analysis show that there was no positive correlation and the negative correlation itself was significant only to nodules. The listed indicators are felt to be appropriate, for the age group and the area studied.It was based on the adaptation of the local prevalence for that age and the recommendations of the WHO (5,8-17).

There is no sufficient information on the issue of the validation to compare the findings. A lot of factors can determine the validity of the approach. The perception of the problem in general and the study populations' perception in particular can determine the result. In the study area there has not been health education on the disease exept that would be seen for the rarely diagnosed individual cases.The perception of the problem is believed to vary with the presence or absence of control measures (5,37), which also is not known in the area.

It is possible that, poor knowledge of the problem has resulted to the observed findings. Besides this the group studied might not give reliable response. In Nigeria it was reported that despite high rate of

dermatitis the response in children was questionable (40). In a study involving adults in Ethiopia the proportion complaining of pruritus and those found to have the objective signs was seen to fit exactly. However, the proportion was not correlated to microfilarial rate and it was concluded that other problems such as helminthiasis could be associated with itching (16).

The consistency of observation in this and the above reports is only to the extent that, reported itching and related objective manifestations like skin colour depigmentation do not correlate with each other nor reflect the actual prevalence of onchocerciasis. Whether or not the students response is reliable and reflects the onchocerciasis problem can not be concluded from the findings. To incriminate diseases other than onchocerciasis, also needs further refinement. Abdominal cramp was reported more than three times as itching, in this study. Intestinal parasitism was among the leading causes of OPD visits (21), and therefore could contribute to itching and skin depigmentation. The students response pattern was consistent when the question was administered by teachers or by the medical team, probably indicating the reliability of students and effectiveness of the teachers. A remarkable proportion of students responded as "I don't understand" to onchocerciasis and there was

no significant difference between males and females response on this unlike the case of other questions listed.As proved here and earlier(5),males are more at risk of the disease and thus the positive response could be more in them. In an area where there is no control activity, where only few cases are recognized and where there is no health education, the lack of knowledge on the problem could be expected. Therefore the responce and recording would be reliable,and comprehension of the questionnaire would be assumed to have been as desired. Similar observation was recorded when the same methodology was tested on schistosomiasis in Ethiopia, as part of a multi-country study (36).

The negative correlation between the indicators and the microfilarial rate needs a close examination. The possible explanation for the negative correlation would be seen by reflecting on the age of study population , and the study area. In another survey done in borders of the current study area less itching was found with increasing age especially for males, and the same explanation was given (Personal communication,Dr Firew Lemma).It was indicated that children who were exposed in their intrauterine life could develop immune tolerance . It is known also , that the major manifestations and especially the itching in onchocerciasis is due to the immuneresponse related to the microfilarial death (5).It

is possible that the children in the high risk areas are exposed to the infection very early that they have less immune responce to microfilaria and thus less itching than those of the low risk areas.At least the extention of this theory can be considered to the children infected at their early ages and this could be more so in those of the high risk areas. Eventhough the other causes of itching could exist,there is no reason to consider the variation in between the areas in this aspect.It needs;however,to study the distribution and effect of other problems on the manifestation of the disease in different age groups. It was indicated that light and early infections may be associated with severe itching (5).The itching and other skin signs would as a result be more frequent or more severe in low risk areas (where the onset of infection would be later,and intensity lesser). The opposite would be true to the high risk areas that there could be immunetolerance and less reporting,and thus the negative correlation.

The other possibility can be adaptation to the manifestations due to long duration (in high risk areas more than in the low risk ones),and so a less frequent reporting in the earlier group.The duration would be a reflection of early infection which itself is related to the intensity of transmission that obviously is higher in the high risk areas.Those of the low risk areas would

have found it disturbing as it is a recent onset,and thus reported positively more freqyently .As a result the negative correlation could have resulted.Since the objective findings (especially of the mild ones) reflects that of the point in time,where as the questionnaire based prevalence includes the history as well, it was not intended to assess the reliability of the report by the objective prevalence.It would be necessary to assess this by other studies.

In the case of the nodule the possible explanation could be:-

1) Development of nodules in early ages in the high risk areas that they are lost to attention and thus not reported as frequently as in the low risk areas,where they would have developed recently and recognized as problems that the reporting is frquent relatively .

