PREVALENCE AND RISK FACTORS FOR TRACHOMA IN A RURAL SOUTHERN ETHIOPIAN POPULATION

A THESIS

PRESENTED TO THE

SCHOOL OF GRADUATE STUDIES OF

ADDIS ABABA UNIVERSITY

IN PARTIAL FULFILLMENT

OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF PUBLIC HEALTH

BY

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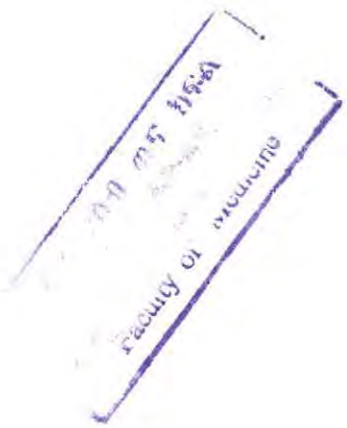
MAY, 1989



To the MEMORY

of

my father SAHLU WALELIGN

and

my mother KEBEBUSH G. YOHANNES

ACKNOWLEDGEMENT

I am grateful to the International Development and Research Centre of Canada for funding this thesis research. I am indebted to Dr. Charles P. Larson, my thesis advisor, who has shown special interest in this work from its beginning through its completion.

My field supervisor, Dr. Yves Bergevin, merits particular thanks for his great and helpful consultation in the research methodology as well as his assistance in the provision of necessary material and equipment for the study.

My gratitude is extended to the Department of the National Program for Prevention of Blindness in Ethiopia for assigning experienced and skilled trainers to work with me in training the eye examiners.

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ABSTRACT

The prevalence and risk factors associated with the occurrence of trachoma in the rural population of Sidama district of the Southern Ethiopia was studied. From 18/11/88 to 7/12/88, 1,222 randomly selected subjects were enrolled. Each subject received eye examination and completed an interview. Subjects with active trachoma (cases) and those with no eye disease (controls) were compared for rates of exposure to economic, educational, behavioral and environmental characteristics.

The prevalence of active trachoma was found to be 16.5% in the general population, 19.7% in children under the age of 10 years and 22% in those over 45 year olds. A significantly higher prevalence of active trachoma was found in females among those 10 to 44 years of age.

Risk factors for active trachoma identified in this study included low income, low education, poor environmental sanitation, and infrequent face washing and bathing. This study represents the first community based epidemiological survey of trachoma in Southern Ethiopia. The results confirm the high prevalence of trachoma and the association of trachoma with poor personal and environmental hygiene. From the knowledge gained in this study more effective control strategies in rural districts are recommended.

T.S.

I. INTRODUCTION

Trachoma is the world's leading cause of preventable blindness. About 500 million people worldwide suffer from the disease and about 1.4% of these are blind as a result (1). Trachoma remains particularly widespread among rural populations in many developing countries (2). Trachoma is internationally recognized as a priority public health problem which presents serious obstacles to social and economic development. The productivity of those blinded by trachoma is sacrificed and strains health resources, material and human, that must be allocated to their care.

Although a fair amount of progress has been made in the fight against avoidable blindness, especially that which can be prevented relatively easily with available resources and technology, trachoma and onchocerciasis account for the major portion of the increased occurrence of blindness in developing countries in comparison to industrialized countries (1). The prevalence of blindness, defined as a visual activity of <3/60, in developed countries is estimated to be 0.2%, while in developing countries it is 1% or greater. Trachoma, in particular, contributes to this difference in prevalence. Among the causes of blindness in many developing countries, trachoma accounts for 10% to over 40% of all cases of blindness(3).

Several factors that contribute to the prevalence and spread of trachoma are closely related to conditions of poverty, under

which the majority of the populations in the developing world live. In many developed countries socio-economic development has been linked with a decline in communicable diseases, particulary trachoma (4). Current rates of socio-economic development, however, are so slow in many countries where trachoma is exceedingly prevalent, that passive waiting is unlikely to provide adequate control On the other hand, minimal changes directed towards development, particulary the provision and use of water has been shown to reduce the prevalence and severity of trachoma (4).

It is essential to an effective trachoma control program that it identify those factors which will have the greatest impact on the reduction of trachoma. To carry out an effective trachoma prevention program, there must be an adequate understanding of its prevalence, distribution, and determinants. It has been recommended that future solutions to trachoma control will need to incorporate scientifically sound information on social determinants, in addition to the more classic knowledge of transmission, immunity and the development of disabling complications (4). Much is known about the physical factors that affect the transmission and severity of trachoma while relatively less research has been conducted to assess the potentially important impact of social factors. This study examines the effect of social and physical factors on the occurrence trachoma in a typical rural area of Ethiopia.

In the Sidamo Region of Southern Ethiopia, there has been no documentation of the prevalence, distribution, severity and the associated risk factors of trachoma. Available information such as morbidity statistics from health units in the district suggest that trachoma is very common. The purpose of this investigation is to provide population-based data on the occurrence (prevalence), severity, distribution and associated risk factors for trachoma in rural Sidama population.

The results of this investigation will provide epidemiologic information about trachoma which can be used by district and regional health teams for the planning of preventive interventions. Moreover, the results will serve as a baseline from which future assessment of prevention programs as well as any changes in the pattern of trachoma could be made.

II. STATE OF KNOWLEDGE

A. Occurrence

Trachoma is a well defined communicable disease of the eye causing a Keratoconjunctivitis and ultimately leading to blindness. The etiologic agent is Chlamydia trachomatis (6). Trachoma has inflicted mankind for hundreds of years and has a worldwide distribution. At the turn of the eighteenth century trachoma was documented to have reached endemic proportions in both the military fighting under Napoleon and the civilian populations of Europe (4). Trehane noted that thirty or forty years ago, blinding trachoma affected large proportions of the rural populations south of latitude 40 degree north (7). Today trachoma affects close to 500 million people, nearly 7 million of whom are blind (1).

Rural communities in which blinding trachoma is a major public health concern are found throughout Africa, the Middle East, Iran, Afghanistan, the north Indian subcontinent, Burma, parts of southeast Asia, in a few parts of Australia, parts of Pacific Islands and in Central and South America (3,7).

In developing countries the major cause of blindness is trachoma (3). It has been documented that in areas of severe endemicity of uncontrolled trachoma 1 to 3% of the adult population are totally blind as a result of trachoma. The later applies to countries in the Middle East, Africa and South-East Asia. More than 4% of the adult population in these areas are

economically blind, i.e., unable to perform any useful work for which sight is essential (3,6). According to a 1979 WHO report about 21 million people residing in the developing countries are blind, or have a visual acuity of less than 3/60 (3).

Good vision is required for industrial development. Impaired vision affects the quantity and the quality of industrial production as well as the worker's liability to accidents. Cost and other implications of trachoma should also include consideration of work days lost. For instance in 1959 in Northern Africa 20 million work days were lost due to trachoma (6).

The majority of the blindness in African countries is caused by trachoma. For instance 50% of the blindness in the rural areas of Egypt, 35% in Kenya, 32% in Malawi, 14.1% in Mali, 40.6% in Uganda and 9.3% in Zambia are caused by trachoma (3). Tizazu and Mburu reported in 1983 that the prevalence of blindness in East Equatorial, Southern Sudan, was 6.4% with rates as high as 13% in some villages. In villages with rates over 10% the major cause of blindness was trachoma, contributing to over 50% of the cases (8).