2) It was indicated that parasitologically positive children are less likely to have nodules than adults(6). If this is due to the age at infection,the children from high risk areas(who could have the infection very early as compared to the low risk ones),would be less likely to have nodules than the group from high risk areas.With these explanations it has to be understood that this method may not be useful to differentiate the communities not at risk at all, from those at risk. Furthermore the findings may not be generalizable to other areas which

may have exposure to health education,or where there was an intensive control activity,where the reverse correlation would be unlikely. It should also be noted that the explanations given here about the negative correlation may not be applicable to adults.

The diagnostic performance calculated for nodules should be taken with caution as well, because the number of schools used were only six. Even if the other factors which can affect the estimation are kept unchanged, it needs to take large number of units to establish the precise measurements for the study area.

The method tested in this study is relatively new. It needs to be tested in a wider area and different settings before arriving at definite conclusions and recommendations.Especially, the variation in the response pattern and the extent as well as the direction of the correlation, in different age groups and areas with varying degree of exposure to information (by health education, presence of control programmes or intensive case detection and treatment with and without education and etc) has to be assessed. Besides this, the association of the other problems and their relative contribution to the reported and observed manifestations of onchocerciasis, in different age groups and areas with different level of knowledge to the disease, has to be sorted out.

The operational feasibility of the indirect questionnaire approach was supported by the earlier studies in which it was applied to urinary schistosomiasis (33,34,36). Its feasibility is once more supported here, for use in onchocerciasis as well. Leykun and co-workers have found the recording of students answers by teachers to be reliable. This was assessed from high rate of the answer "I don't know" in the response which " indicated the sincerity of the teachers who did the student interviews to register only what has been answered by a respondent" (36). The high degree of correlation observed in the rate of positive response to teachers and medical team, as well as the remarkable proportion of the answer " I don't know" to onchocerciasis, is a comparable finding. This probably supports the reliability of the teachers as well as the consistency of the report of the respondents.

It should be noted that the information is only qualitative. Up to now the educational sector is the existing administrative system, to which the method is studied. The use of key informants' perception and prioritization based on their experience and observation in the community was a part of the questionnaire tested in Tanzania. Head teachers and party chairmen were used to rank priority diseases and problems & this was found to correlate with the actual problem extent (33). This

part was not applied in this study. The reason was the limited number of schools studied, that the response of the few subjects and the possibility of the response to reflect only small observations couldn't be taken to estimate the picture. On the other hand, local government administrative offices were not strengthened to be involved. In Ethiopian situation, one of the favourable situations that could be used are district and kebele administrations. Especially the kebeles represent a more or less homogenous society, the members know the community more than a teacher or other government employee, and their prioritization would be more of an indicator for the community involvement in control activities. There however is a need to manage the problem related to the literacy aspect. This section was not used in this particular study due to the fact that these structures were undergoing elections and were at organizational phase during the time of study.

The motivation and performance of the authorities is found to be better, probably because of the face to face communication and discussion that persuaded them. The head teachers were given more responsibility and expectation from the officers. The fact that the questionnaires were not filled for a month and required repeated calls and explanations in one of the schools, and delayed for more than this in another school, is to

be noted. In both of them (unlike the others), the head teachers were newly assigned and arrived after the questionnaire has reached the schools. This probably indicates that the administrative system to use should be stable well functioning and authorities settled.On the other hand this may indicate the advantage to be gained from orienting the staff involved.

The time required was comparable in both phases. Not forgetting the above two cases, the lack of an efficient channel of communication in the area, applicable to the routine conditions as well probarly has influenced that of the questionnaire approach,which otherwise would have been shortened. Based on the accessibility of the six schools studied, it would be fair to expect a longer return time and reduction in return rate, if large number was to be studied and inaccessible sites were included. This should be anticipated especially, if communities such as kebele leaders are to be involved.