In Ethiopia little is known about the prevalence, geographic distribution and the risk factors of trachoma. The prevalence of blindness is thought to be approximately 1.5%. Of the estimated 487,000 blind people in Ethiopia, 205,000 cases are thought to be due to trachoma (14). WHO has reported the prevalence of blindness in Ethiopia to be among the highest in the world, i.e.

4% (3). The prevalence of trachoma reported in Ethiopia has varied greatly from place to place. The prevalence of moderate to severe trachoma reported by Descle was 6.5% in Jinka (Gamo Gofa), 20.4% in Gaser, 3.6% in Kontema, 50.7% in Bitate, 65% in Chaha (Shewa), 51.8% in Borena (Sidamo) cattle herders and 38.5% in Kereyu (9,10). In 1963, the percentage of moderate to severe infections between the ages of 1 and 9 years was 40% on average, and varied between 90% in Gonder area, 60% in Dessie and 15% in Dire Dawa. For the adult population the same report indicated an average prevalence of 20% (11). A 1959 study reported the prevalence of trachoma to be 42% in Addis Ababa, 56% in Harar and 77% in Gonder among children attending grades 1 - 3. In 1961, trachoma prevalence among school children was found to be 62% in Addis Ababa and 83% in Harar. In another report in 1980 the prevalence of trachoma was 99% in Wello and 94.2% in Shewa among school children (12).

In Sidama district, for the year 1987/88, eye diseases were among the ten top causes of both out-patient visits and hospital admissions. Among patients who attended the health units for an eye complaint, about 70% were from areas with a protected water supply. Nonetheless more than 50% were found to have trachoma and its complications. From MCH records of under-five clinic attenders in all health units in the district it was found that 1,242 (1.9%) of the total 70,938 diagnoses were trachoma (21).

Records from one health centre in Awassa, the main town of Sidamo region, in 1984/85 and 1985/86 ranked eye diseases as the

8th and 6th most frequent diagnosis respectively among the out-patient visits (obtained from the reports of Awassa Health Centre). Less than 50% of the residents of Sidama district have access to health services and it may be that the magnitude of the problem is much greater than documented. Even where there is access to health services, patients rarely seek medical care for trachoma unless it is severe enough to interfere with daily activities.

B. Determinants

Disorders of the eye, like many other disorders are due to a combination of ecological, biological and social factors including personal habits. To prevent blindness due to trachoma an understanding of the epidemiologic determinants that promote the occurrence of the disease are required. Such determinants include, 1) host factors such as age and sex, 2) environmental determinants including climate and water availability, and 3) general socio-economic conditions. The intensity of these determinants has been shown to be responsible for creating an environment conducive to hyperendemic trachoma (4,6,7).

One of the first researchers to recognize both the contagious nature of trachoma and identify the behavioral aspects of transmission was John Vetch. At the turn of eighteenth century Vetch did much to destroy the fiction that trachoma could be propagated through the air by only looking at the diseased eye. Vetch noted that soldiers of Napoleon with trachoma lived in unsanitary conditions which favoured the spread of infection

through sharing common wash water, towels, and bed linen contaminated with pus. He was instrumental in improving the living conditions of the soldiers, insisting on "hygiene, fresh air and life in the open air for ophthalmic soldiers" (4).

Many researchers after Vetch confirmed the association of trachoma with socio-economic development, occupation, crowding, education, and personal and environmental hygiene (7,10,12, 14-20). Dawson, working in Tunisia found significantly higher rates of trachoma in rural areas suggesting an association with poverty, poor housing and inadequate water supply (14). Reinhards reported a modest correlation between water use and trachoma; with per capita daily use inversely related to its occurrence among 1 to 14 year-olds. Low water consumption was associated with a higher prevalence of severe disease across all age groups in Southern Morocco (15). In Sudan Majckuk et al reported to have found a suggestive association of poverty, low levels of education, crowding and infrequent bathing with higher disease intensity in households (16).

According to recent estimates, the number of people suffering from trachoma in the world may have dropped from over 500 million to about 360 million over the last three decades (2). The gradual disappearance of the disease in Europe and North America has been brought about by a multitude of changes in living conditions, personal hygiene and health care delivery or as expressed by Reinhards, through "material and cultural progress" rather than specific chemotherapeutic intervention

programs (13).

Today, despite progress made in the fight against "avoidable" blindness, a general increase in living standards, environmental improvements and better health care, there are still many rural communities in developing countries where trachoma is endemic causing blindness and is the major public health problem (2,7). Because of its high prevalence, trachoma remains a high priority preventable health problem. Continued research into its occurrence and factors affecting its occurrence remain relevant and essential to the planning of preventive services.

III. OBJECTIVES

The general objective of the study was to establish the prevalence of trachoma and assess the relative importance of various environmental and behavioral risk factors.

SPECIFIC OBJECTIVES:

1. To provide population based information on the prevalence of trachoma in the rural district of Sidama.
2. To search for important economic , educational, environmental, and behavioral characteristics placing individuals at altered risk for the occurrence of trachoma.
3. To recommend appropriate actions, on the basis of results, to be taken for the prevention of trachoma.

HYPOTHESES:

This was largely a hypotheses generating study. Specific occurrence relations tested include:

H1: (Economic and Educational factors):

The occurrence of trachoma is significantly ($P<0.05$) associated with years of education and occupational status of head of household, education of subject and number of individuals residing in household;

H2: (Environmental factors):

The occurrence of trachoma is significantly ($P<0.05$) associated with exposure to cattle, smoke in living quarters, and poor garbage disposal.

H3: (Behavioral factors):

The occurrence of trachoma is significantly ($P<0.05$) associated with the frequency of face washing and bathing.

IV. METHODS

A. STUDY DESIGN:

A cross-sectional descriptive survey of systematically selected households for the presence of trachoma was conducted on 1222 people residing in 10 randomly selected rural communities in Sidama district. A case-control design was used to analyze the associations of active trachoma with demographic, behavioral and environmental variables (potential risk factors).

B. STUDY DOMAIN:

Sidama district is one of the six districts in the Sidamo administrative region of Southern Ethiopia. It has a total population of 1.6 million and an area of about 6,800 sq. kms, with a population density of about 235 people/sq. kms. It is one of the most densely populated districts in Ethiopia. About 94% of the population live in rural areas. Children under the age of 10 years constitute 40% of the total population. The average number of persons per household is 6 (21). The district is predominantly inhabited by the Sidama ethnic group.

The economy of the district is based on agriculture. It presents a wide variety of ecological zones ranging from desert or semi-arid to the most fertile highlands. Livestock raising is common although grazing land is scarce. The main staple foods are cereals and enset or false banana.

Health services are provided through 57 units including, one regional hospital staffed and supported by Norwegians; three Ministry of Health (MOH) and one non-governmental health centres, and forty three MOH and nine non-governmental health stations.

Health status indicators provided by a survey conducted by the district health team, during the preparation of the district's health profile (21), included an estimated IMR of 129.9 per 1000 live births, a crude birth rate of 55.7, a crude death rate of 15.9 and a rate of natural increase of 3.9%.

C. POPULATION: (refer to figure 1)

1. Source Population:

The source population included any individual residing in a rural community within Sidama district (awraja). The district is divided into 8 sub-districts or woredas, of which one sub-district was excluded, (n = 24,411; 1.5% of the total population) because of its remote location and difficulties in communication. People residing in the 36 urban dwellers associations were also excluded, (n = 96,678; 6% of the total population). Hence, the source of the study population was people residing in the 498 peasant associations located in the seven accessible sub-districts, (92.5% of the district's population).

2. Study Population:

Sampling was carried out in two stages. First, ten out of the 498 peasant associations were selected at random using the

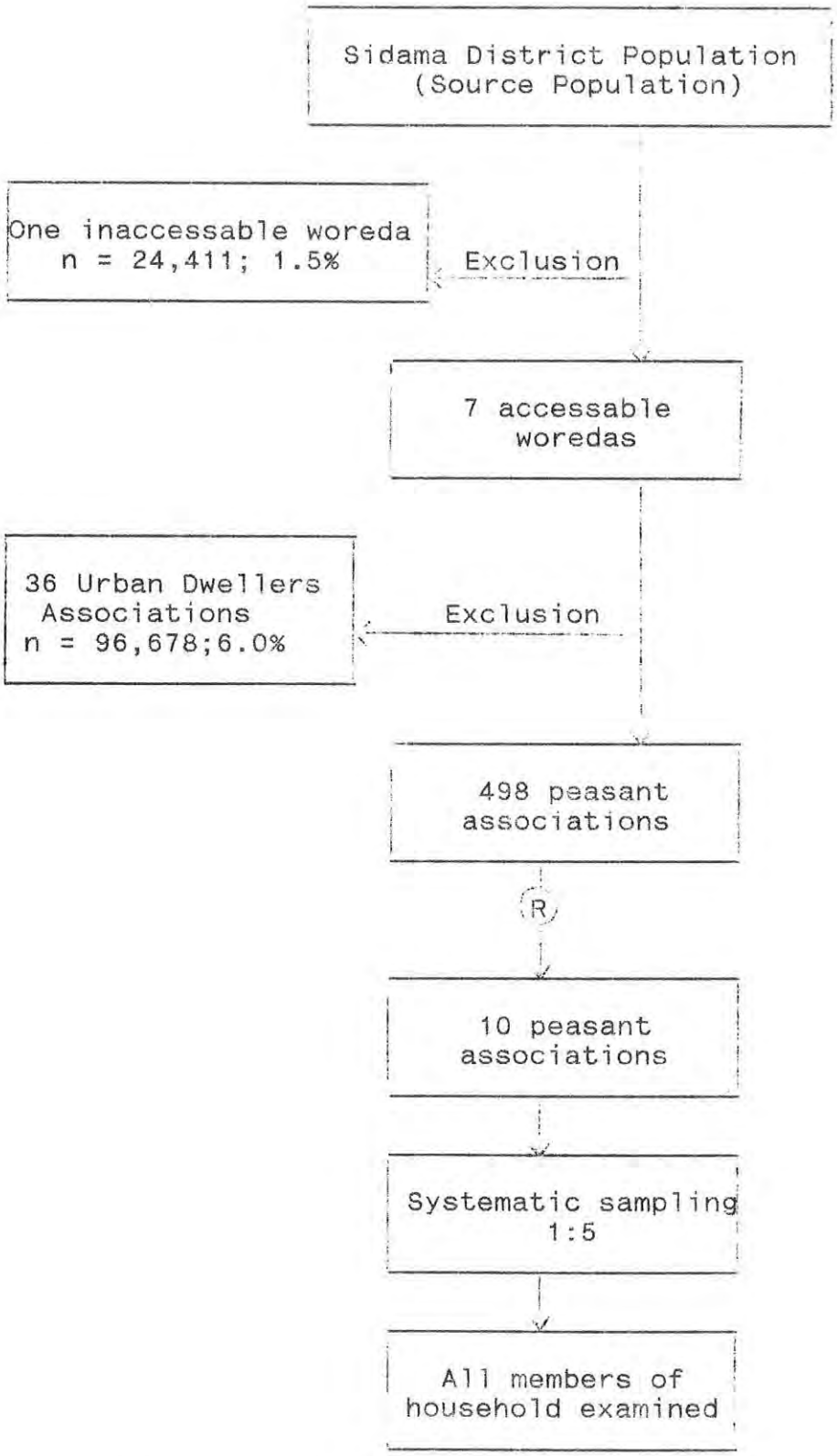

Figure 1: Selection of Study Population

lists of peasant associations available in the district office. In these ten peasant associations, 221 households were selected systematically, one in five, in the second stage, using the list of heads of households in the peasant associations office. A house to start with was selected randomly. All individuals in the selected households were examined and interviewed.

A total of 1222 individuals (558 males and 664 females) were examined for the presence of trachoma and other types of eye diseases. 81 subjects could not be examined because of their absence during the survey.

3. Sample size:

The required sample size was based upon the following assumptions and desired degrees of confidence:

alpha = 0.05 (chance of type I error)

beta = 0.20 (chance of type II error)

Estimated overall prevalence of trachoma, p = .15

Minimal detectable change (one-sided) in exposed vs unexposed = .15

Taking hypothesis 2, and assuming a .20 prevalence of animals in the home, the estimated sample size per group is 151*.

To obtain this number of cases in a community, where prevalence was estimated to be .15, about 1100 people would need to be surveyed. An additional 10% of adjustment led to a target sample size of 1,200.

*Biometrics Tables for Statistics, vol I, 2nd edition

D. MEASUREMENT:

1. Eye exam: Eye examinations on all individuals in the study population were carried out by 5 health assistants (HA) working in the district. The HAs were trained by two physicians from the Department of the National Program for Prevention of Blindness in Ethiopia, experienced in field studies for trachoma. The 23 day training was both theoretical and practical, including field training in the district.

At the end of the training, intraobserver and interobserver agreement in the grading of trachoma by the HAs was determined by the trainers. For intraobserver agreement the Kappas coefficient ranged from 0.75 to 0.95. For interobserver agreement the Kappa was 0.84 to 0.92.

Each family member was examined for trachoma. Each eye was examined with the examiner sitting in front of the individual in daylight, using a binocular loupe (X 3.5) and flashlight. The same examination procedure and level of magnification were used in all examinations. Eyes were inspected for in turned eyelashes, following which the cornea was scrutinized for scarring. To check for in turned eyelashes, the upper lid was pushed upwards slightly to expose the lid margins. Then by turning the upper tarsal conjunctiva, the conjunctiva was examined for inflammation and scarring. Each eye was examined and assessed separately. The examiner cleaned his hands with disinfectant solution (alcohol or savlon) between each examination.

To be considered present clinical signs needed to be clearly seen. When there was doubt, a sign was recorded as absent. An individual found to have inflammatory trachoma, or conjunctivitis was given a full course of tetracycline ophthalmic ointment therapy with demonstration of its application.

The intensity of trachomatous inflammation, as observed on the everted upper tarsal conjunctiva, was graded according to standard examination procedures under field conditions recommended by WHO (24). The four categories on the intensity scale applied in this study were: TRIVIAL (insignificant or absent), MILD, MODERATE and SEVERE. Classification is based on follicles (F) and papillary hypertrophy (P) observed in the everted upper tarsal conjunctiva (see annex A for details of scoring)

2. Interview: The study interview was divided into two parts; part one was about household characteristics and part two was about individual characteristics (refer to annex B). Pretesting was done on 20 households in a rural community in Sidama district. With one exception, all individuals responded to all the questions without agitation. A question concerning the annual income of a family irritated nearly all and hence was excluded from the final questionnaire. Occupation and ownership of animals were used as proxies for income. Interviewers received one day of training on the conduct of the questionnaires. This was given by the principal investigator.