The cost incurred in the indirect questionnaire approach was low.But the comparison didn't include the capital cost of resources required in the biomedical approach, mainly the equipments such as the microscopes, microtitration plates, balances, field supplies, and vehicles.These were either borrowed from different places in the country or used from the health institutions. The

cost of these and the initial training of the team would be remarkable.There could be more coverage (of schools and students) in the questiopnnaire approach with out much additional cost,and by involving small costs for distribution and return. Therefore the cost efficiency comparison of the two approaches shown in the result has to be seen as underestimation of the cost of the standard approach.On the other hand the contribution of different parts of the educational sector, in terms of time materials and the effect of the job on their routine work and life was not assessed. However it was accepted as part of the routine activities that the sector has to contribute to the students, to the community and the administration as a whole.

b).Estimation of distribution of Onchocerciasis.

A preliminary estimation of the prevalence of onchocerciasis was done for the areas covered by the study. The areas identified were demarcated based on their geographical contiguity and similarity. The variation of prevalence between the areas fits to the expectation that could be formulated from their proximity to the major rivers. This didn't fit only in one case.The prevalence was six percent in the students from Bonga town, which is surrounded by big rivers with in two to 15 kms and the highest prevalence was recorded around

one of these rivers. This could be due to low exposure of these students (of the comparatively urban area) to the breeding sites and, restriction of the vector to within short distances. Two towns studied in the area during the 1968 survey of the south-western Ethiopia by Oomen were Bonga and Ghimbo (or Ufa), and the prevalence in males aged 15 and above was 30% and 53% respectively (8). Applying the results of different studies in the country (8-11,15-17), the microfilarial rate for the age group 10-14 year is estimated. Based on this the two previously studied areas were still in the same range of risk. This could justify the reliability of the estimation in other areas as well. Still it has to be known that the areas were identified with different levels of risk only (qualitative estimate), that this was from the estimates on the students, and the figures were only based on crude extrapolations.

One point to be emphasized in this respect is that, the school enrolment rate is too low in the area (21), and the method of the sampling was convenience sampling. If the youngsters not enroled or dropped out (who may have more exposure) were included there could be a different picture, and probably higher rate. Therefore it could be appropriate to take the extrapolated figures to give more of a specific labelling of the areas to their endemicity level.

VII. CONCLUSIONS AND RECOMMENDATIONS.

a). **Conclusions.**

This study gives a baseline information on the application of the indirect questionnaire approach for the assessment of communities at risk of onchocerciasis. At this stage the following conclusions are given based on this study.

a) The use of indirect questionnaire approach in assessing high risk areas of onchocerciasis can not be concluded from this study. In a setting where the community is not aware of the problem, where the manifestations are mild,and when young teenagers are involved the questionnaire may give inverse correlation.

b) Among the early manifestations of Onchocerciasis,(keeping the above conclusions) nodule gives the highest diagnostic performance, for the qualitative assessment of onchocerciasis at community level. Itching and skin depigmentation are the early manifestations that give good correlation next to nodule.

c) Even if there is high level of endemicity, where the manifestations are mild, the knowledge of community about onchocerciasis seems poor.

d) The educational sector may very well serve as a reliable and valuable means of assessing community's

health problem.It is operationally feasible to use this sector in the indirect questionnaire approach and direct communication of the health team supported by acceptance and commitment of the officers enhances the feasibility.

e) The indirect questionnaire approach saves cost by large extent, doesn't require highly trained manpower nor expensive and advanced equipments and materials as compared to the standard epidemiological methods of assessment of onchocerciasis.

f) In a large area of Kefa zone onchocerciasis is mesoendemic or hyperendemic.

b).**Recommendations**

This study was testing the application and use of a relatively new approach in assessing community health problems, with particular reference to onchocerciasis. The study area and the study problem have some specifications that indicate the need for further assessment of this methodology. The following recommendations are given.

1)It is recommended to test the method in a wider area,and whenever possible to assess the disease/illness perception and prioritization pattern beforehand.

2) Due to a silent but high prevalence that could be found,the need for better attention to Onchocerciasis in Ethiopia is recommended.

3) Further more, With respect to the application of the method on onchocerciasis the following aspect should be elaborated by further studies.

a) The difference in perception, response pattern and prevalence of the objective findings in relation to the actual disease prevalence in different age groups, concerning onchocerciasis.

b) perception in communities with differing degree of access to information of the problem and communities with differing socio-economic conditions including health status.

c) The validity of different indicators (both early and late) of onchocerciasis in identifying communities at risk of the disease.

d) The effect of prevalence of intestinal parasites and other tropical diseases, on the validity of the indicators of onchocerciasis.