E. CONDUCT AND MANAGEMENT:

This investigation was carried out from 18/11/88 to 07/12/88. There were two physicians, including the principal investigator, as supervisors. The research team examined all family members in a selected house. A household was defined as those people whose meals primarily came from the chosen dwelling. The purpose of the study was explained to the heads of households or in the absence of the head to another responsible adult member of the household. All subjects were asked for their consent to be interviewed and examined.

The examinations and interviews were scheduled for the early morning hours in order to find the majority of the members of the household within the chosen dwelling. Direct observations were required to confirm the presence of a latrine and garbage pit.

Interviews were carried out after the eye examination. The results of the eye examinations were unknown to the interviewers. The results of each examination were recorded on a separate examination record. When both eyes were involved, the findings of the worse eye were recorded. At the end of each working day both the questionnaire and the examination record, were checked for completeness and accuracy by one of the two supervisors.

F. DATA ANALYSIS:

A descriptive analysis was done to determine the frequency and distribution of trachoma in the study population. Trachoma was recorded for further analysis in the following manner to

reduce it into three categories: none as 0, trivial to mild as 1,.and moderate to severe as 2.

Individuals found to have moderate to severe infection (active trachoma), defined as cases, were compared with those who did not have any form of eye diseases, or controls, (refer to Figure 2). Cases and controls were then compared for rates of exposure to economic, educational, environmental, and behavioral characteristics. Rate ratios, their 95% confidence intervals, and chi-square statistics were calculated. Significant bivariate associations were then included in regression models for the prediction of the occurrence of trachoma. A stepwise multiple regression procedure was used allowing for the entry of variables into the equation at the p=.05 level.

Data analysis was carried out using the SPCC/PC + statistical program.

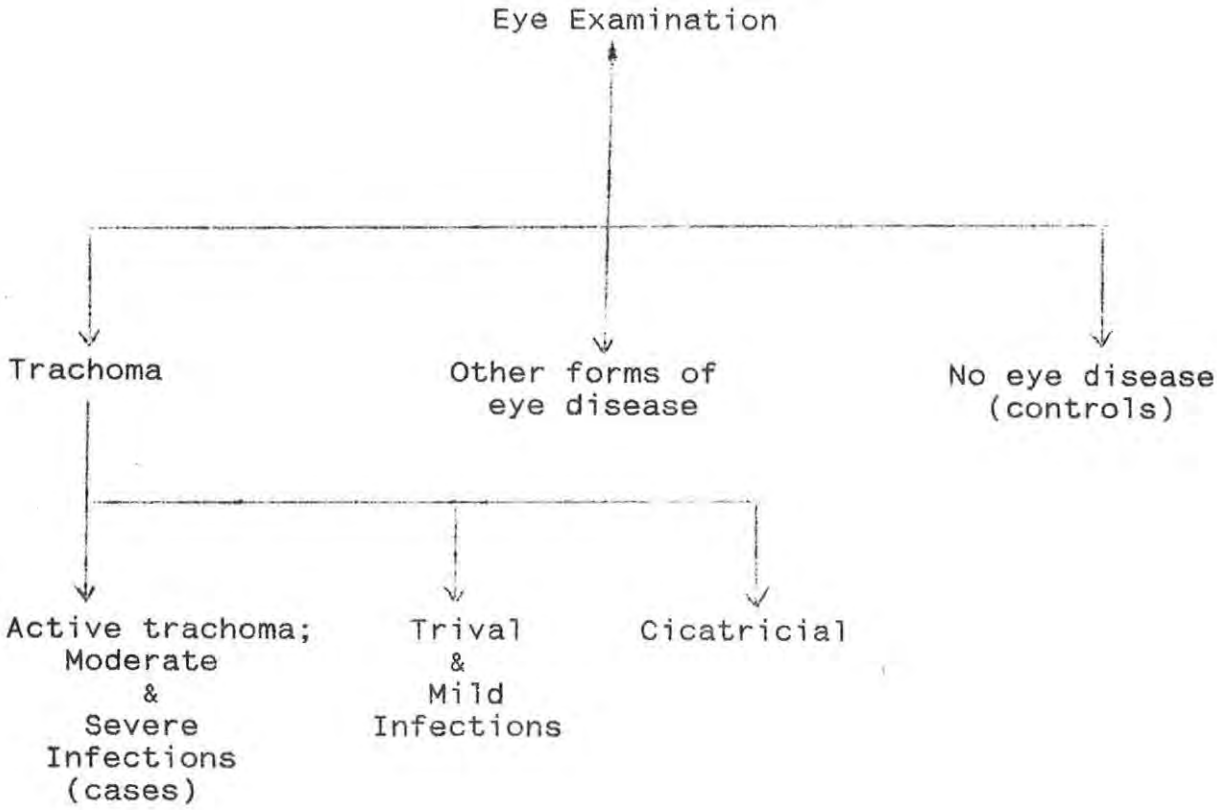

Figure 2: Outcome Classification Following Eye Examination

V. RESULTS

A total of 1222 subjects residing within ten peasant associations were enrolled in the study. 558 (45.7%) were males and 664 (54.3%) were females. Children under the age of 10 years constituted 48% of the study population. The average number of people examined from each peasant association was 122. The mean age of the study population was 17 +/- 6.4 years. The maximum age was 80 years and the minimum was 2 months.

The study population came from 221 households. 54 of the 81 people who were missed during the house-to-house survey were in the age group of >45 years. The average size of the household was 5.5. The occupation of 82.4% of the heads of the households was directly linked to agriculture. The heads of the households were predominantly males (91.2%).

The prevalence of mild, moderate and severe trachoma was found to be 26.8%. The highest prevalence was among the age groups 0 to 10 years and in those > 45 years old, which were 29.7% and 31.3% respectively. In table I the age distribution of the study population by eye exam results are summarized. In this table it can be seen that the highest prevalence rates for moderate to severe trachoma are found in children under 10 years of age. The prevalence of all grades of cicatricial trachoma was found to be 3.0%. The age specific prevalence of cicatricial trachoma increases with increasing age, reaching the highest pick in the age group of >45 years. Table 2 summarizes the age

TABLE I

Age Distribution of the Study Population by Results of Eye Examination

Age (years)	Normal		Trachoma										Conjunctivitis & other eye disease	
			Trivial		Mild		Moderate		Severe		Cicatricial			
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
0 - 4	185	62.5	22	7.4	26	8.8	25	8.5	30	8.0	1	0.3	7	2.4
5 - 9	165	57.5	22	7.7	32	11.2	29	10.1	31	10.8	3	1.1	5	1.7
10- 14	97	61.0	13	8.2	21	13.2	12	7.6	12	7.6	3	1.9	1	0.6
15- 24	102	72.9	7	5.0	16	11.4	5	3.6	3	2.1	6	4.3	1	0.7
25- 34	89	63.6	14	10.0	12	8.6	12	8.6	4	2.9	5	3.6	4	2.9
35- 44	47	58.0	7	8.6	8	9.9	8	9.9	5	6.2	6	7.4	1	1.2
≥ 45	41	35.0	17	14.5	11	9.4	13	11.1	13	11.1	13	11.0	10	8.6
Total	726	59.5	102	8.4	126	10.3	104	8.5	98	8.0	37	3.0	29	2.4

TABLE II

Distribution of Trachoma by Age

Age (years)	Total Examined	Mild		Moderate		Severe		Total	
		%	(N)	%	(N)	%	(N)	%	(N)
0 - 4	296	8.8	(26)	8.5	(25)	10.1	(30)	27.4	(81)
5 - 9	287	11.2	(32)	10.1	(29)	10.8	(31)	32.1	(92)
10 - 14	159	13.2	(21)	7.6	(12)	7.6	(12)	28.3	(45)
15 - 24	140	11.4	(16)	3.6	(5)	2.1	(3)	17.1	(24)
25 - 34	140	8.6	(12)	8.6	(12)	2.9	(4)	20.0	(28)
35 - 44	82	9.9	(8)	9.9	(8)	6.2	(5)	25.6	(21)
> 45	118	9.4	(11)	11.1	(13)	11.1	(13)	31.3	(37)
Total	1,222	10.3	(126)	8.5	(104)	8.0	(98)	26.8	(328)

distribution among those found to have trachoma. The prevalence of trachoma is fairly even across age groups, with the exception of a small drop from ages 15 to 34.

The overall prevalence of active trachoma (moderate and severe trachoma) was 16.5%. Active trachoma was also most common in children under the age of 10 years, and in those >45 years old (figure 3). There was no difference in the prevalence of active trachoma between males and females in children under the age of 10 years and in those above 45 years of age. Summary of the sex distribution of active trachoma in the age group of 10 to 44 years old is presented in table 3. It could be seen from this table that among those 10 to 44 years active infections were significantly more common in females than in males with the rate ratio in females being 2.09.

A summary of significant bivariate relations with the occurrence of active trachoma is found in tables 4 and 5. Those with active trachoma had a significantly increased rate of exposure to households headed by housewives, illiterates, infrequent face and body washing, and families who dispose of their rubbish in open fields near the house.

As shown on table 4, the respective rate ratios of active trachoma in subjects from houses headed by government employees, farmers and housewives is in an increasing order. The educational status of examinees over 10 years of age was tested for its association with active trachoma. It was found that the rate ratio for active trachoma decreased with an increase in

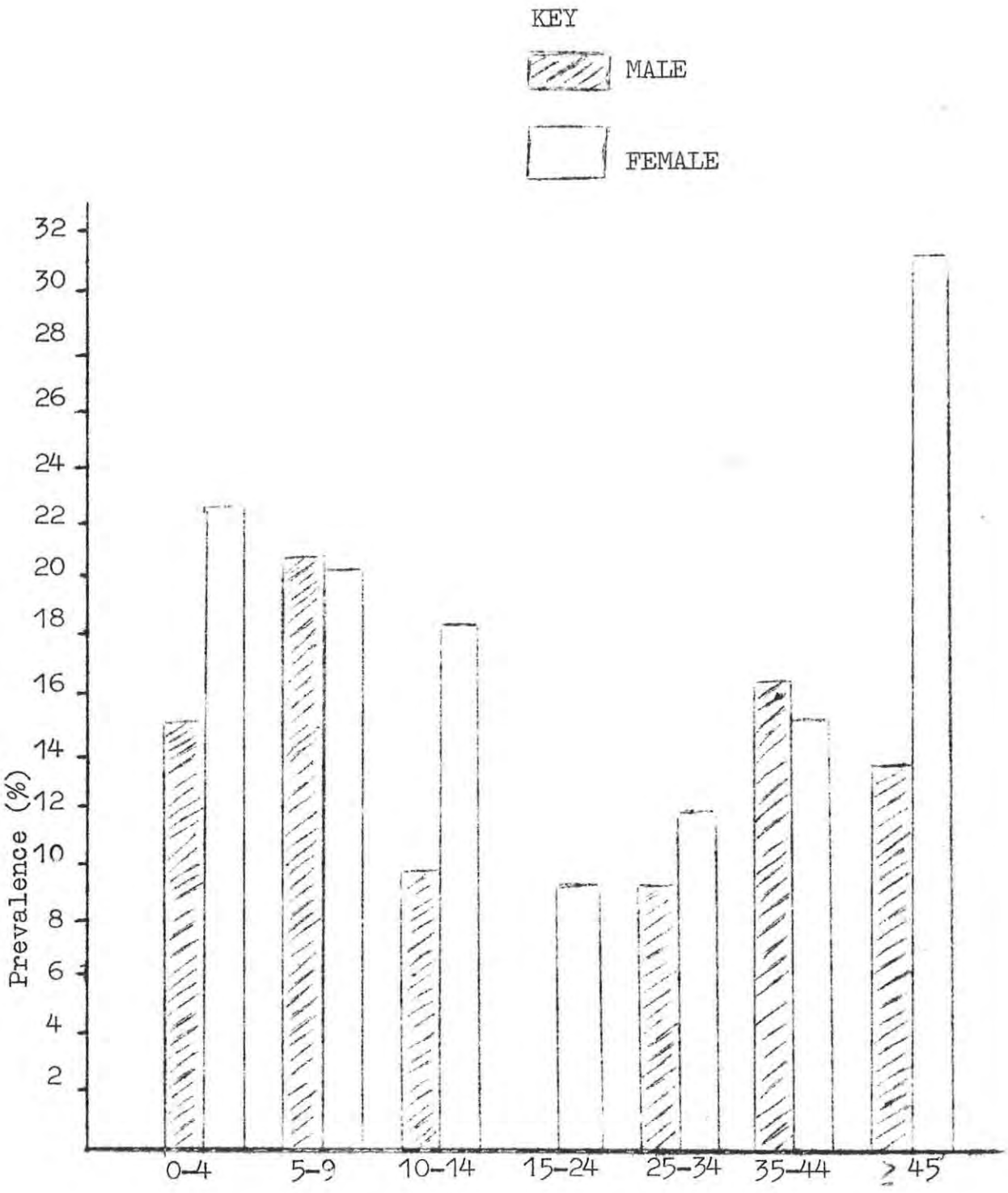

Figure 3: Age and Sex Specific Prevalence of Active Trachoma

TABLE III

Sex Distribution of Active Trachoma in the Age Group 10-44 Years

n = 637

Sex	Active Trachoma	No eye Disease
Female	45	192
Male	16	143

$X^2 = 5.16$, $(0.01 < P < 0.05)$

Odds ratio = 2.09, (95% confidence interval 1.14, 3.85)

TABLE IV

Summary of Bivariate Analysis of Demographic Economic and Educational Determinants of the Occurrence of Active Trachoma