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APPENDIX A1.

Student questionnaire format

School Class/ Section Date of interview

Students class R.No.											
101	.ID(leave this line free!)										
102	age (in years)										
103	Sex /If male =1 If female = fill No.2										

For Qn. 104 use the following guidelines and record only the appropriate number

1 = Bonga town and surrounding 4. Menjeo woreda 7. Diecha woreda
2 = Ghimbo woreda except # 1 5. Tello " 8. Chenna "
3 = Gewata woreda 6. Chetta " 9. Tinishu Gesha
10 = Tiliku Gesha woreda 11. Shewa Gimira woreda 12. Outside of Kefa

104	Address (use the above codes only)										
105	Duration of stay in this address										

For Qn 106-115 raise each qn.individually (explaining if necessary), ask the student if he/she has/had experienced it.Record the answer in numbers only and on the space corresponding to the student and the question. If the answer is yes record = 1, if no = 2. If the student doesn't remember or understand after explanations, record = 3 in the appropriate box.

106	Itching										
107	Malaria										
108	Groin lymph node enlargement										
109	A pea-sized or more swelling on the body										
110	Early or advanced leg edema (Elephantiasis										
111	Goitre (early or easily visible neck swelling)										
112	Skin colour depigmentation										
113	Skin disease called onchocerciasis (R-blindness)										
114	Headache or dizziness										
115	Abdominal cramp										
116	Anaemia										

Appendix A₂

የቀበሌ ስም ______________ በቀበሌ ስለሆነ ______ ወረዳ የቀበሌ ቁ [illegible]

ገበሬ/ቷ/ ተራ ቁጥር									
/ ..../ የሀገን መስፈር በፊት ይ ተበ:/.									
ዕድሜ/በዓመት/									
ጾታ/ወንድ ከሆነ = 1 ፣ ሴት ከሆነች = 2 ቁጥር በቦ ይፃፉ/.									

የጋብቻ ሁኔታ በሚከተሉት ኮዶች ተገልጸን ቁጥር በቦ ይጻፉ::

1. ያላገባ ወይም ያላገባች = 1 | 3. ተፋቶ ወረዳ = 3 | 5. በሞት ወረዳ = 5 | 8. ወና ወረዳ = 8 | 11. [illegible]
2. ጋብቻ ወረዳ በቁርባን ትዳር | 4. [illegible] ወረዳ = 4 | 6. ባታ " = 6 | 9. ትግስጋሽ = 9 | 12. [illegible]
ያለለ በበተቋ = 2 | 7. ዳቻ " = 7 | 10. ትሰዓገሽ = 10

ሃይማኖት/ኮዱ በተለጠው [illegible] በቦ ይጻፉ::/									
[illegible] ሰዓታ የቀዳ ጉዳይ/በዓመት/									

ከ1ዐ6 እስከ 115 የተዘረዘሩትን በየተራ እየጠሩና እንደ የሚሰራ [illegible] ተገልጋይ/ዋ/ [illegible] ያለው እንደሆነ ወይ... ለሁን ካለበት /ባት ይጠይቁ:: መልሱን በቁጥር በቦበቱ ያበሩና በተሳሪው/ዋ/ ተራ ቁጥር አቅጣጫ ይጻፉ:: [illegible] [illegible] [illegible] ወሮ = 2 ይሆናል:: ተገልጋይ/ዋ/ [illegible] ሲገዙ ቁጥር በቦ [illegible] ይጻፉ::

ነጭ ሽንኩርት									
[illegible]									
[illegible] እንጨጨ ዕጨ [illegible]/[illegible]/									
[illegible] ላይ በአፈር [illegible] የተሰራ ዕጨ ወይም ዕቃ									
[illegible] የቀየ የእግር ዕቃበት/ኮሁኔ/									
[illegible] ወይም ማገስጸ የሚቀየ የእንጋት ላይ ዕበጠት									
[illegible] እሰም እሰም [illegible] ወይም [illegible]									
[illegible]/እንገበርኪያበ/ የሚገለ የቀዳ በጠት									
[illegible] ወይም የሚዘር በዓት									
[illegible]									
[illegible]									

APPENDIX B.