Characteristics	Active Trachoma %	(N)	Normal %	(N)	Crude Rate Ratio	95% confidence interval
1. Age (years)*						
+ a. > 10	18.8	(87)	81.2	(376)	1.00	
b. < 10	24.7	(115)	75.3	(350)	1.42	1.02, 1.90
2. Occupation of the head of a house **						
+ a. Government employee	14.9	(11)	85.1	(63)	1.00	
b. Farmer	20.2	(159)	79.8	(627)	1.45	0.75, 2.82
c. Housewife	37.7	(23)	62.3	(38)	3.47	1.52, 7.91
3. Education of the head of a house **						
+ a. 7-12 grade	3.7	(7)	96.3	(184)	1.00	
b. 1-6 grade	22.7	(135)	77.3	(460)	7.71	3.54, 16.8
c. Illiterate	24.6	(60)	75.4	(184)	8.57	3.82, 19.2
4. Educational status of the individual**						
+ a. 7-12 grade	12.3	(23)	87.7	(164)	1.00	
b. 1-6 grade	21.6	(29)	78.4	(105)	1.97	1.08, 3.59
c. Illiterate	28.1	(75)	71.9	(192)	2.79	1.67, 4.65
5. Ownership of cattle**						
+ a. Yes	19.7	(159)	80.3	(649)	1.00	
b. No	35.3	(43)	64.7	(79)	2.22	1.47, 3.34

\+ Referent category
* $P < 0.05$
** $P < 0.01$

TABLE V

Summary of Bivariate Analysis for Behavioral and Environmental Determinants of the Occurrence of Trachoma

Characteristics	Active Trachoma %	Active Trachoma (N)	Normal %	Normal (N)	Crude Rate Ratio	95% Confidence Interval
1. Garbage disposing system*						
+ a. Far away	16.4	(110)	83.6	(559)	1.00	
b. Backyard	35.3	(92)	64.7	(169)	2.77	2.00,3.84
2. Frequency of face washing (per week)*						
+ a. > 7 times	20.7	(131)	79.3	(502)	1.00	
b. 7 times	23.5	(39)	76.5	(127)	1.18	0.79,1.77
c. < 7 times	24.6	(32)	75.4	(98)	1.25	0.80,1.95
3. Frequency of bathing (per month)*						
+ a. > 4 times	20.1	(86)	79.9	(341)	1.00	
b. 1 - 4 times	22.7	(87)	77.3	(296)	1.17	0.84,1.64
c. < 1 times	24.4	(29)	75.6	(90)	1.28	0.79,2.07

\+ Referent category

* P< 0.001

educational status of the subject as well as the head of the household.

Not having cattle was found to be a risk for trachoma, which may be a reflection of income. There was no statistically significant association between keeping animals inside the house and trachoma.

A striking association was found between garbage disposal system and the occurrence of active trachoma. A subject found to have active trachoma has a 2.8 times higher chance of being from household disposing its garbage in an open field near the house.

Association was also found between frequency of face washing and active trachoma. Active trachoma was more frequent in those who washed their faces less than seven times per week. The odds ratio of active trachoma in those who washed their faces less than once per day compared with the rest of the population was 1.2. The risk was even higher when compared with those who washed their faces more than once per day. Active trachoma was also more frequent in those who washed their bodies infrequently. The odds ratio for active trachoma in those who washed their body less than once per month, when compared with the rest of the population was 1.19; the figure is even higher when compared with those who bathe at least once per week.

A summary of the multiple regressions based upon demographic, economic, educational, behavioral, environmental and combined models are presented in tables 6,7 and 8 respectively.

Demographic factors predictive of the occurrence of active trachoma were ownership of cattle and the occupation and educational status of the head of the household (table VI). Not predictive were age and education of the subject. Behavioral/ environmental factors predictive of active trachoma were the method of garbage disposal, frequency of facewashing and bathing (table VII). Not entered into the equation were animals living within the house. In the combined model the following factors were most predictive of trachoma: method of garbage disposal, occupation and education of head of household, ownership of cattle (table VIII).

TABLE VI

Multivariate Analysis of Demographic, Economic and Educational Determinants of Active Trachoma in Rural Sidama District

Characteristic	B	SE B	BETA	Significance
Ownership of cattle	-0.109	0.029	-0.124	0.000
Occupation of the head of household	0.030	0.011	0.093	0.004
Education of the head of the household	-0.011	4.939E-03	-0.073	0.027
Constant	0.271	0.032		0.000

TABLE VII

Multivariate Analysis of Behavioral and Environmental Determinants of Active Trachoma in Rural Sidama District

Characteristic	B	SE B	BETA	Significance
Garbage disposing system	0.081	0.014	0.172	0.000
Frequency of face washing	-0.079	0.037	-0.079	0.010
Frequency of bathing	-0.062	4.982E-03	-0.066	0.026
Constant	0.198	0.110		0.000

TABLE VIII

Summary of the Multivariate Aanalysis of All the Risk Factors for Active Trachoma in Rural Sidama District

Characteristic	B	SE B	BETA	Significance
Garbage disposal system	0.081	0.015	0.172	0.000
Occupation of the head of household	0.029	0.010	0.089	0.006
Ownership of cattle	-0.080	0.029	-0.091	0.005
Education of the head of household	-0.011	4.868E-03	-0.073	0.023
Constant	0.129	0.042		0.002

VI. DISCUSSION

The purpose of this investigation was to document the prevalence of trachoma in the rural Sidama population and to identify important determinants of the occurrence of trachoma. This study documented a high prevalence of trachoma in the district. Additionally, several behavioral, environmental, economic and educational characteristics were identified that are significantly related to the occurrence of active trachoma. This discussion will separately address the occurrence and determinant findings, next assess certain methodologic issues and conclude with a consideration of the study's generalizability and implications.

The study used a well recognized determination of sample size and a house to house survey of eye examination. The trachoma grading system used agreed with the WHO criteria (25). Health assistants trained by experienced trainers were used. Their interobserver and intraobserver agreement in the grading of trachoma were good. The method used a higher 3.5 x magnifying loupe which could compensate the deficiency observed during the intraobserver and interobserver agreement. Exclusion of the trivial (insignificant) cases in the calculation of the overall prevalence of trachoma might have underestimated the prevalence of trachoma in the district.

The relatively high prevalence of all grades of trachoma in children under the age of 10 years is consistent with other

studies in Ethiopia and other developing countries (5,9,12,18). The prevalence of moderate to severe infections in children under the age of 10 years was felt to be due to the fact that children are exposed to various types of risk factors and are less able to maintain personal hygiene.

The difference between males and females in the occurrence of active trachoma in the age group of 10 to 44 years of age is consistent with a woman's greater exposure to and intimate contact with children during the inflammatory and maximally infectious phase of the disease.

People in the age group of >45 years were relatively underrepresented. As described, most of the individuals who were not present during the survey were people in the age group of >45 years. Probably people with trachoma might have stayed at home. This is probably why a pardoxical increase in the prevalence of active trachoma, especially in females, in this age group was observed. Additionally rural women in this age group usually stay at home taking care of small children while the younger and stronger members of the family go to market or work. Therefore, these women could get the infection more easily from the children they attend. Repeated attacks of trachoma in younger ages may have contributed to the observed relatively higher prevalence of cicatricial trachoma in old ages.

Usually the assessment of economic status of a family is difficult, particulary among rural population. In this study, the economic status of households could be estimated from the

occupation of the head of the household and ownership of cattle. Government employees, mostly elementary school teachers, have a constant monthly income, while housewives have low and irregular income as usually observed in the rural community. The significant variation in the prevalence of active trachoma between households headed by government employees, and housewives as well as the difference observed in households having and not having cattle may be due to the variation in economic status, hence suggesting the importance of the economic status in the occurrence of trachoma.

On the other hand, the government employees are the best educated groups in the local community. Therefore, it might be difficult to say which was important in the occurrence of trachoma in this case. In general, occupation of the head of the household and probably the economic status of the household, significantly affected the occurrence of active trachoma. Ko and Kyaw in Burma and Taylor in India found higher rates of trachoma among those of lower economic status (4, 26).

Lower levels of education were associated with higher disease intensity, in Sudan, and higher prevalence of disease in India (4). In the present study, both education of the heads of the families and education of the individual are strongly associated with active trachoma. This may result from the fact that where diseases of the eye are recognized as problems of importance, where there is good knowledge about ocular diseases and good attitude towards trachoma infection, all of which are

characterstics of educated subjects, may influence people to seek help early.

The strong association of open field disposal of garbage with active trachoma found in this study underlines the importance of environmental sanitation in the occurrence of trachoma. Garbage provides an excellent media for the breeding of flies which are the principle vectors of transmission. Some researchers found that flies are not the principle transmitters and showed that their control alone had little influence on the occurrence of trachoma (13). However, the high prevalence of active trachoma in the conditions of unclean environment found in this study indicated that flies played an important role in the transmission of trachoma. This finding is in accord with that of Okano who has found the relation of environmental cleanliness with the prevalence of trachoma (4).

As observed by the research team domestic garbage, which included ash. dust, dropping of animals and even feces of children, was thrown into the backyards of several houses and was considered as fertilizer, where flies were hovering around. Discharge from eyes and unclean faces of children playing around attract the flies,, increasing the probability of transmission of the infection from eye to eye.

As shown by Desole in Ethiopia, the presence of cattle and the way they are kept increases the risk of trachoma (10). One hypotheses at the beginning of the study was that more cases of

active trachoma would be found in those who owned cattle. However, the reverse was found in the present study. This may be due to the fact that those who owned cattle are well-to-do families in the community. Dropping of cattle may be disposed with other garbage so the effect of the animal dropping on trachoma perhaps depends upon the system of garbage disposal rather than their mere presence. Thus, this variable (ownership of cattle) probably showed socioeconomic status, rather than the risk it was initially intended to show. There was no difference in prevalence of trachoma between owners who kept their cattle inside the living room and those who kept them outside the living room. The benefits from owning the cattle might be higher than the disadvantages arising from keeping them inside the living room if their dropping are used or disposed properly. A better off family is more likely to use the health services, is better educated and more likely cares for personal and environmental hygiene. This study did not investigate the relationship of cattle owning and other variables, such as education and the like.

Trachoma is often associated with face washing. Many authors have shown the importance of face washing in the prevention of trachoma (5,7,23). It is of interest that in the present study no association was found between the source of water for household and active trachoma, but a correlation was found between frequency of face washing and bathing and prevalence of active trachoma. There is no doubt that fewer

flies collect on clean faces thereby reducing the transmission of trachoma. The modest association between frequency of bathing and active trachoma might probably be due to the fact that people who bathe frequently were more concerned about their personal hygiene and hence washed their faces more often than those who do not.

The association between frequency of face washing and bathing and the occurrence of active trachoma implies that the availability and use of water for personal hygiene is one of the changes that is important in the prevention of trachoma. These types of hygienic practices are not expensive, do not require trained manpower or major changes in culture. Only a minimum amount of water is required for frequent face washing. Therefore the use of water for personal hygiene is an important point of intervention, which interrupts the transmission of trachoma.

The likelihood of acquiring active trachoma by an individual, once it is known that there is poor garbage disposal system, low income and low educational level of the family is very high. The results in this study suggest that these determinants, among several others, were the most important in predicting the occurrence of active trachoma. This might be an indication that an increase in fly population, favoured by rubbish in the open field, was the most important factor for the transmission of the disease in the rural population of Sidama district. Poor environmental sanitation and personal hygiene are not restricted only to the rural population of Sidama district,

but are common for the majority of the rural population of Ethiopia. Since about 90% of the Ethiopian population is in a similar situation, improvements in environmental and personal hygiene would be expected to significantly reduce the prevalence of active trachoma.

VII. CONCLUSIONS AND RECOMMENDATIONS

The results of this community based epidemiological survey suggest the following observations in conclusion:

1. Trachoma was prevalent in the district;
2. The prevalence of active trachoma directly correlated with the age and gender of the individual;
3. System of garbage disposal, environmental sanitation, was the most important predictor of active trachoma;
4. Active trachoma was more prevalent in the conditions of poverty, low education and infrequent face washing and bathing.

These observations led to the following recommendations:

1. Introducing garbage pits and demonstrating its use in the rural community is crucial;
2. Continuous emphasis on face washing and bathing;
3. Targeting children and mothers in the prevention program;
4. Continuous surveillance of trachoma for monitoring the occurrence and impact of intervention program;
5. Continued research on determinants of trachoma.

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ANNEX A:

The guide used for grading trachoma (Recommended by WHO in 1981:

For scoring follicles (F) the everted upper tarsal conjunctival surface was divided into three approximately equal zones. See diagram.

Key:

F_0 = No follicle;

F_1 = Follicles present, but no more than 5 in zones 2 and 3 together;

F_2 = More than 5 follicles in zones 2 and 3 together but less than 5 in zone 3;

F_3 = Five or more follicles in each of the three zones.

The scores for upper tarsal papillary hypertrophy and diffuse infiltration (P) are as follows:

P_0 = Absent: normal appearance;

P_1 = Minimal: individual vascular tufts (papillae) prominent, but deep conjunctival vessels on the tarsus not obscured;

P_2 = Moderate: more prominent papillae, and normal vessels appear hazy, even when seen by naked eye;

P_3 = Pronounced: conjunctiva thickened and opaque, normal vessels on the tarsus are hidden over more than half of the surface.

According to the above scoring criteria the intensity of inflammatory trachoma was classified as follows:

Intensity	Follicles	Papillae	Key sign
Severe	F_3 (or F_2 or F_1)	P_3	P_3
Moderate	F_3	P_2	F_3
Mild	F_2	P_0, P_1, P_2	F_2
Trivial	F_0 or F_1	P_0, P_1, P_2	F_0 or F_1

In addition, to assess cicatricial trachoma and the contribution of trachoma to visual loss in the community the scores were used:

Conjunctival scarring (C):

C_0 No scarring on the conjunctiva;

C_1 Mild: fine scattered scars on the upper tarsal conjunctiva or scars on other parts of the conjunctiva;

C_2 Moderate: more severe scarring but without shortening or distortion of the upper tarsus;

C_3 Severe: scarring with distortion of the upper tarsus.

Trichosis and/or entropion (T/E):

T/E_0 No trichosis or entropion;

T/E_1 Lashes deviated towards the eyes but not touching the globe;

T/E_2 Lashes touching the globe but not rubbing on the cornea;

T/E_3 Lashes consistently rubbing on the cornea.

Corneal scarring (CC):

CC_0 Absent;

CC_1 Minimal scarring or opacity but not involving the visual axis and with clear external cornea;

CC_2 Moderate: scaring or opacity involving the visual axis, with pupillary margin visible through the opacity;

CC_3 Severe: central scarring or opacity with the pupillary margin not visible through the opacity.

According to these scoring cicatricial trachoma was graded as:

Mild - the presence of definite scars in the tarsal conjunctiva (C_1 and C_2);

Moderate - sufficient scarring of the tarsal conjunctiva to cause distortion of the tarsal plate (C_3);

Severe - trichiasis in the presence of tarsal conjunctival scarring.