/Keffa Awraja/ Biomedical Validation data collection form

School _____ Date _____
Class and Section _____ Students class Roll No____

101. Identification No _____ 101 ___
102. Age in Years _____ 102 ___
103. Sex (M-1 , F-20)_____ 103 ___
104. Home address a, Woreda ____ 104 a,__
b, Kebele ____ 104 b,__
105. Duration of stay in the stated address (yrs ___ 105 ____
117. Previous address (if any) from present back to birth 117a_1___

a. Woreda	b. Kebele	c. Stay duration (yrs)
a_1 _____	b_1 _____	c_1 _____
a_2 _____	b_2 _____	c_2 _____
a_3 _____	b_3 _____	c_3 _____

a_2___
a_3___
117b_1___
b_2___
117c_1___
c_2___
c_3___

118. For which of the following purposes do you go to river(s) and how often? >1/d=5 4-7/w =4 1-3/w =3 1-3/m-2 <1/m =1 Never =0 118.

a. For bathing _____ 118a. ___
b. For swimming _____ b. ___
c. For fishing _____ c. ___
d. For washing clothes_____ d. ___
e. For collecting water_____ e. ___
f. For collecting wood_____ f. ___
g. To cross by river_____ g. ___
h. Other (specify) _____ _____ h. ___
i. " " _____ _____ i. ___

119. Do (did) you have (experienced) the following? 119.
Yes = 1 No = 2 Don't remember (or understand) = 3

a. itching _____ a. ___
b. Groin lymph node swelling_____ b. ___
c. nodules _____ c. ___
d. early or advanced leg elephantiasis _____ d. ___
e. skin colour depigmentation_____ e. ___
f. Difficulty to see in the day_____ f. ___
g. " " only in the night _____ g. ___
h. Photophobia _____ h. ___
i. Other Specify _____ i. ___
k. " " _____ k. ___

PHYSICAL EXAMINATION

120. a. weight (kg) _____ 120 a. ____
b. height (cm) _____ b. ____
121. Visual acuity _____category 121.

a. Right eye _____ a. ____
b. Left eye _____ b. ____

122. Skin signs and sites (Make sign or specify

Signs	0 None	1 Lower extrem.	2 Both extrem.	3 2+ abd. &/or chest	4 genera-lized	5 Other specify
a. scratch marks						
b. macular rash						
c. papular rash						
d. pustular rash						
e. urticarial rash						
f. scales excoriations						
g. Edemas						
h. ulceration						
i. hypo-pigmentation						
j. hyper-pigmentation						
k. atrophy						
l. hypertrophy						
m. lizard skin						
n. hanging groin						
o. leopard skin						
p. leonine f.						
q. diffuse s.						
r. other specify						

123. lymphadenopathy (yes = 1, No=2) 123.

a. Femoral _____ a. _____
b. Inguinal _____ b. _____

c. popliteal _____ e. _____

124. Adenolymphocele (yes = 1, No=2) 124._____

125. Elephantiasis of the leg (yes 1, No = 2)____ 125._____

126. Scrotal elephantiasis (yes=1, No=2)_____ 126._____

127. Nodules (Total)

Site	No
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
Total	_____

128. Others specify _____ 128a. _____
_____ b. _____
_____ c. _____
_____

129. Clinical impressions 1. onchocerciasis 129. _____
2. questionable "
3. non -onchocerciasis

130. Laboratory findings (skin biopsy) 130. _____

A. Right gluteal _____ A. _____

B. Left " _____ B. _____

C. Total mf _____ C. _____

D. Average mf/mg _____ D. _____

DECLARATION

I, the undersigned, declare that this thesis is my original work and has not been presented for a degree in this or any other University, and that all sources of material used for the thesis have been duly acknowledged.

Name Habtamu Argaw MD

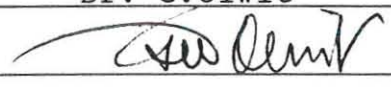
Signature 

Place Addis Ababa University

Date of submission May 1993

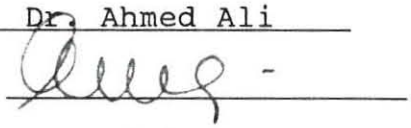
This thesis has been submitted for examination with our approval as University Advisor(s).

Dr. G.Olwit



Advisor

Dr. Ahmed Ali



Advisor