ANNEX B:

The questionnaire used in the study:

Column

1. Name of the head of the family:

_____

2 Peasant association No._____ ____ 1

3. House No._____ ___ ___ ___ 2 3 4

I. Household questions:

4. Sex of the head of the household:

1. Male 2. Female ____ 5

5. Occupation of the head of the household:

1. Farmer;
2. Government employee;
3. Merchant;
4. Self employee;
5. Housewife;
6. Pensioner (retired);
7. Others; specify _____ ____ 6

6. Family size_____ ___ ___ 7 8

7. Educational status of the head of the household:

00. Illiterate;

01. Completed literacy campaign;

--. If school highest grade completed -- ___ ___ 9 10

Column

8. Do you own cattle?

   0. No 1. Yes _____ 11

9. If yes do the cattle live within the living room?

   0. No 2. Yes _____ 12

10. Where do you get water for domestic uses?

   1. River;
   2. Pond (lake);
   3. Roof catchment (rain water);
   4. Well - unprotected;
   5. Spring - unprotected;
   6. Well - protected;
   7. Spring - protected;
   8. Pipe. _____ 13

11. Where do you dispose of garbage? As verified by the interviewer.

   1. Backyard - unburned?
   2. Backyard - burned?
   3. Far away from the house. _____ 14

12. Where do you defecate?

   1. Open field near the house;
   2. Open field far away from the house:
   3. In a latrine. _____ 15

Column

13. Where do you cook?

1. In the bed room;
2. In a separate room in the house;
3. Outside the living house. _____ 16

14. Is there window in the cooking room?

0. No 1. Yes _____ 17

15. Number of rooms in the living house_____ _____ 18

II. Individual questions of the examined person:

Name of the examined person:_____

1. Sex:

1. Male 2. Female _____ 19

2. Age: _____ _____ __ __ __ __ 20 21 22 23

3. Occupation:

1. Farmer;
2. Government employee;
3. Merchant;
4. Self employee;
5. Housewife;
6. Student;
7. Retired;
8. Others: specify_____ _____ 24

Column

4. Educational status:

   99. too young to go to school;

   00. illiterate;

   01. completed literacy campaign;

   --. If school, highest grade completed ____ ___ ___ 25 26

5. Do you wash your face?

   0. No 1. Yes _____ 27

6. If yes, how often?

   times per week _____ _____ 28

7. Do you bathe?

   0. No 1. Yes _____ 29

8. If yes how often?

   times per month_____ ___ ___ 30 31

9. How many people share your bed room?_____ _____ 32

10. Result of the eye examination_____ _____ 33

Name of the interviewer_____

Signature_____

DECLARATION

I, the undersigned, declare that this thesis is my work and that all sources of material used for this thesis have been duly acknowledged.

Name Teferra Sahlu, M.D.

Signature 

Place Addis Ababa, Ethiopia

Date of Submission April, 1989

በሲዳማ አውራጃ የዓይን ማዘ ጥናት

መጠይቅ፣

ሀ. የቤተሰብ መጠይቅ፣

1. የቤተሰብ ኃላፊ ስም_____

2. የቀበሌ ገበረ ማኅበር ቁጥር_____

3. የቤት ቁጥር_____

4. የቤተሰብ ኃላፊ፣ ፀታ፣_____

   1. ወንድ ___ 2. ሴት_____

5. የቤተሰብ ኃላፊ ሥራ

   1. ገበረ

   2. የመንግሥት ሠራተኛ

   3. ነጋዴ

   4. የቀን ሠራተኛ

   5. የቤት አመቤት

   6. ጡረተኛ

   7. ሌላ ይገለጽ፣

6. የቤተሰብ ብዛት_____

7. የቤተሰቡ ኃላፊ የትምህርት ደረጃ

   00. ያልተማረ_____

   01. መሠረተ ትምህርት የተማረ ወይም በመማር ላይ ያለ_____

   . መደበኛ ት/ቤት ከገባ የክፍል ደረጃው ___ ___

8. የቤት እንስሳት አለዎት?

   0. የለም_____

   1. አዎ_____

9. አዎ ካሉ የቤት እንስሳት የሚኖሩት በመኖሪያ ቤት ውስጥ ነው?

   0. አይደለም ___

   1. አዎ _____

10. የመጠጥ ውኃ የሚያገኙት ከየት ነው?

1. ከወንዝ
2. ከሸይቀ ወይም ከአንድ ቦታ ከተጠራቀመ ውኃ /ኩሬ/
3. ከዝናብ
4. ከጉድጓድ / ያልተጠበቀ/
5. ከምንጭ
6. ከተጠበቀ ጉድጓድ
7. ከተጠበቀ ምንጭ
8. ከቧንቧ _____

11. ቀ ሽሽ የሚጥሉት የት ነው? በጠያቂው የተረጋገጠ

1. ጋሮ አይቃጠልም
2. ጋሮ ይቃጠላል
3. ከመኖሪያ ቤት ርቆ _____

12. ለመጸዳጃ የሚጠቀሙት የት ነው?

1. በሜዳ ላይ በመኖሪያ ቤት አጠገብ
2. በሜዳ ላይ ከመኖሪያ ቤት ርቆ
3. በሽንት ቤት

13. ምግብ የሚያበስሉት የት ነው?

1. መኝታ ቤት ውስጥ
2. በመኖሪያ ቤት ውስጥ የተለየ ክፍል
3. ከመኖሪያ ቤት ውጪ

14. በማብሰያ ቤት ውስጥ መስኮት አለ?

0. የለም
1. አለ _____

15. በመኖሪያ ቤት ውስጥ ስንት ክፍሎች አሉ?

_____

ሰ/ <u>የግል መጠይቅ፤</u>

የተመርማሪው ስም_____

1. የተመርማሪው ፀታ_____

   1. ወንድ ___ 2/ ሴት_____

2. የተመርማሪው ዕድሜ _____

   በወራት _____ _____

   በዓመት _____ _____

3. የተመርማሪው ሥራ

   1. ገበረ

   2. የመንግሥት ሠራተኛ

   3. ነጋዴ

   4. የቀን ሠራተኛ

   5. የቤት እመቤት

   6. ጡረተኛ

   7. ተማሪ

   8. ሌላ ይጠቀስ _____

4. የተመርማሪው የትምህርት ደረጃ

   99 ዕድሜው ለትምህርት ለደረሰ ___

   00 ያልተማረ _____

   01 መሠረተ ትምህርት የተማረ ወይም በመማር ላይ ያለ ___

      መደበኛ ት/ቤት ከገባ ክፍል _____

5. ፊትዎን ይታጠቡሉ?

   0. አልታጠብም

   1. አዎ አታጠቢለሁ _____

6. አዎ ካሉ በሳምንት ምን ያህል ጊዜ ይታጠቡሉ? _____ ጊዜ

7. ሰውነት ያን ይታጠቢሉ?

   0. አልታጠብም

   1. አዎ አታጠቢለሁ_____

8. አዎ ካሉ በወር ምን ያህል ጊዜ ይታጠቢሉ? _____ ጊዜ

9. በተመርማሪው የመኝታ ቤት ውስጥ ምን ያህል ሰው ይተኛል? _____ ሰው

10. የአይን ምርመራ ውጤት

መጠይቁን የሞላው ሰው ስም_____

ፊርማ _____

ቀን_____ 1981__